FLIR®

M460 / M560 SERIES

Installation & Operation Instructions

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This product is covered by one or more of US Patent Nos: 7470904; 7034301; 6812465; 7470902; 6929410 and other patents pending, or design patents pending.

Export control

M460 / M560-Series thermal cameras are controlled by US export laws. Please contact FLIR customer support if you have any questions.

Contact details can be found on the FLIR website: www.marine.flir.com

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CHAPTER 1: IMPORTANT INFORMATION

Safety warnings

Warning: Product installation and operation

• This product must be installed and operated in accordance with the instructions provided. Failure to do so could result in personal injury, damage to your vessel and/or poor product performance.

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

Warning: Weather conditions

When working in adverse weather conditions, ensure that a full risk assessment is carried out prior to working aloft. Adverse weather conditions can include — but are not restricted to — high winds, heavy rain, snow, ice, or a sea state which may cause vessel pitch and roll.

Warning: Working aloft

When working at height, ensure that:

• All applicable regulatory, employer, shipyard and vessel health & safety requirements are adhered to, including but not limited to the inspection and use of Personal Protective Equipment (PPE), such as approved safety harnesses and protective gloves etc.

• All nearby devices with moving parts or which emit Radio Frequency (RF) radiation are fully electrically and mechanically isolated.

• Someone in authority and at ground level is aware of the required works and that suitable clear warnings are in place.

• A safety cordon is put in place below the working area.

• All access routes are secure. Beware of wet or slippery surfaces, such as work areas or ladder rungs etc.

• All equipment and loose items such as replacement equipment and tools are safely stowed or secured, to prevent a drop hazard.

Warning: Object lifting

• When lifting the product, equipment or spare items to a platform or via a ladder, heavy objects must be lifted using a suitably-rated lifting bag or strops.

• Where applicable, it is highly recommended that you use the lifting equipment (e.g. lifting bag or strops) which is supplied with your product. FLIR will not be held liable for any product damage, vessel damage or personal injury which is caused as a result of using a third-party alternative.

• You MUST NOT manually carry heavy objects up ladders, as they can present a drop hazard.

Warning: 2–person installation required

To prevent potential product damage, vessel damage or personal injury, the installation of this product requires 2 people.

Warning: Moving parts

This product features moving parts that provide potential entrapment and striking hazards. To prevent potential product or vessel damage, or personal injury, you must:

• Before power is supplied: Ensure that the product is installed in accordance with the instructions provided.

• Before service or maintenance is undertaken: Ensure that the product's power / safety switch is switched OFF. For more information, refer to:

– **p.13 — Safety switch**

• Ensure that you and all crew members keep clear of moving parts at all times.

Warning: Switch off power supply

Ensure that 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 to do so 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: Ensure safe navigation

This product is intended only as an aid to navigation and must never be used in preference to sound navigational judgment. Only official government charts and notices to mariners contain all the current information needed for safe navigation, and the captain is responsible for their prudent use. It is the user's responsibility to use official government charts, notices to mariners, caution and proper navigational skill when operating this or any other product.

Warning: Maintain a permanent watch

Always maintain a permanent watch, this will allow you to respond to situations as they develop. Failure to maintain a permanent watch puts yourself, your vessel and others at serious risk of harm.

Warning: Thermal hazard

The external camera housing can exceed safe-to-touch surface temperatures under certain conditions (e.g. prolonged exposure to direct sunlight, or prolonged use following window heater use). Before attempting to touch the external camera housing, ensure that it has sufficiently cooled.

Failure to adhere to these guidelines could result in potential burn injuries.

Laser safety warnings

LASER RADIATION — AVOID DIRECT EYE EXPOSURE (Class 3R laser product)

Warning:

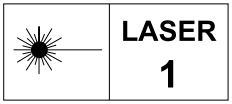
Advisory:

All camera variants referenced in the document are fitted with a Class 3R laser (in accordance with the **IEC 60825-1:2014** standard).
The Class 3R laser supports a 450 nm wavelength, 2.2° beam divergence, and a < 300mW @ 100 mm maximum power output.

Laser radiation from the Class 3R laser is emitted through the right window lens aperture located at the front of the camera's tilt assembly.
Avoid potential eye exposure to the laser beam. Do NOT direct the laser beam toward individuals or other vessels or aircraft in motion.
Unless otherwise specified, the camera must NOT be disassembled due to risk of potential exposure to the laser beam.

INVISIBLE LASER RADIATION (Class 1 laser product)

Warning:



Advisory:

All laser range finder (LRF) camera variants referenced in the document are fitted with a Class 1 laser (in accordance with the **IEC 60825-1:2014** standard).
The Class 1 laser supports a 1.55 µm wavelength and a 1.0 x 0.8 milliradian (mrad) beam divergence (horizontal x vertical).

Laser radiation from the Class 1 laser is emitted through the left window lens aperture, which is located at the front of the camera's tilt assembly.
Avoid potential eye exposure to the laser beam. Do NOT direct the laser beam toward individuals or other vessels or aircraft in motion.
Unless otherwise specified, the camera must NOT be disassembled, due to the risk of potential exposure to the laser beam.

Product warnings

Warning: Product grounding

Before applying power to this product, it MUST be correctly grounded, in accordance with the instructions provided.

Warning: Positive ground systems

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

Warning: Power supply voltage

Connecting this product to a voltage supply greater than the specified maximum rating may cause permanent damage to the unit. For the correct voltage, refer to the information label affixed to the product.

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: Load-bearing

Do NOT apply a load or force to the camera's windows or external housing. Doing so could potentially damage the camera.

Warning: Sand or dust storms

During sand or dust storms, impacts from abrasive particles may cause damage to the camera windows. To reduce the risk of damage, set the camera to the parked position when exposed to these conditions.

Warning: Product coating

Do NOT apply paint or any other finish to the product. Doing so may affect performance and potentially invalidate the product warranty.

Caution: Power supply protection

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

Caution: Service and maintenance

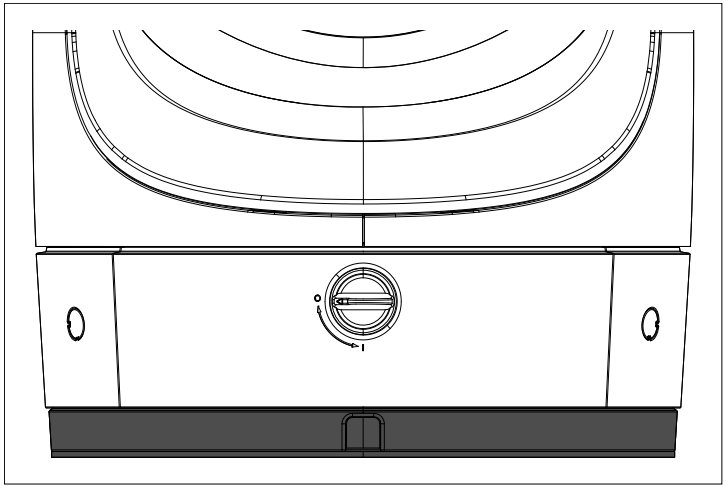
This product contains no user serviceable components. Please refer all maintenance and repair to authorized FLIR dealers. Unauthorized repair may affect your warranty.

Safety switch

The camera's power / safety switch can be used to quickly stop the camera from rotating.

The camera's power / safety switch is located at the rear of the camera base.

To quickly stop the camera from rotating, turn the switch OFF (i.e. turn the switch to the 9 o'clock position), as shown below:



Note:
It is also possible to quickly stop the camera from rotating by switching off the power to the VCM150, via the appropriate fuse / thermal breaker at the vessel's power distribution panel.

Regulatory notices

Cleaning the thermal camera

The camera housing and windows require occasional cleaning. You should clean the windows if excessive contaminant buildup is seen, or when a degradation is noticed in image quality / spotlight performance, or, for LRF-variant cameras only, laser range finder performance. Clean the interface between the yoke and base often to prevent accumulation of debris or salt deposits.

Important:
Before attempting to clean the camera, its power / safety switch must be set to OFF. For more information, refer to:

• **p.13 — Safety switch**

When cleaning this product:

• Do NOT wipe the windows 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 windows, which have 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. If required, moisten the cloth with fresh water and a mild detergent.
3. Clean the camera windows:
   - Rinse the windows 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 windows with a clean microfibre cloth or soft cotton cloth.
   - If necessary, use a mild detergent to remove any remaining spots or marks.

Routine camera inspections

It's important to routinely inspect cameras and associated mounting hardware.

Important:
Routinely inspect the camera and its mounting surface. When the camera is powered off, grasp it firmly at the base and confirm it is rigid and secure. Then hold the camera above the base and confirm it is rigid, while rotating freely.

• Conduct both visual and mechanical checks during your inspection, including the use of torque wrenches to ensure that all mounting fixings are secured to the recommended torque, as stated in the installation instructions.

• Ensure that the camera and weight-bearing mountings (including any risers) are installed securely, that the coated surfaces are intact, and that there are no signs of damage.

• Maintain a regular inspection schedule. Both visual and mechanical checks should be included in each inspection. Maintain a record of all inspections.

Water ingress

Water ingress disclaimer

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

Disclaimer

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

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

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EMC installation guidelines

FLIR 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:

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

  - More than 2 m (6.6 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- FLIR 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.

Connections to other equipment

Requirement for ferrites on non-FLIR cables:

If your FLIR equipment is to be connected to other equipment using a cable not supplied by FLIR, a suppression ferrite MUST always be attached to the cable near the FLIR unit.

For more information, refer to your third-party cable manufacturer.

Declaration of Conformity — M460 / M560-Series

Raymarine UK Ltd declares that the following products listed below are in conformity with the relevant sections of the listed designated standards and / or other normative documents:

- M460 (30 Hz) dual payload thermal camera, part number: E70678
- M460-LRF (30 Hz) dual payload thermal camera, part number: E70679
- M560 (30 Hz) dual payload thermal camera, part number: E70682
- M560-LRF (30 Hz) dual payload thermal camera, part number: E70683

Region	Standard	Mark
UK	EMC Regulations 2016	UKCA
EU	Radio Equipment Directive 2014/30/EU	CE

The original Declaration of Conformity certificate may be viewed at: www.bit.ly/3Seupv7

Declaration of Conformity (VCM150 (A80808))

Applicability: VCM150 (A80808).

Raymarine UK Ltd declares that the VCM150 (A80808) **Voltage Converter Module**, part number E70648, is in conformity with the relevant sections of the listed designated standards and / or other normative documents:

Region	Standard	Mark
UK	EMC Regulations 2016	UKCA
EU	Radio Equipment Directive 2014/30/EU	CE

The original Declaration of Conformity certificate may be viewed on the relevant product page at www.bit.ly/rym-docs

PSTI Compliance

For products sold into the United Kingdom (UK), use the following link to obtain the product's Statement of Compliance with the *Product Security and Telecommunications Infrastructure* (PSTI) Regulations:

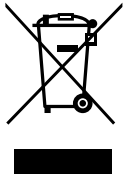
Visit the following web address and enter the product's model name or number (SKU) into the provided search field:

- www.bit.ly/rym-sec-com

Product disposal

Dispose of this product in accordance with the WEEE Directive.

The Waste Electrical and Electronic Equipment (WEEE) Directive requires the recycling of waste electrical and electronic equipment 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

Warranty policy and registration

Visit the Raymarine / FLIR Maritime website to **read the latest warranty policy**, and **register** your product's warranty online:
www.bit.ly/455XYGZ

It is important that you register your product to receive full warranty benefits. Your product package includes a barcode label indicating the serial number of the unit. This serial number is also provided on a label affixed to the product itself. You will need this serial number when registering your product online.

Technical accuracy

To the best of our knowledge, the information in this document was correct at the time it was produced. However, FLIR 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, FLIR cannot accept liability for any differences between the product and this document. Please check the FLIR website (www.flir.com/marine/support) to ensure you have the most up-to-date version(s) of the documentation for your product.

Publication copyright

CHAPTER 2: DOCUMENT INFORMATION

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2.1 Document information

This document contains important information related to the installation and operation of your FLIR product.

The document includes information to help you:

- Plan your installation and ensure you have all the necessary equipment;
- Install and connect your product as part of a wider system of connected marine electronics;
- Use your product along with an appropriate video monitor, Joystick Control Unit (JCU), Web browser, or multifunction display (MFD) / chartplotter.
- Troubleshoot problems and obtain technical support if required.

2.2 Obtain the latest documentation

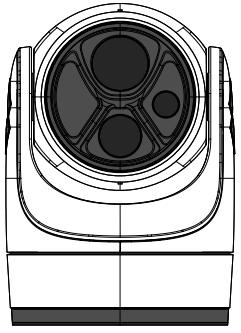
This printed document may not reflect the latest information available for your product. Please ensure that you obtain the **latest version** of the following document via the FLIR website.

(71006) *M460 / M560-Series Thermal Camera Installation & Operation Instructions*:

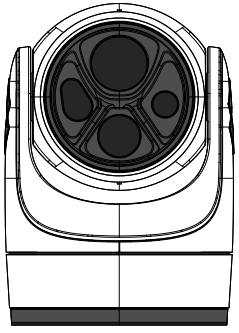
QR code	Link
	www.bit.ly/3Seupv7

2.3 Applicable products

This document is applicable to the following products:



M460 (30 Hz)
M560 (30 Hz)



M460-LRF (30 Hz)
M560-LRF (30 Hz)

M460 (30 Hz) — (E70678):

Thermal sensor	Visible light sensor
Uncooled LWIR (Long Wavelength Infrared) thermal sensor. • 640px thermal resolution. • 5.86° to 30.68° HFOV (Horizontal Field of View) range. • 5.4x optical zoom. • 8x digital zoom.	DLTV visible-light optical sensor: • 3840px visible resolution. • 2.4° to 49.5° HFOV (Horizontal Field of View) range. • 25x optical zoom. • 12x digital zoom.

M460-LRF (30 Hz) — (E70679):

Thermal sensor	Visible light sensor	LRF
Uncooled LWIR (Long Wavelength Infrared) thermal sensor: • 640px thermal resolution. • 5.86° to 30.68° HFOV (Horizontal Field of View) range. • 5.4x optical zoom. • 8x digital zoom.	DLTV visible-light optical sensor: • 3840px visible resolution. • 2.4° to 49.5° HFOV (Horizontal Field of View) range. • 25x optical zoom. • 12x digital zoom.	LRF (Laser Range Finder); up to distances of 12 km (6.5 NM).

M560 (30 Hz) — (E70682)

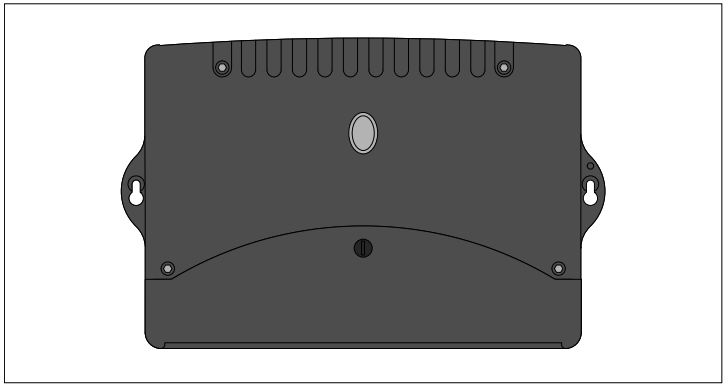
Thermal sensor	Visible-light sensor
Cooled MWIR (Middle Wavelength Infrared) thermal sensor: • 640px thermal resolution. • 1.9° to 28° HFOV (Horizontal Field of View) range. • 15.26x optical zoom. • 8x digital zoom.	DLTV visible-light optical sensor: • 3840px visible resolution. • 2.4° to 49.5° HFOV (Horizontal Field of View) range. • 25x optical zoom. • 12x digital zoom.

M560-LRF (30 Hz) — (E70683)

Thermal sensor	Visible-light sensor	LRF
Cooled MWIR (Middle Wavelength Infrared) thermal sensor: • 640px thermal resolution. • 1.9° to 28° HFOV (Horizontal Field of View) range. • 15.26x optical zoom. • 8x digital zoom.	DLTV visible-light optical sensor: • 3840px visible resolution. • 2.4° to 49.5° HFOV (Horizontal Field of View) range. • 25x optical zoom. • 12x digital zoom.	LRF (Laser Range Finder); up to distances of 12 km (6.5 NM).

This document is applicable to the following VCM (Voltage Converter Module) products:

VCM150 — (A80808)



Important:

• The VCM150 is an **essential** component in your product's system and MUST be used to supply power to the product. The model number of the VCM that is suitable for use with your product is: VCM150 (A80808).

• **Do NOT use other versions of the VCM with your product.**

2.4 Product documentation

Applicable documentation:

The following documentation is applicable to your product.

Description	Part number
M460 / M560-Series Thermal Camera Installation and Operation Instructions (this document) Installation and operation of an M460 / M560-Series thermal camera and connection to a wider system of marine electronics.	71006
M460 / M560-Series mounting template Cut out template for mounting an M460 / M560-Series thermal camera.	77010
External LED indicator mounting template Cut out template for mounting the M460 / M560-Series thermal camera's external LED indicator.	77019

Related documentation:

The following documentation is related to your product.

Description	Part number
JCU-4 Installation & Operation Instructions	71007

2.5 MFD / chartplotter software version

When using the camera with a multifunction display (MFD) or chartplotter, ensure that the MFD / chartplotter is using the latest software version.

For instructions on how to obtain and update the MFD / chartplotter software, refer to the documentation that accompanies the display.

2.6 Applicable software version

This document has been updated to reflect the following M460 / M560-Series software version:

Applicable software version:
v1.0.8

Check the website for the latest software:

Software download link
www.bit.ly/3FyByn8

CHAPTER 3: PRODUCT AND SYSTEM OVERVIEW

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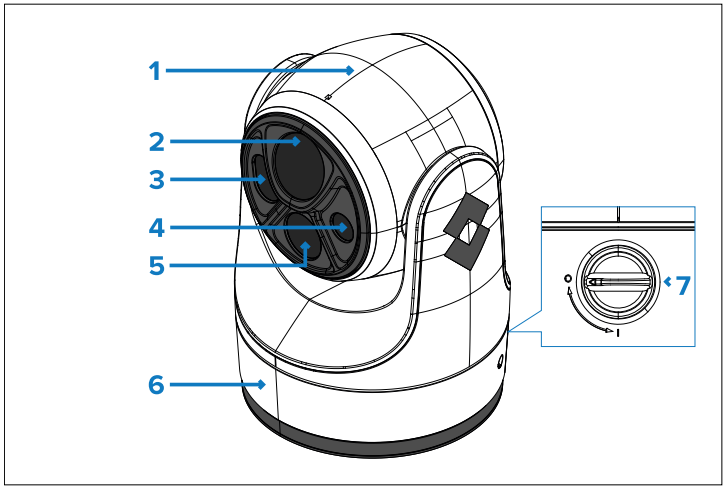
3.1 Product overview

The M460 / M560-Series are specialized multi-spectral maritime cameras, ideal for early detection and long-range observation of obstacles and vessels in maritime environments.

Equipped with a dual-payload imaging system, the M460 / M560-Series cameras combine a long-wavelength thermal sensor with a 4K ultra high-definition low-light visible-light camera, plus a long-range LED laser spotlight. Additionally, the LRF-variant M460 / M560-Series cameras include an ITAR-free Laser Range Finder, effective at distances up to 12 km (6.5 NM).

- **Visible-light** — provides a clear color image in daylight conditions. For example, a visible-light camera can help you to maintain a watch of your surroundings, or to zoom-in on distant objects.
- **Thermal** — provides a clear image in faint and no-light conditions. For example, a thermal camera can help you to navigate at night or identify people or obstacles in areas of low visibility, or even total darkness.



1. Tilt assembly.
2. Thermal payload lens window.
3. (1) Laser Range Finder (LRF) lens window.
4. Spotlight lens window.
5. Visible-light payload lens window.
6. Pan assembly.
7. Safety switch (located on the rear of the camera).

The M460 / M560-Series has the following key functions and features:

- Supports IP connectivity, as well as connections to NMEA 0183 / NMEA 2000 systems, simplifying system installation and integration.
- ONVIF (Profile S) support, for compatibility with a wide range of security systems and applications.
- 5 simultaneous video outputs, including 2 visible-light streams, 2 thermal digital streams and an SDI (6G-SDI compatible) video output. For more information, refer to:
  - **p.58 — Video connections**
- Pan, tilt, and zoom (PTZ) operations via dedicated Joystick Control Unit (JCU), multifunction display (MFD) / chartplotter, or Web browser.
- 3-axis mechanical camera stabilization to suit changing conditions.
- 25x visible-light optical zoom / 12x visible-light digital zoom; and:
  - (M460-Series): 5.4x thermal optical zoom / 8x thermal digital zoom
  - (M560-Series): 15.26x thermal optical zoom / 8x thermal digital zoom
- Tight-beam laser spotlight — Illuminates distant objects up to 1 km (0.5 NM) away, with minimal light reflection and scattering.
- (1) Laser Range Finder (LRF) — Measures the camera's distance from targets located up to 12 km (6.5 NM) away.
- InstAlert thermal imaging mode — Highlights objects detected within the camera's field of view, according to a relative temperature threshold.
- Color Thermal Vision (CTV) blending mode — Blends thermal and visible-light color video feeds for enhanced identification of buoys, vessels, and other targets at night.
- Multi-Spectral Dynamic Imaging (MSX) blending mode — Adds specific details from the visible-light video feed in real time to the thermal video feed, for detecting and sharpening the edges of objects in the thermal video feed.
- Target classifier tracking system — Uses Convolutional Neural Networks (CNNs) and other algorithms to analyze the camera's

video image and identify water-based targets which can be tracked by the camera. For more information, refer to:

  – **p.117 — Target classifier tracking**

- Automatic window heaters to de-ice the windows in cold conditions.
- 12 V or 24 V dc power (via VCM150 power converter).
- Diagnostics available via external LED indicator.

Note:
(1) This item is only available on camera variants which support a Laser Range Finder (LRF).

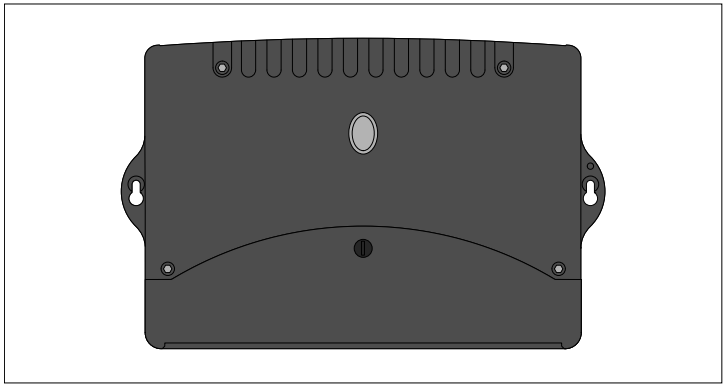
VCM150 Voltage Converter Module (VCM)

The VCM150 converts the source of direct current from your vessel's power source to a safe level for the connected product.

Important:

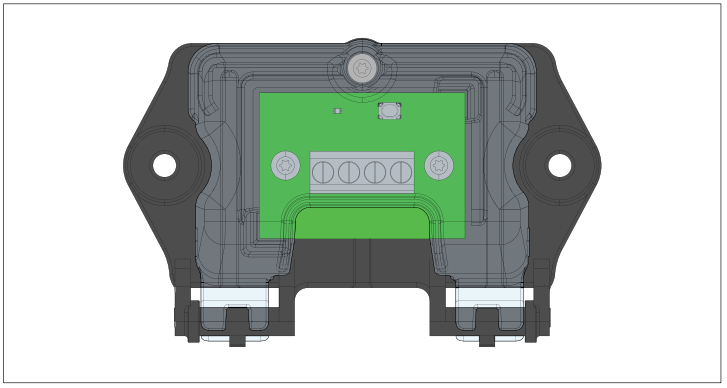
• The VCM150 is an **essential** component in your product's system and MUST be used to supply power to the product. The model number of the VCM that is suitable for use with your product is: VCM150 (A80808).

• Do NOT use other versions of the VCM with your product.



External LED

The external LED indicator provides diagnostic information which can be used to identify the camera's status and to help troubleshoot any potential issues that may occur.



For information on the diagnostic patterns shown on your external LED indicator, refer to:

- **p.126 — System checks and troubleshooting**

3.2 System overview

The camera has a flexible array of connection options for integration with your vessel's electronics system.

With the right combination of devices and connections, you can view and control the camera's image from the most convenient locations on your vessel.

The following illustration shows a very **typical** installation scenario. For more system configuration examples, ranging from small to large systems, refer to:

- **p.65 — Network connections**

For an overview of the camera's video connection options, refer to:

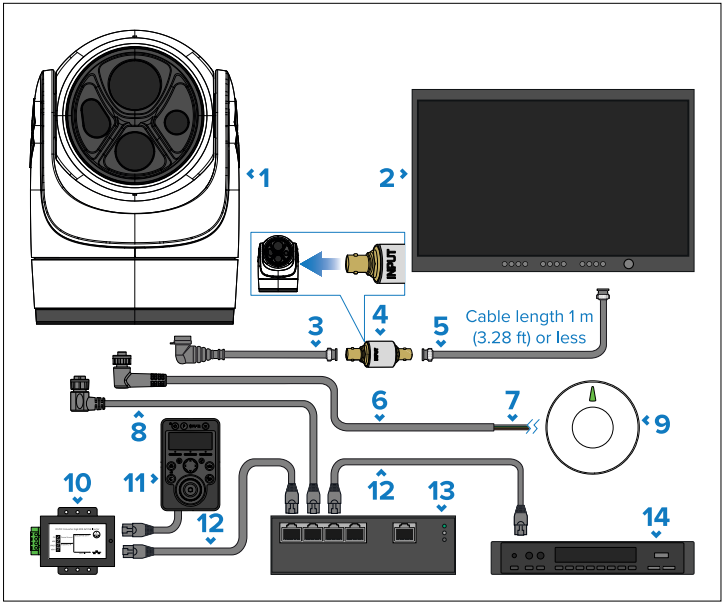
- **p.126 — Video connections**

Note:
Power connections to the VCM150 and external LED indicator are required, but not shown throughout the following illustrations. For more information, refer to:

- **p.73 — Power connections**

For power connection information on the other network devices shown, refer to the documentation which accompanies each device.

Important:
If you are powering a JCU via the separately-available PoE Injector (2nd Generation; 5 Gbit) (A80811), do NOT connect the power input labelled "*VIN1+*" on the PoE Injector.



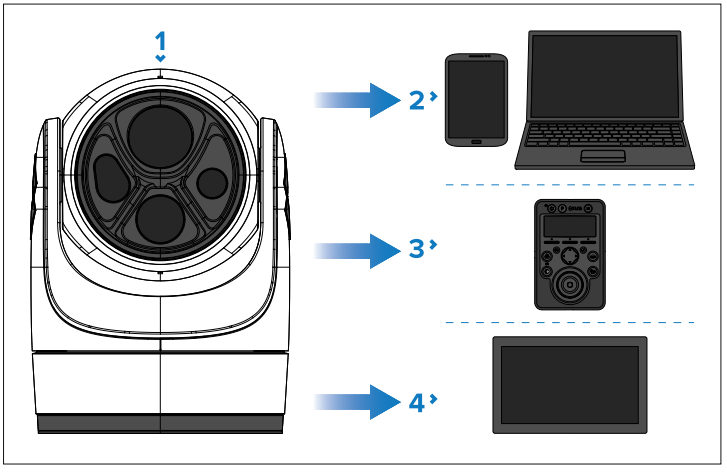
	Description
1	M460 / M560-Series camera
2	Digital video (6G-SDI) monitor, available separately from third-party retailers
3	6G-SDI video cable (RA BNC to BNC connectors), available separately
4	6G-SDI video isolation transformer, available separately from third-party retailers **Important:** An appropriate 6G-SDI video isolation transformer must be fitted to camera 6G-SDI connections. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**

	Description
5	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers **Note:** The 6G-SDI video cable connected between the 6G-SDI video isolation transformer and your digital video (6G-SDI) monitor or video converter must be maximum 1 m (3.28 ft) in length. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
6	Right-angled Bulkhead to NMEA 0183 bare wires adapter cable, available separately
7	NMEA 0183 connection. For more information on how to connect NMEA 0183 devices to the camera, refer to: • **p.63 — NMEA 0183 connection**
8	Right angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
9	Heading sensor, available separately from third-party retailers
10	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-4, available separately
11	Joystick control unit (JCU-4 currently illustrated), available separately
12	RJ45 to RJ45 Ethernet cable, available separately
13	Ethernet network switch, available separately
14	Network video recorder, available separately from third-party retailers

3.3 Control options

The following illustration shows the different options available for controlling the camera.

These options are not exclusive; the camera can be controlled from more than one device.



Note:
This illustration does NOT include any cables or accessories that may be required to connect the products shown; it is simply an overview of control options. For more information on specific connections, refer to the *Connections* section.

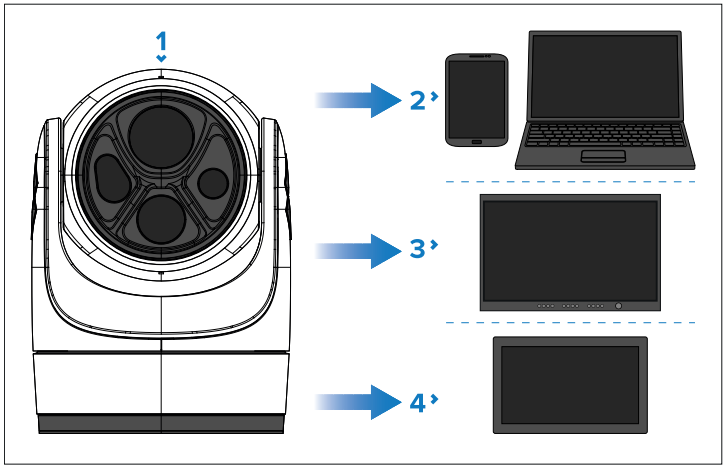
1. Camera.
2. Laptop or another Ethernet device running a Web browser, via an Ethernet connection.
3. Compatible Joystick Control Unit (JCU), via an Ethernet connection.
4. Compatible MFD / chartplotter, via an Ethernet connection.

3.4 Display options

The following illustration shows the different options available for displaying the camera's video feeds.

All video feeds are available simultaneously.
For more information on the different video feeds available, refer to:

- **p.58 — Video connections**



Note:
This illustration does NOT include any cables or accessories that may be required to connect the products shown. For more information on specific connections, refer to the *Connections* section.

1. Camera.
2. Laptop or another Ethernet device running a Web browser: via an Ethernet connection.
3. Digital video monitor: via a 6G-SDI connection directly to the camera (or an HDMI connection via a converter, available separately from third-party retailers).
4. Compatible multifunction display (MFD) / chartplotter: via an Ethernet connection.

Note:
This product is ONVIF compatible and uses Profile S. ONVIF profiles help you to determine which IP digital video devices are compatible with one another. For more information on ONVIF profiles, refer to: www.onvif.org/profiles

3.5 Compatible joystick controllers (JCU)

A Joystick Control Unit (JCU) is available to purchase as an optional accessory. With the JCU connected to the camera via a network switch, you can use the JCU's physical controls to control the camera remotely.

The camera's OSD (On-Screen Display) menu can also be accessed and further controlled using a connected JCU. For more information on the OSD menu options available, refer to:

- **p.105 — OSD Menu and status icons**

JCU-4

JCU variant	Documentation
• JCU-4 (E70695 / E70697)	www.bit.ly/jcu4-docs

3.6 Compatible MFDs / chartplotters

Some multifunction displays (MFDs) / chartplotters may support camera control options via an ONVIF (Profile S)-compatible video / camera application. The range of control options available is dependent on the support that the MFD / chartplotter manufacturer has implemented for the dedicated video / camera application. Refer to the MFD / chartplotter manufacturer for information on whether your display is compatible with the camera.

The image streamed via the camera's RayNet (Ethernet) connector can also be viewed on any MFD / chartplotter featuring a Web browser. The on-screen controls displayed in the Web browser will enable you to perform camera control operations from your MFD / chartplotter, including pan / tilt functions and setting menu changes. For more information, refer to:

- **p.87 — Camera configuration and operation via Web browser**

Note:
It is recommended that you use a dedicated video / camera application in order to avoid Web browser session expiration.

3.7 Additional data requirements

Data must be obtained from other devices on the camera network in order for the following camera features to correctly function:

Camera feature	Required data source(s)
[Stabilization], see; • **Stabilization mode**	• Heading sensor.
[NMEA tracking], see; • **p.120 — NMEA radar tracking**	• Heading sensor. • GPS or GNSS receiver.

Note:
For optimum performance, ensure that your required data sources support a 10Hz update rate.

Note:
[NMEA tracking] functionality may be inaccurate if magnetic variation is not correct for your region.

CHAPTER 4: PARTS SUPPLIED

CHAPTER CONTENTS

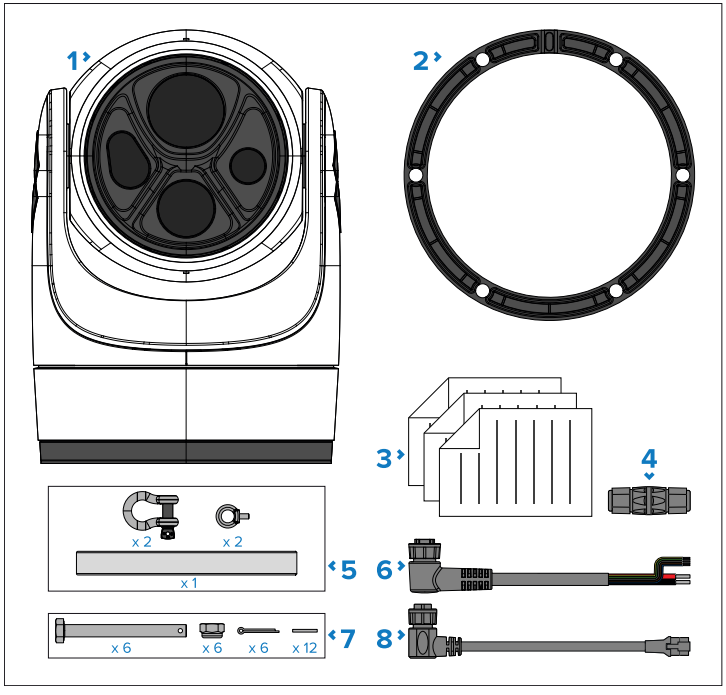
4.1 Parts supplied (camera)

The following parts are supplied with the camera:

Unpack the camera in accordance with the instructions provided to prevent damage or loss of parts. For more information, refer to:

- **p.43 — Unpacking and moving the camera**

Check the box contents against the list below. Retain the packaging and documentation for future reference.

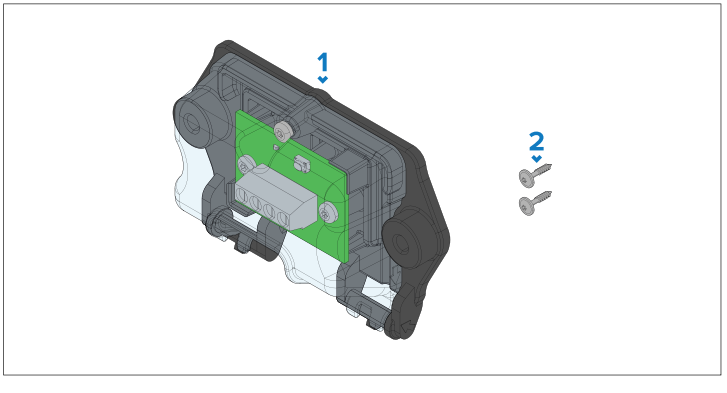


	Description
1	M460 / M560-Series camera.
2	Camera seal.
3	Documentation pack.
4	RJ45 to RJ45 waterproof coupler.
5	Lifting kit: 2x M8 eyebolts, 2x stainless steel shackles, 1x lifting sling.
6	Right-angled power cable, 1 m (3.28 ft).
7	Fixings: 6x M10x100 bolts, 6x M10 nyloc nuts, 12x M10 flat washers, 6x split pins.
8	Right-angled RayNet (Ethernet) to RJ45 adapter cable, 1 m (3.28 ft).

4.2 Parts supplied (external LED)

The following parts are supplied with the external LED indicator.

Unpack your product carefully to prevent damage or loss of parts. Check the box contents against the list below. Retain the packaging and documentation for future reference.

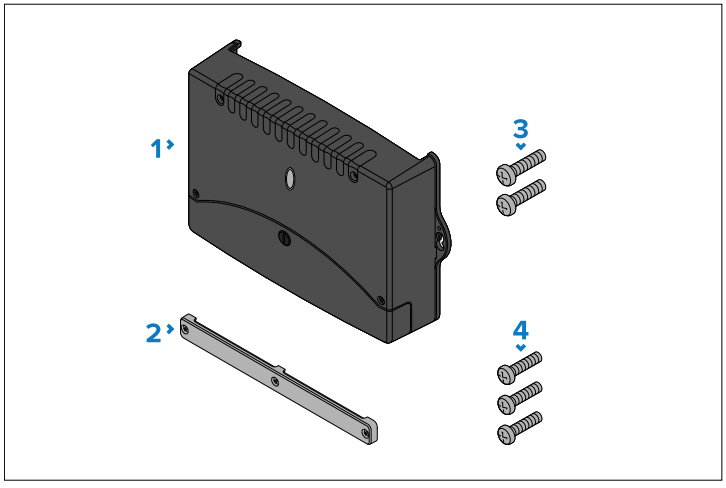


	Description
1	External LED indicator.
2	Fixings: 2x No.10 (5 mm x 25 mm) T25 Torx flanged button head wood screw.

4.3 Parts supplied (VCM150)

The following parts are supplied with the VCM150.

Unpack your product carefully to prevent damage or loss of parts. Check the box contents against the list below. Retain the packaging and documentation for future reference.

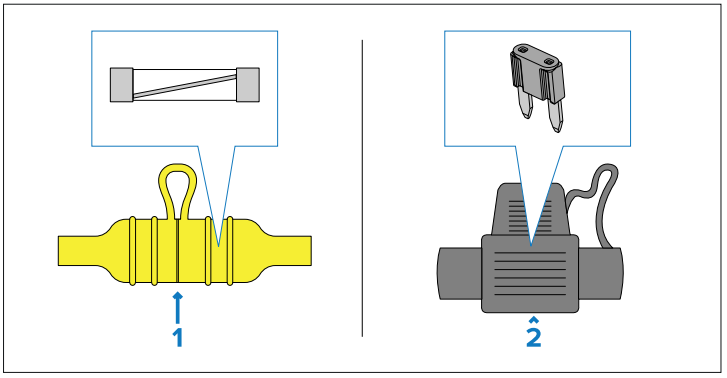


	Description
1	VCM150
2	Cable clamp
3	VCM150 mounting screw x2
4	Cable clamp mounting screw x3

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 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.

Circuit breaker and fuse ratings

All power connections between the VCM150 and its power source MUST be protected by a single circuit isolator switch AND either a thermal circuit breaker or in-line fuse, fitted close to the power connection. The connection from the output of the VCM150 to the camera base does not require a fuse or circuit breaker.

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

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

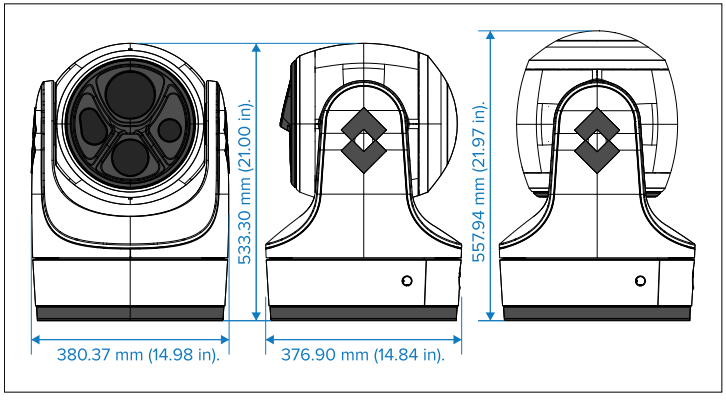
Power supply	Protection	Rating
12 V	Fuse	30A
	Thermal breaker	30A
	Isolator switch	> 50A

Power supply	Protection	Rating
24 V	Fuse	15A
	Thermal breaker	15A
	Isolator switch	> 50A

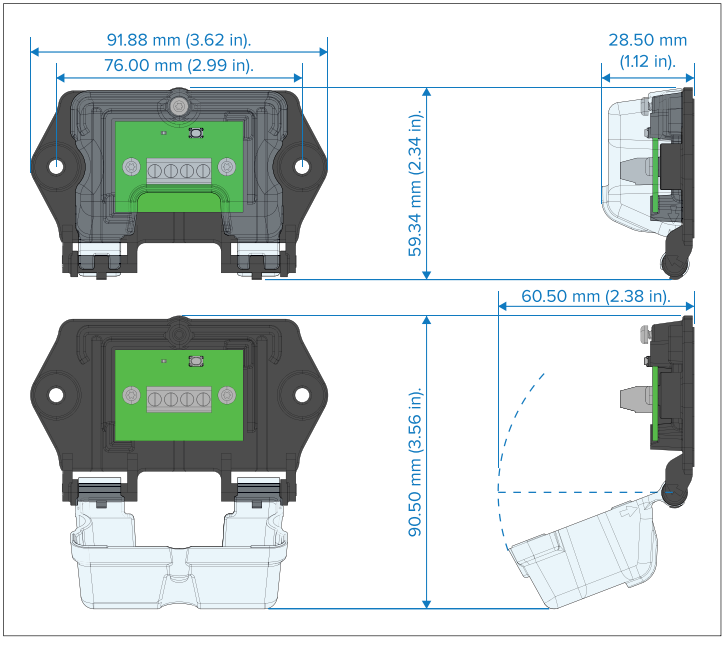
CHAPTER 5: PRODUCT DIMENSIONS

CHAPTER CONTENTS

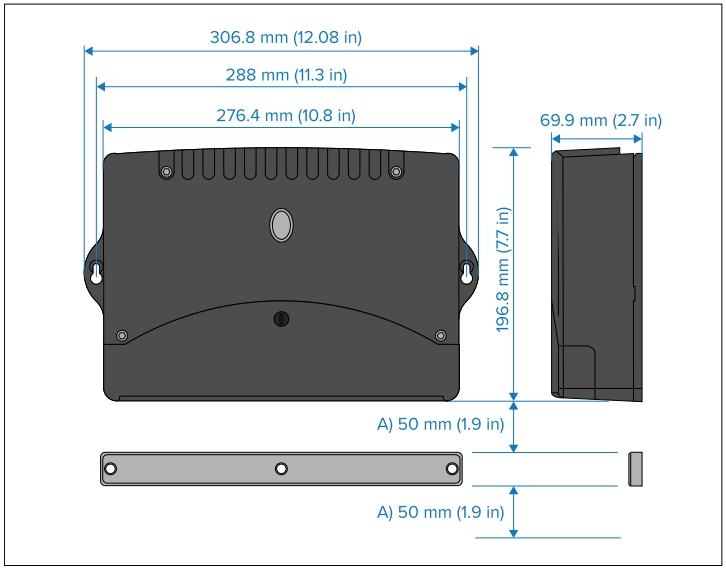
5.1 Product dimensions (camera)



5.2 Product dimensions (external LED)



5.3 Product dimensions (VCM150)



A) — Minimum cable clearance

CHAPTER 6: LOCATION REQUIREMENTS

CHAPTER CONTENTS

6.1 Warnings and cautions

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

• **p.10 — Important information**

Warning: Potential ignition source

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

6.2 General camera location requirements

Important considerations when choosing a suitable location for your product.

The product should be mounted where it will be:

- Protected from physical damage and excessive vibration.
- Well ventilated and away from heat sources.

When choosing a location for the product, consider the following points to ensure reliable and trouble-free operation:

- **Access** — there must be sufficient space to enable cable connections to the product, avoiding tight bends in the cable.
- **Clear view** — the product should have a clear view of the water with minimal obstruction to the 360° view.
- **Electrical interference** — the product should be mounted far enough away from any equipment that may cause interference such as motors, generators and radio transmitters / receivers.
- **Magnetic compass** — refer to the *Compass safe distance* section in this document for advice on maintaining a suitable distance between this product and any compasses on your vessel.
- **Height** — the product should be mounted as high as practical, giving a clear view of all directions.
- **Power** — to keep cable runs to a minimum, the product must be located as close as possible to the vessel's DC power supply.
- **Mounting surface** — ensure the product is adequately supported on a secure surface. Refer to the weight information provided in the *Technical specification* for this product and ensure that the intended mounting surface is suitable for bearing the product weight. Do NOT mount units or cut holes in places which may damage the structure of the vessel.

6.3 EMC installation guidelines

FLIR 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:

- FLIR equipment and cables connected to it are:
  - At least 1 m (3.3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (6.6 ft).
  - More than 2 m (6.6 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- FLIR 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.

6.4 Compass safe distance

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

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

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

6.5 Camera location requirements

When planning the installation location, consider the following points:

- The camera is waterproof, and appropriate for above decks mounting.
- Ensure the camera is installed in a location where both sides of the mounting surface are accessible for installation and maintenance purposes.
- Ensure the camera is installed in a location that will allow it to be accessed for regular periodic cleaning (fresh-water rinse) and for inspection of mounting point integrity and mechanical soundness.
- The underside (inside) of the compartment or deck on to which the camera is mounted must be weather-tight. You must ensure protection from water ingress, fouling and sun damage to cables and connections.
- When mounting the camera in the ball-down (upside down) position, ensure that the camera is fitted to a weather-tight, flat and stiff mounting surface, with no open air exposure. For comprehensive ball-down installation instructions, refer to:
  - **p.48 — Mounting the camera ball-down**
- When mounting the camera in the ball-down (upside down) position, ensure that the camera is installed with adequate drainage so that standing water does not collect in the base. For comprehensive ball-down installation instructions, refer to:
  - **p.48 — Mounting the camera ball-down**
- The mounting surface must be horizontal.
- The camera should be mounted as high as practical, but without interfering with any radar, navigational or communications electronics.
- The camera must be mounted 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.
- Choose a location that will provide the most unobstructed view in all directions.
- Choose a location as close to the vessel's center line as possible. This provides a symmetrical view when looking forward or aft.
- Select a location for the camera that is at least 1 m (3.28 ft) from any magnetic compass.
- Select a location that is at least 1 m (3.28 ft) from devices that may cause interference, such as motors, generators and radio transmitters / receivers.
- If installing an optional JCU, select a location for the JCU that is at least 1 m (3.28 ft) from any magnetic compass.

6.6 External LED location requirements

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

- **Diagnostics LED** — Ensure the unit is mounted in a location where the diagnostics LED is viewable.
- **Ventilation** — Ensure that:
  - Equipment is mounted in a compartment of suitable size.
  - Ventilation holes are not obstructed. Allow adequate separation of equipment.

- **Mounting surface** — Ensure equipment is adequately supported on a secure surface. Do not mount units or cut holes in places which may damage the structure of the vessel.
- **Physical damage** — Choose a location where the unit will be:
  - Safe from physical damage and excessive vibration.
  - Not subjected to a load or force.
- **Cables** — Ensure the product is mounted in a location which allows proper routing and connection of cables:
  - Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.
  - Use cable supports to prevent stress on connectors.
  - All power cable lengths should be kept as short as possible.
- **Water ingress** — The product is designed to be installed below decks in a protected area away from prolonged and direct exposure to rain and salt spray. To prevent water ingress, the product's cover must be fitted in all installations and the product MUST be mounted on a flat vertical surface with the wire routing opening facing down.
- **Electrical interference** — Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters/receivers.
- **Magnetic compass** — Mount the product at least 1 m (3.28 ft) away from a magnetic compass.
- **Power supply** — Select a location that is as close as possible to the VCM150. This will help to keep cable runs to a minimum.

6.7 VCM150 location requirements

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

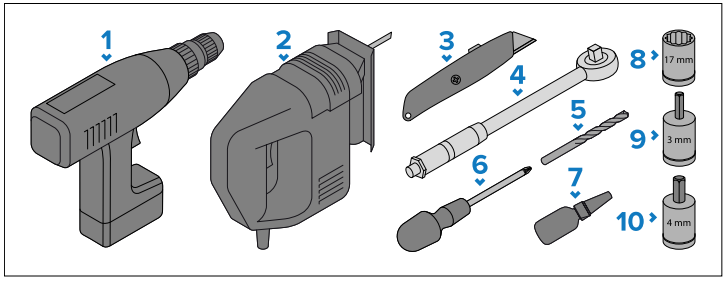
- **Mounting orientation** — Ensure product is mounted vertically to allow for efficient heat dissipation.
- **Ventilation** — Ensure that:
  - Equipment is mounted in a compartment of suitable size.
  - Ventilation holes are not obstructed. Allow adequate separation of equipment.
- **Mounting surface** — Ensure equipment is adequately supported on a secure surface. Do not mount units or cut holes in places which may damage the structure of the vessel.
- **Cables** — Ensure the unit is mounted in a location which allows proper routing and connection of cables:
  - Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.
  - Use cable supports to prevent stress on connectors.
  - The maximum length of cable between the battery and the VCM150 should not normally exceed 6 m (19.69 ft). All power cable lengths should be kept as short as possible.
- **Water ingress** — The VCM150 is splashproof, and suitable for mounting below decks only.
- **Electrical interference** — Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters/receivers.
- **Magnetic compass** — Mount the VCM150 at least 1 m (3.28 ft) away from a magnetic compass.
- **Power supply** — Select a location that is as close as possible to the vessel's DC power source. This will help to keep cable runs to a minimum.

CHAPTER 7: MOUNTING

CHAPTER CONTENTS

7.1 Tools required

The following tools are required for installation:



1. Drill.
2. (1) Jigsaw.
3. (2) Safety knife.
4. Torque wrench.
5. Drill bit (appropriate size dependent on thickness and material of mounting surface).
6. Pozi-drive screwdriver.
7. Thread-lock.
8. 17 mm socket.
9. 3 mm hex bit socket adapter.
10. 4 mm hex bit socket adapter.

Note:

- (1) Items are only required when opting to route camera cables through the mounting surface.
- (2) Items are only required when opting to route camera cables through the riser sidewall.

7.2 Camera orientation

The camera can be mounted in 2 orientations informally known as "Ball-up" (upright) and "Ball-down" (upside down).

- When the camera is mounted ball-up (upright), the camera is mounted on top of the mounting surface.
- When the camera is mounted ball-down (upside down), the camera is mounted below the mounting surface.

The default video image orientation is for the ball-up (upright) configuration; if the camera is to be mounted in the ball-down (upside down) configuration then the video image must be rotated. To rotate the video image, you must **either**:

- Use the camera's Web browser configuration interface to set the appropriate option. For further information, refer to:
  - **p.87 — Camera configuration and operation via Web browser**
- Use an ONVIF supported MFD video application to set the appropriate option. For further information, refer to documentation which accompanies your display.

7.3 Mounting surface fixing suitability

The supplied M10 bolts are long enough to accommodate the supplied M10 nyloc nuts, M10 flat washers *and* a maximum 25 mm (0.98 in) thick mounting surface.

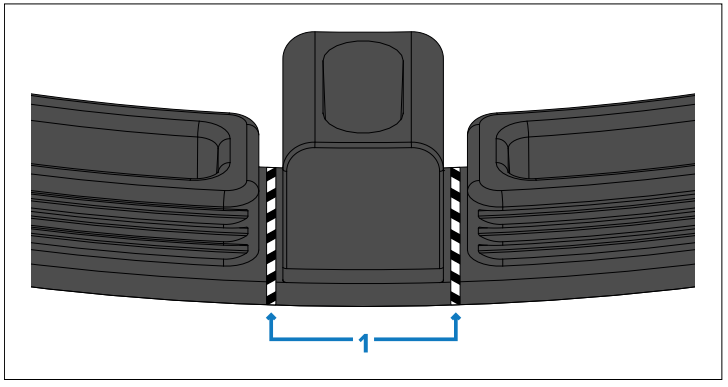
If the thickness of your intended mounting surface *exceeds* 25 mm (0.98 in), look to obtain longer replacement prevailing torque fixings which support a tensile strength of 800N/mm^2 (MPa) and a secondary retention method (e.g. wire locking the retaining fasteners) which MUST be used to prevent the total release of the fastener.

7.4 Routing cables through the riser's sidewall

Alternative cable routing method.

Ideally, the camera's cables should be routed through a mounting surface cutout which is weather-tight and protected from water ingress, fouling, and sun damage. If this is not possible, the cables can alternatively be routed through the riser's sidewall. An optional 20 mm (0.79 in) area is provided on the riser sidewall for this purpose.

In order for the optional 20 mm (0.79 in) area to be revealed, a modification must first be made to the camera seal before it is fitted to the camera.



1. Paying careful attention to the correct location of the cutout lines as shown in the above image, use a safety knife to cut through the raised markings and remove the camera seal's riser sidewall plug.

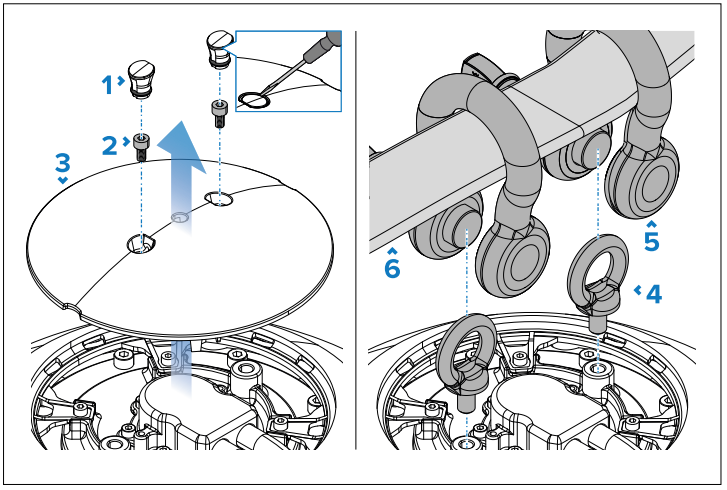
7.5 Camera mounting

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.10 — Important information**

Unpacking and moving the camera

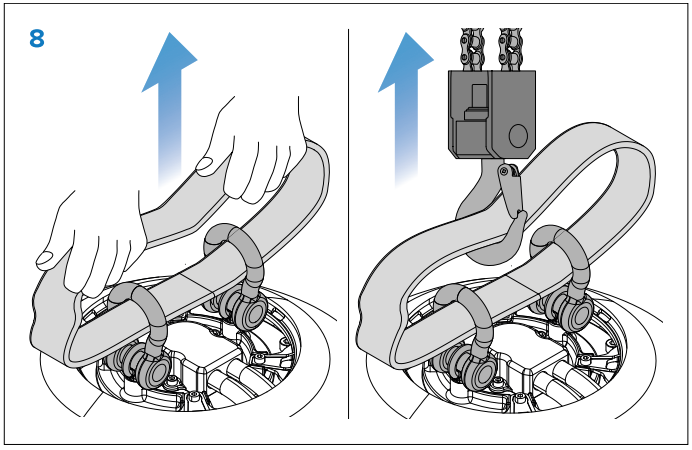


Follow these instructions to safely unpack and move the camera prior to installation.

Note:
Ensure that all camera fixings and parts are retained for later use.

1. Using a thin flat-bladed screwdriver, insert the tip of the screwdriver into the gap between the screw caps and the payload rear cover, then gently lever the screw caps away from the camera to expose the screws underneath.

   The camera is supplied in its box in the parked position, with the camera windows facing down. This ensures that the payload rear cover is easily accessible via the top of the camera.
2. Unscrew and remove the revealed payload rear cover M4 screws.
3. Detach the payload rear cover from the camera.
4. Insert the supplied M8 eyebolts into the exposed mounting bosses and tighten until secure.
5. Attach the supplied stainless steel shackles to the eyebolts.
6. Attach the supplied lifting sling to the stainless steel shackles.
7. Using the lifting sling, either:



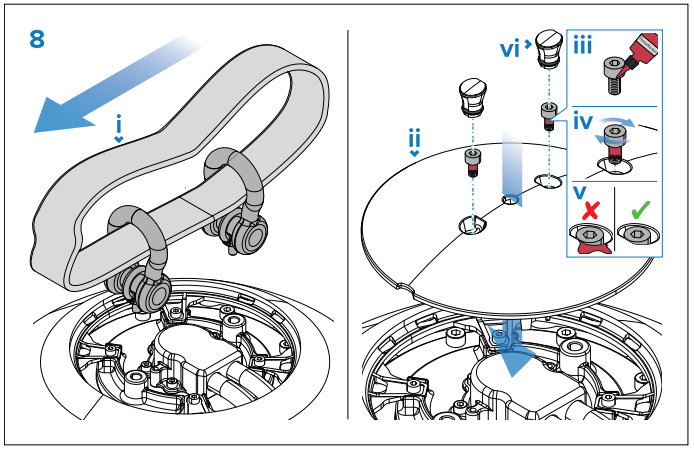
- (With two people positioned at either end of the lifting sling), lift and remove the camera from the box, to the area where you wish to mount the camera; OR:
- Attach the lifting sling to suitable lifting equipment (e.g. a crane or hoist) which is capable of supporting the camera's weight. Then, using the lifting equipment, lift and remove the camera from the box, to the area where you wish to mount the camera.

Important:

• The supplied lifting sling is rated to a Safe Working Load (SWL) of 1000 kg.

• For safety reasons, **it is recommended that the unit is NOT lifted by only one person**.

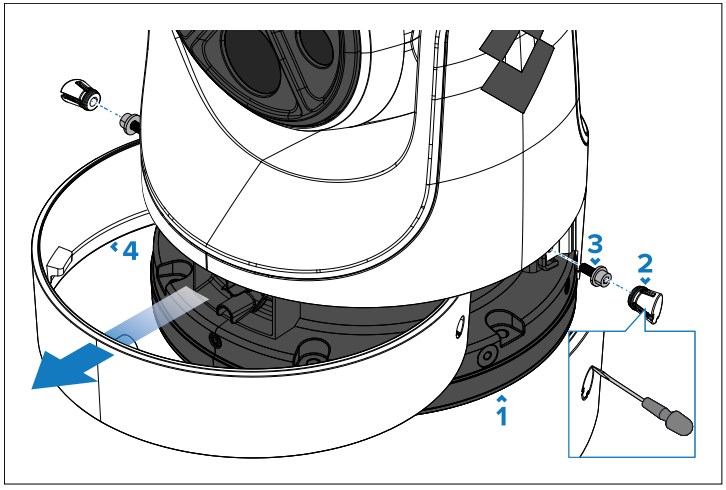
8. **(Ball-down mounting only)** The following steps are only applicable if you wish to mount the camera unit in the "Ball-down" (upside down) mounting position:



i. Detach the M8 eyebolts, stainless steel shackles, and lifting sling from the camera. These items must be retained for later use.
ii. Position the payload rear cover fixing holes so that they are aligned with the corresponding fixing holes located on the camera.
iii. Apply a suitable threadlocker (e.g. "*Loctite 243*") to the payload rear cover M4 screws.
iv. Re-insert the payload rear cover M4 screws into the camera and **tighten the screws to a torque of 2.8 N·m (2.1 lbf·ft).**
v. Clean any excess threadlocker, and allow the threadlocker to cure for 24 hours.
vi. Place the removed screw caps on top of exposed screws and gently push down until secure.

Mounting the camera ball-up

Instructions for mounting the camera unit in the “Ball-up” (upright) mounting position.



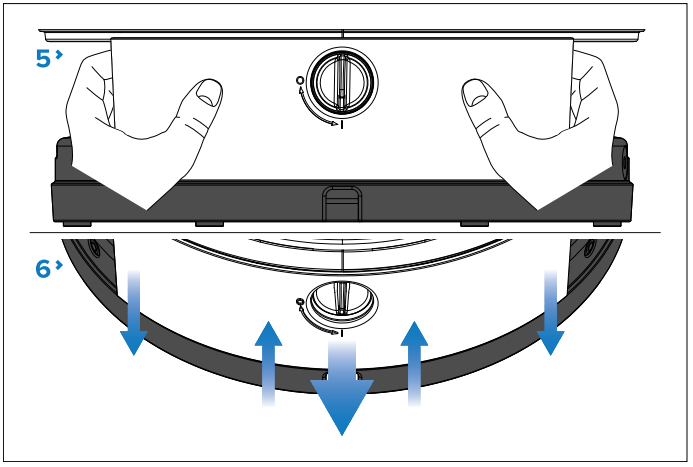
Note:
Ensure that all camera fixings and parts are retained for later use.

1. Use the supplied mounting template to drill holes for the camera fixings (and cables, if you are opting to route the cables through the mounting surface).

Note:
Observe the forward marking located on the mounting template. You must ensure that the camera is mounted so that it is orientated properly, relative to the vessel's bow. If the camera is NOT orientated properly, a new forward position must be set. For more information, refer to:

• **p.81 — Forward position**

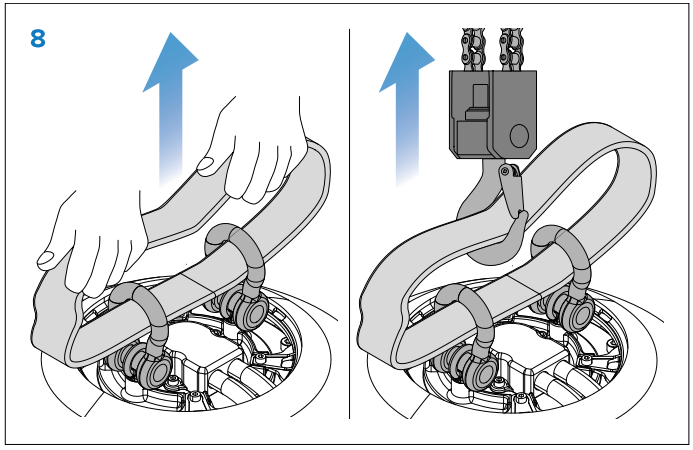
2. Using a thin flat-bladed screwdriver, insert the tip of the screwdriver into the gap between the screw caps and safety switch / base cover located at the base of the camera, then gently lever the screw caps away from the camera to expose the screws underneath.
3. Unscrew and remove the revealed safety switch / base cover M5 screws and attached washers.
4. Pull the base cover away from the front of the camera.



5. From the rear of the camera, grab onto both sides of the safety switch cover and then position your thumbs so that they rest on either side of the safety switch.
6. While pushing both thumbs inward and pulling both sides of the safety switch cover back, gently remove the safety switch cover from the camera.
7. Ensure that the supplied M8 eyebolts, stainless steel shackles, and lifting sling are attached to the mounting bosses located underneath the camera’s rear payload cover, in accordance with the information found in the following section:

• **p.43 — Unpacking and moving the camera**

8. Using the lifting sling, either:

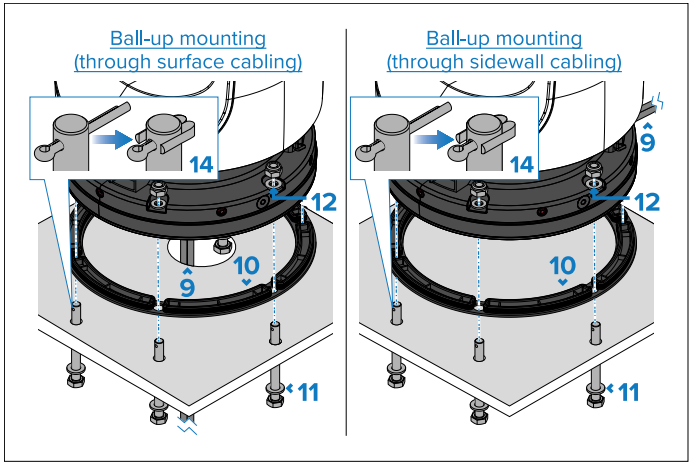


- (With two people positioned at either end of the lifting sling), move the camera into position on the mounting surface; OR:
- Attach the lifting sling to suitable lifting equipment (e.g. a crane or hoist), which is capable of supporting the camera's weight. Then, using the lifting equipment, move the camera into position on the mounting surface.

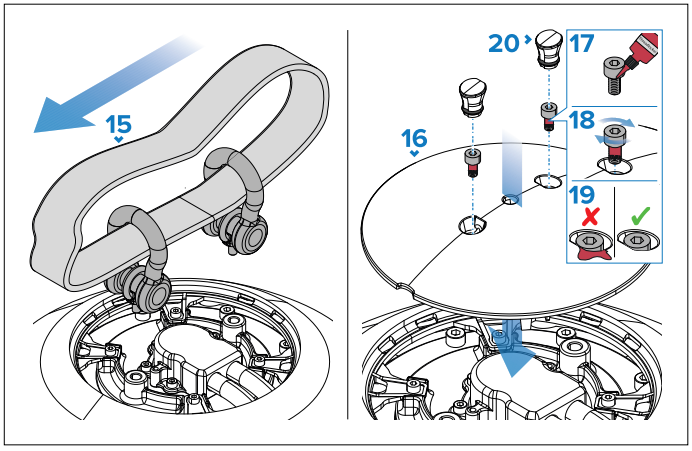
Important:

• The supplied lifting sling is rated to a Safe Working Load (SWL) of 1000 kg.

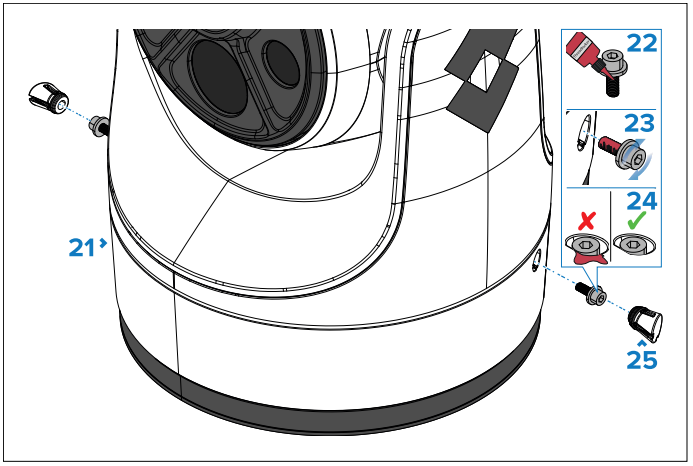
• For safety reasons, **it is recommended that the unit is NOT lifted by only one person**.



9. Connect the cables to the camera, then either:
   - Loop the cables around within the riser base so that they can be threaded through the bottom of the riser and into the cable routing hole drilled in the mounting surface; OR:
   - Loop the cables around within the riser base so that they can be threaded through the riser sidewall. In order for the riser sidewall opening to be revealed, a modification must first be made to the camera seal **before it is fitted to the camera**. For more information, refer to:
     - **p.43 — Routing cables through the riser's sidewall**
10. Fit the camera seal to the bottom of the camera, carefully aligning the seal holes with the mounting surface drill holes.
11. Ensuring that the camera's mounting holes align with the mounting surface drill holes, fit a supplied M10 flat washer onto a supplied M10 bolt, then insert the M10 bolt through the mounting surface.
12. Paying careful attention to the correct arrangement of the fixings as shown in the above image, attach a supplied M10 flat washer and M10 nyloc nut to the M10 bolt, then **tighten the nyloc nut to a torque of 65.0 N·m (47.9 lbf·ft).**
13. Repeat steps 11 to 12 for each mounting hole.
14. Insert a supplied split pin into the pre-drilled end of each M10 bolt, then secure the split pins in place by bending each leg backwards around the sides of each bolt.



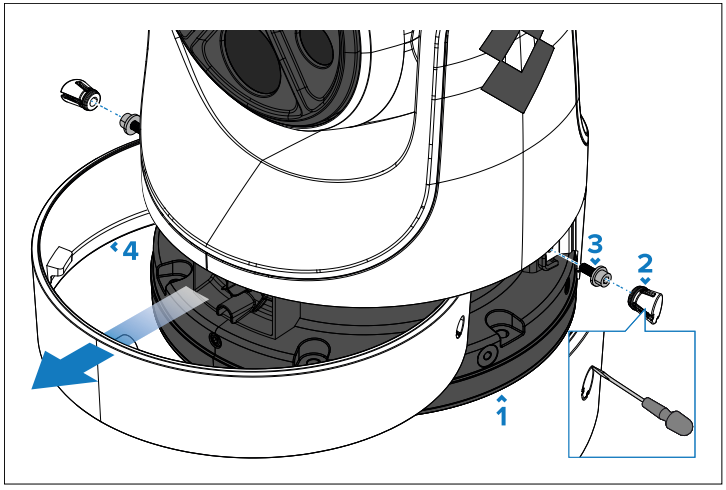
15. Detach the M8 eyebolts, stainless steel shackles and lifting sling from the camera.
16. Position the payload rear cover fixing holes so that they are aligned with the corresponding fixing holes located on the camera.
17. Apply a suitable threadlocker (e.g. "*Loctite 243*") to the payload rear cover M4 screws.
18. Re-insert the payload rear cover M4 screws into the camera, then **tighten the screws to a torque of 2.8 N·m (2.1 lbf·ft).**
19. Clean any excess threadlocker, and allow the threadlocker to cure for 24 hours.
20. Place the removed screw caps on top of exposed screws, and gently push down until secure.



21. Place the safety switch cover and then base cover back into position, ensuring that the fixing holes located on each cover are aligned with the corresponding fixing holes located on the camera.
22. Apply a suitable threadlocker (e.g. "*Loctite 243*") to the safety switch / base cover M5 screws.
23. Re-insert the safety switch / base cover M5 screws and attached washers onto the camera, then **tighten the screws to a torque of 2.8 N·m (2.1 lbf·ft).**
24. Clean any excess threadlocker and allow the threadlocker to cure for 24 hours.
25. Place the removed screw caps on top of exposed screws, and gently push down until secure.

Mounting the camera ball-down

Instructions for mounting the camera unit in the “Ball-down” (upside down) mounting position.



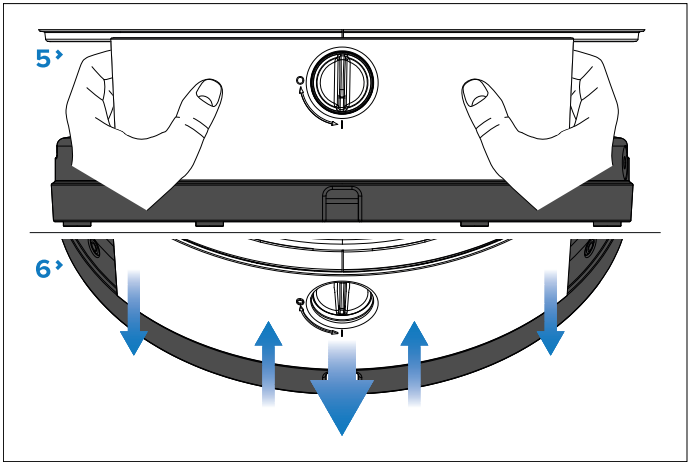
Note:
Ensure that all camera fixings and parts are retained for later use.

1. Use the supplied mounting template to drill holes for the camera fixings (and cables, if you are opting to route the cables through the mounting surface).

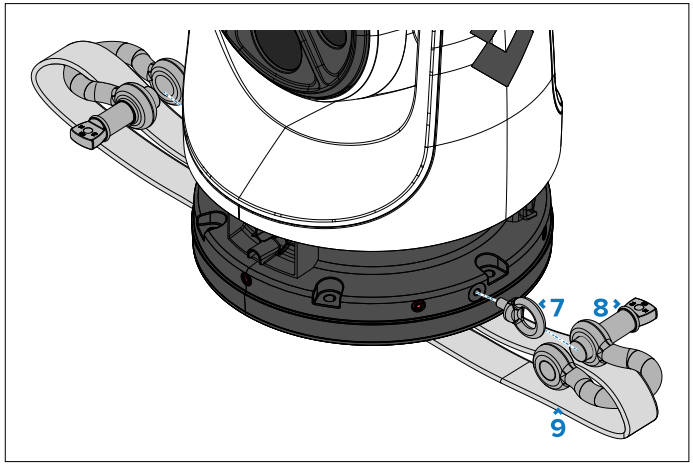
Note:
Observe the forward marking located on the mounting template. You must ensure that the camera is mounted so that it is orientated properly, relative to the vessel's bow. If the camera is NOT orientated properly, a new forward position must be set. For more information, refer to:

• **p.81 — Forward position**

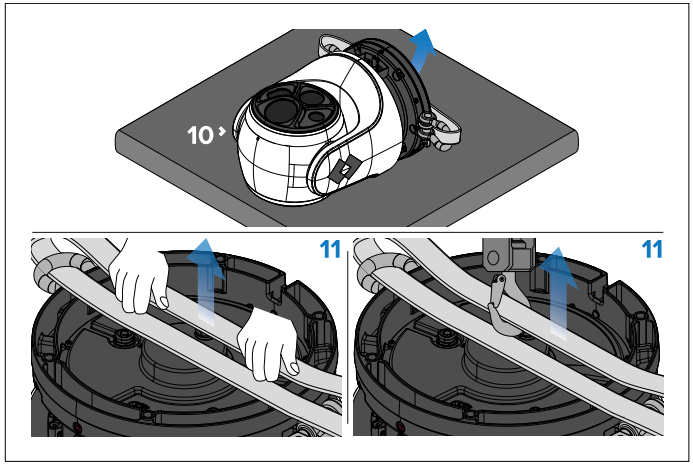
2. Using a thin flat-bladed screwdriver, insert the tip of the screwdriver into the gap between the screw caps and safety switch / base cover located at the base of the camera, then gently lever the screw caps away from the camera to expose the screws underneath.
3. Unscrew and remove the revealed safety switch / base cover M5 screws and attached washers.
4. Pull the base cover away from the front of the camera.



5. From the rear of the camera, grab onto both sides of the safety switch cover and then position your thumbs so that they rest on either side of the safety switch.
6. While pushing both thumbs inward and pulling both sides of the safety switch cover back, gently remove the safety switch cover from the camera.



7. Insert the supplied M8 eyebolts into the exposed mounting bosses and tighten until secure.
8. Attach the supplied stainless steel shackles to the eyebolts.
9. Attach the supplied lifting sling to the stainless steel shackles.

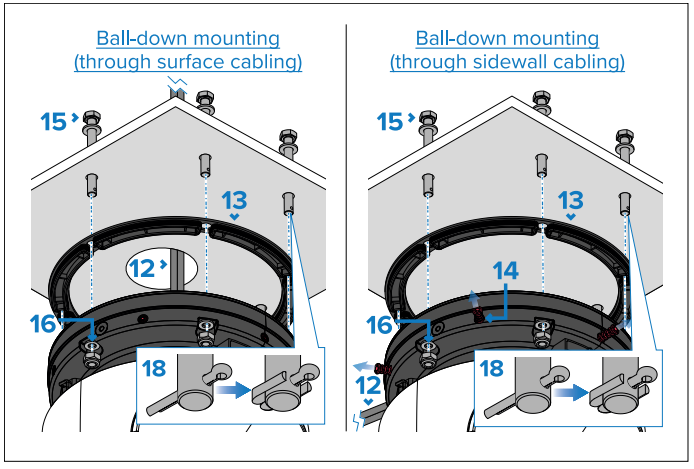


10. Carefully lay the camera down onto a flat, cushioned surface which is capable of supporting the camera's weight. This will ensure that when the camera is lifted via the eyebolts located at the base of the camera, it will be safely oriented into the ball-down mounting position.
11. Using the lifting sling, either:
    - Attach the lifting sling to suitable lifting equipment (e.g. a crane or hoist) which is capable of supporting the camera's weight. Then, using the lifting equipment, move the camera into position on the mounting surface; OR:
    - (With two people positioned at either end of the lifting sling), move the camera into position on the mounting surface.

Important:

• The supplied lifting sling is rated to a Safe Working Load (SWL) of 1000 kg.

• For safety reasons, **it is recommended that the unit is NOT lifted by only one person**.

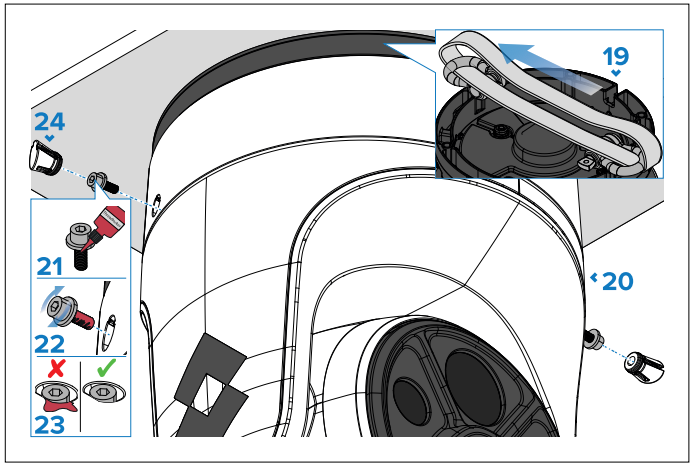


12. Connect the cables to the camera, then either:
    - Loop the cables around within the riser base so that they can be threaded through the bottom of the riser and into the cable routing hole drilled in the mounting surface; OR:
    - Loop the cables around within the riser base so that they can be threaded through the riser sidewall. In order for the riser sidewall opening to be revealed, a modification must first be

made to the camera seal **before it is fitted to the camera**. For more information, refer to:

– **p.43 — Routing cables through the riser's sidewall**

13. Fit the camera seal to the bottom of the camera, carefully aligning the seal holes with the mounting surface drill holes.
14. **(Through sidewall cable routing only):** Remove the 6 pre-fitted plugs from the base of the camera.
15. Ensuring that the camera's mounting holes align with the mounting surface drill holes, fit a supplied M10 flat washer to a supplied M10 bolt, then insert the M10 bolt through the mounting surface.
16. Paying careful attention to the correct arrangement of the fixings as shown in the above image, attach a supplied M10 flat washer and M10 nyloc nut to the M10 bolt, then **tighten the nyloc nut to a torque of 65.0 N·m (47.9 lbf·ft).**
17. Repeat steps 15 to 16 for each mounting hole.
18. Insert a supplied split pin into the pre-drilled end of each M10 bolt, then secure the split pins in place by bending each leg backwards around the sides of the bolts.



19. Detach the M8 eyebolts, stainless steel shackles, and lifting sling from the camera.
20. Place the safety switch cover and then base cover back into position, ensuring that the fixing holes located on each cover are aligned with the corresponding fixing holes located on the camera.
21. Apply a suitable threadlocker (e.g. "*Loctite 243*") to the safety switch / base cover M5 screws.
22. Re-insert the safety switch / base cover M5 screws and attached washers onto the camera, then **tighten the screws to a torque of 2.8 N·m (2.1 lbf·ft).**
23. Clean any excess threadlocker, and allow the threadlocker to cure for 24 hours.
24. Place the removed screw caps on top of exposed screws and gently push down until secure.

7.6 External LED mounting

Mounting the external LED

Instructions for mounting the external LED indicator.

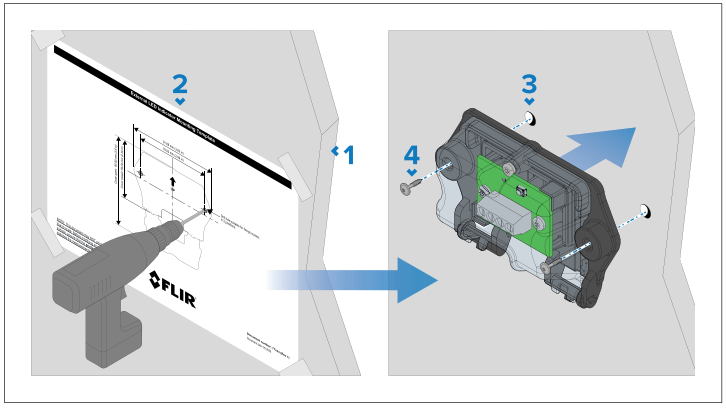
Before mounting the unit, ensure that you have:

- Selected a suitable location, based on the location requirements found in this document. For further information, refer to:

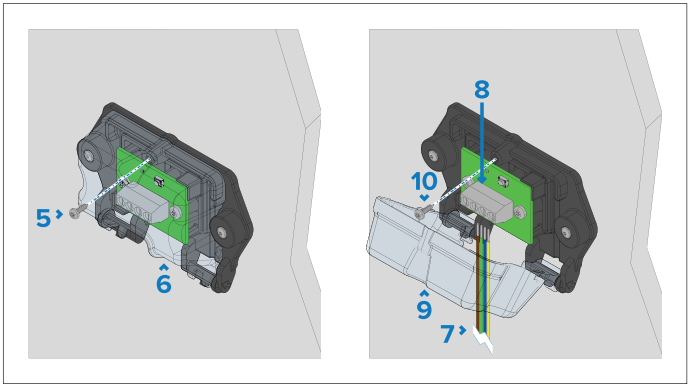
  – **p.37 — Location requirements**

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

Important:
The external LED indicator is designed to be installed below decks in a protected area away from prolonged and direct exposure to rain and salt spray. To prevent water ingress, the indicator's cover must be fitted in all installations and the indicator MUST be mounted on a flat vertical surface with the wire routing opening facing down.



1. Check the selected location for the unit. The external LED indicator requires a clear, flat vertical surface with suitable space for routing the cable and wires below the unit.
2. Prepare the mounting surface:
   i. Fix the supplied mounting template to the chosen location, using masking or self-adhesive tape.
   ii. Drill 2 holes as indicated on the template to accept the fixings.
   iii. Remove the mounting template.
3. Align the unit's fixing holes with the drilled holes on the mounting surface.
4. Insert the fixings and fully tighten until secure.



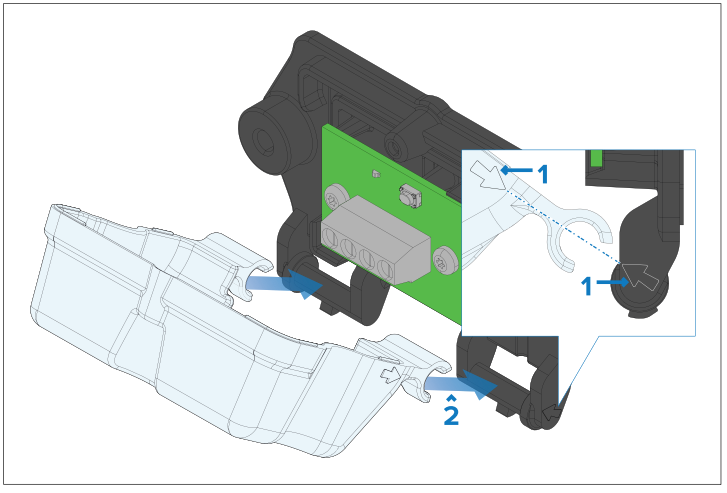
5. Remove the protective cover fixing located at the top of the unit.
6. Lower the protective cover so that the indicator's wire terminals are freely accessible.
7. Route the relevant wires through the opening located at the bottom of the protective cover.
8. Connect the wires according to the instructions provided in this document.
9. Raise the protective cover back into position.
10. Re-insert the protective cover fixing and tighten until secure.

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

Attaching the external LED cover

If the external LED indicator's protective cover is detached during the installation procedure, follow the steps listed below to re-attach the protective cover to the backplate.

Note:
Failure to follow the instructions provided can cause potential damage to the unit's protective cover.



1. Align the arrow markings located on the side of both the protective cover and the external LED indicator, so that they are pointing toward one another.
2. Gently push the protective cover onto the hinge of the external LED indicator until secured.

7.7 VCM150 mounting

Mounting the VCM150

Instructions for mounting the VCM150.

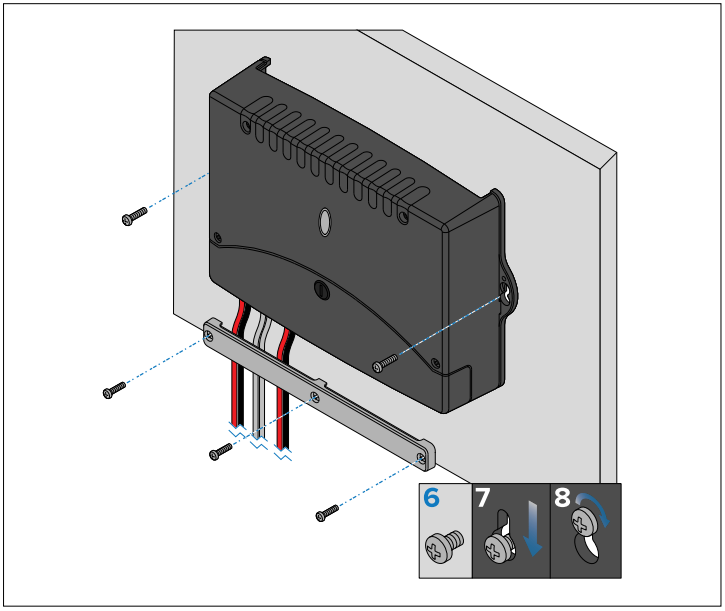
Before mounting the unit, ensure that you have:

- Selected a suitable location, based on the location requirements found in this document. For further information, refer to:
  - **p.37 — Location requirements**

Important:
The VCM150 is splashproof, and suitable for mounting below decks only.

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

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



1. Check the selected location for the unit. The VCM150 requires a clear, flat, vertical surface with suitable space for routing the cables below the unit.
2. Hold the VCM150 in place at the required mounting location.
3. Using a pencil, mark the drilling area inside the mounting lug on each side of the VCM150 unit.
4. Using a 3 mm (0.1 in) drill bit, drill holes at the marked locations.
5. Using a suitable screwdriver, screw the self-tapping mounting screws approximately halfway into the drilled holes.
6. Align the VCM150 mounting lugs with the drill holes.
7. Place the VCM150 into position, and ensure that the VCM150 slides down into position.
8. Secure the VCM150 by fully tightening the screws.
9. Connect the cables, according to the instructions provided in this document.
10. Hold the cable clamp in place over the cables, approximately 50 mm (2 in) below the mounted VCM150 unit.
11. Using a pencil, mark the drilling area inside each mounting bracket hole.

    Ensure that the cables do NOT cover the holes.

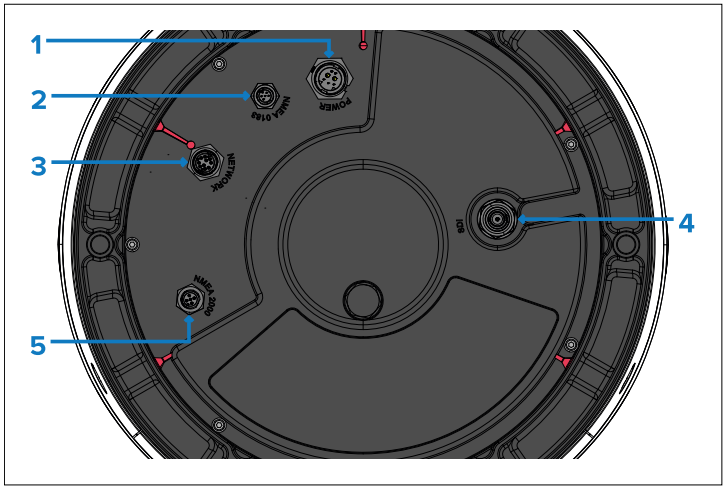
12. Using a 3 mm (0.1 in) drill bit, drill a hole through the pencil marks.
13. Hold the cable clamp in place, each hole aligned with the drill holes.
14. Using a suitable screwdriver, screw the self-tapping mounting screws through the bracket holes, into the drilled holes.

CHAPTER 8: CONNECTIONS OVERVIEW

CHAPTER CONTENTS

8.1 Camera connections overview

Physical connectors available on the camera, suitable connections and cables.



Note:
Cables should be routed to a dry area of the vessel for connection. Alternatively you must ensure that all connections are water tight.

Note:

- It is NOT possible to connect cables with straight connectors to the camera due to cable bend radius constraints.
- The RayNet (Ethernet) to RayNet (Ethernet) right-angled coupler / adapter (A80262) is NOT suitable for use with the camera.

Connector	Suitable cables
1) Power Connects to: • 12 / 24 V dc power supply (via the VCM150) • External LED indicator	• Right-angled power cable (supplied)
2) Bulkhead Connects to: • NMEA 0183 network device	• Right-angled bulkhead to NMEA 0183 bare wires adapter cable (available separately).
3) RayNet (Ethernet) Connects to: • RayNet (Ethernet) network device	• Right-angled RayNet (Ethernet) to RJ45 adapter cable (supplied) • Right-angled RayNet (Ethernet) to RayNet (Ethernet) cable (available separately)
4) BNC Connects to: • 6G-SDI digital video device. Alternatively, the camera can be connected to an HDMI device via suitable converter and adapter cables, available separately from third-party retailers.	• 6G-SDI video cable, terminated in Right-angled BNC to BNC connectors (available separately).
5) DeviceNet Connects to: • NMEA 2000 backbone.	• Right-angled DeviceNet to DeviceNet cable (available separately from third-party retailers)

- For more information on the NMEA 0183 sentences supported by the camera, refer to:
  - **p.149 — Supported NMEA 0183 sentences**
- For more information on the NMEA 2000 PGNs supported by the camera, refer to:
  - **p.149 — Supported NMEA 2000 PGNs**
- For more information on the available cables, refer to:
  - **p.140 — Spares and Accessories**

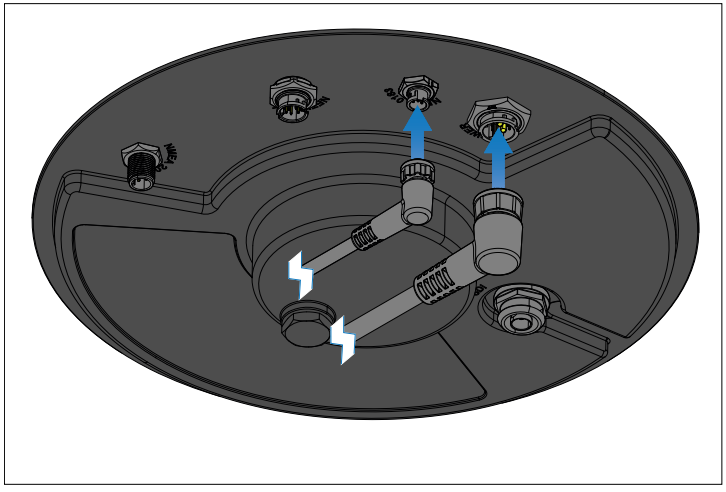
8.2 Connecting cables

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.

8.3 Orientation of right-angled cable connectors

When making cable connections, ensure that you orient the connectors correctly with respect to the thermal camera base.



8.4 General cabling guidance

Cable types and length

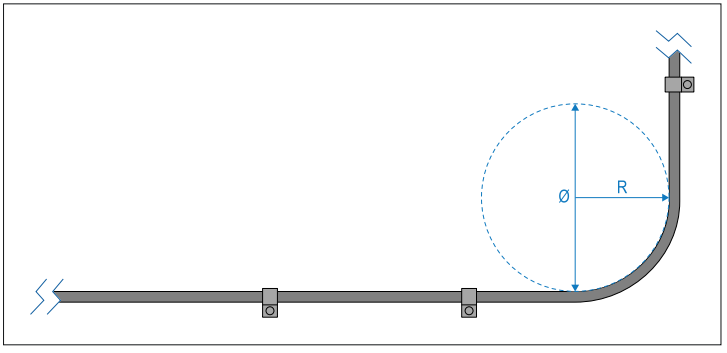
It is important to use cables of the appropriate type and length.

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

Cable routing and bend radius

To maximize cable performance and lifespan, it's important to ensure that all cables are routed correctly and adequate space is provided to allow for each cable's minimum bend radius.

Minimum cable bend radius



Do NOT bend cables excessively. Wherever possible, ensure that your chosen product installation location allows enough clearance for the minimum cable bend diameter specified in the following table:

	Description	Value
Ø	Cable minimum bend **diameter**.	200 mm (7.87 in.)
R	Cable minimum bend **radius**.	100 mm (3.94 in.)

Note:
For products where multiple different cable types are connected, each with a different minimum cable bend radius, the higher figure is provided in the table above (i.e. the cable with the greatest minimum bend radius is specified).

Cable routing — best practices

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

Strain relief

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

Circuit isolation

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

- Always use isolating transformers or a separate power-inverter to run PCs, processors, displays and other sensitive electronic instruments or devices.
- If using Weather FAX audio cables, always use an isolating transformer.
- If using a third-party audio amplifier, always use an isolated power supply.
- If using an RS232/NMEA converter, always ensure optical isolation on the signal lines.
- Always ensure that PCs or other sensitive electronic devices have a dedicated power circuit.

Cable shielding

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

Important:
Be aware that some **third-party** cables and adaptors (for example, certain Ethernet cables using RJ45 connectors) are not always shielded. To prevent breaks in cable shielding continuity and potential grounding issues, special attention is required to ensure that any cables, extension cables, adaptors, or other signal-coupling devices (such as multi-way connectors, junction boxes, terminal blocks etc.) used in cable runs **maintain all shield connections throughout the cable run**.

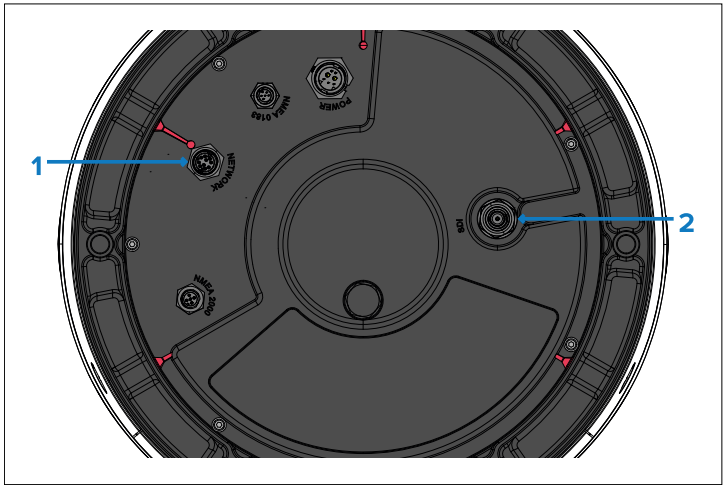
CHAPTER 9: VIDEO CONNECTIONS

CHAPTER CONTENTS

9.1 Video connections

The camera supports multiple video formats, and is capable of providing different video feeds to multiple devices, simultaneously.

Furthermore, you can use a **combination** of different video connection methods to display both thermal and visible-light video feeds **simultaneously**. For example, you can view a visible-light video feed via a display connected to the camera's 6G-SDI connector, and a thermal video feed at the same time, via a display connected to the camera's RayNet (Ethernet) connector. The different camera video output methods are described below:



1) RayNet (Ethernet):
2x **Primary** digital IP video streams:

- 2x primary streams can be used to display a visible-light video feed at UHD resolution (3840 x 2160) or a thermal video feed at the resolution supported by your camera's thermal payload.
- Both primary streams can be configured to use either the H.264 or MJPEG video codec.

2x **Secondary** digital IP video streams:

- 2x secondary streams can be used to display a visible-light video feed at FHD resolution (1920 x 1080) or a thermal video feed at the resolution supported by your camera's thermal payload.
- Both secondary streams can be configured to use either the H.264 or MJPEG video codec.

All video streams are configured separately from one another. For more information on the primary and secondary stream configuration options which are available via the camera's Web browser configuration interface, refer to:

- **Video settings**

Important:
When streaming digital IP video to multiple devices via the RayNet (Ethernet) connector and a network switch, it may be necessary to set the *[Enable Multicast]* option to "Yes", via the camera's Web browser configuration interface. Multicasting is very effective at optimizing bandwidth in systems where multiple users on the same network require access to the same live IP video stream. The default setting for the camera is "No" (i.e. only Unicast video streams), which means that the stream can only be received by a limited number of IP devices (typically less than 3). For more information, refer to:

- **p.66 — Multicasting**

2) BNC:
SDI digital video format, 6G-SDI compatible:

- The 6G-SDI video output can be used to display the visible-light video feed at UHD resolution (3840 x 2160) or a thermal video feed at the resolution supported by the camera's thermal payload.

Note:
It is also possible to connect to an HDMI-capable display or device, via a suitable third-party 6G-SDI to HDMI converter. Contact your dealer or retailer for suitable devices and cables

9.2 Video and network cables

A range of cables is suppled with the camera to cover typical connection scenarios. You may need to purchase additional cables to complete your installation.

Connector	Suitable cables
RayNet (Ethernet):	To connect to a network device with an RJ45 connector: • Use the supplied right-angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft.). Longer adapter cables are available separately. To connect to a network device with a RayNet connector: • Use the separately-available right-angled RayNet (Ethernet) to RayNet (Ethernet) cable.
BNC:	To connect to a 6G-SDI digital video monitor with a BNC connector: • Use the separately-available 6G-SDI video cable terminated in right-angled BNC to BNC connectors.
Bulkhead:	To connect to a network device with NMEA 0183 bare wire connections: • Use the separately-available right-angled bulkhead to NMEA 0183 bare wires adapter cable (available separately).
DeviceNet:	To connect to a NMEA 2000 backbone: • Use a right-angled DeviceNet to DeviceNet cable, available separately from third-party retailers.

Note:

• It is NOT possible to connect cables with straight connectors to the camera due to cable bend radius constraints.

• The RayNet (Ethernet) to RayNet (Ethernet) right-angled coupler / adapter (A80262) is NOT suitable for use with the camera.

Note:
It is also possible to connect to an HDMI-capable display or other video device, via a suitable third-party 6G-SDI to HDMI converter. Contact your dealer or retailer for suitable devices and cables.

9.3 6G-SDI cable connection

When making the 6G-SDI connection to the camera using the separately-available accessory cable, ensure that the rubber shroud surrounding the cable connector is secured with cable ties (not supplied), once fitted to the connector. Fit one tie to the shroud at the point where the cable enters the bottom of the shroud, and another tie around the shroud where it covers the connector itself.

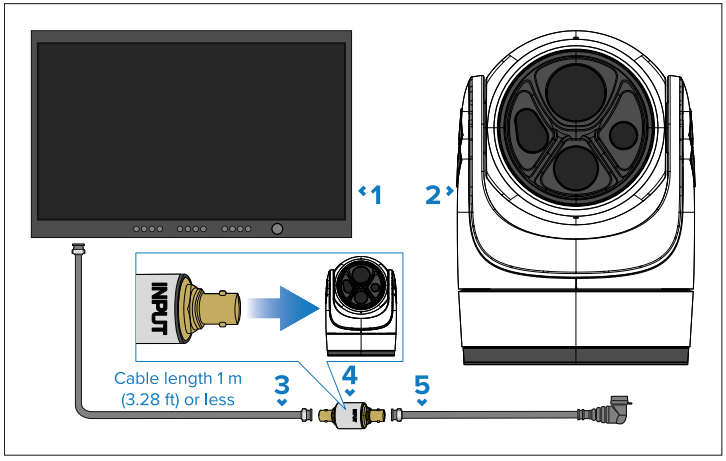
9.4 6G-SDI isolation transformer

When connecting the camera via 6G-SDI, to prevent potential grounding issues, a 6G-SDI video isolation transformer must be fitted to the 6G-SDI cable within 1 m (3.28 ft) of the display or video converter, ensuring that the **camera** is connected to the end of the isolation transformer labelled **input**.

A suitable isolation transformer is available separately from third-party retailers.

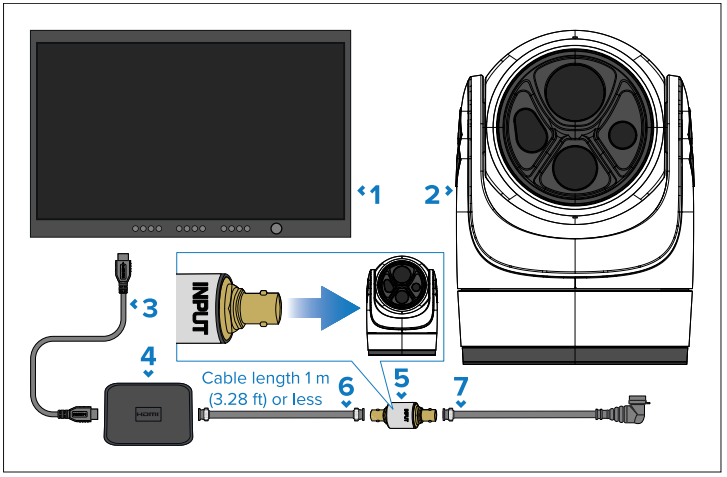
Note:
The 6G-SDI video cable connected between the 6G-SDI video isolation transformer and your digital video (6G-SDI) monitor or video converter must be maximum 1 m (3.28 ft) in length.

Example: 6G-SDI digital video monitor connection



	Description
1	Digital video (6G-SDI) display, available separately from third-party retailers.
2	M460 / M560-Series camera.
3	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers — **connected to the digital video (6G-SDI) display**.
4	6G-SDI video isolation transformer, available separately from third-party retailers.
5	Right-angled 6G-SDI video cable (Right-angled BNC to BNC connectors) (3 m / 9.8 ft), available separately — **connected to the M460 / M560-Series camera**.

Example: 6G-SDI to HDMI video converter connection



	Description
1	Digital video (HDMI) display, available separately from third-party retailers.
2	M460 / M560-Series camera.
3	HDMI video cable, available separately from third-party retailers
4	6G-SDI to HDMI video converter, available separately from third-party retailers
5	6G-SDI video isolation transformer, available separately from third-party retailers.
6	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers — **connected to the 6G-SDI to HDMI video converter**.
7	Right-angled 6G-SDI video cable (Right-angled BNC to BNC connectors) (3 m / 9.8 ft), available separately — **connected to the M460 / M560-Series camera**.

Note:
If you need to extend the length of a video cable connected to your product, refer to:

- **p.140 — Spares and accessories**

CHAPTER 10: NMEA 0183 CONNECTION

CHAPTER CONTENTS

10.1 NMEA overview

The NMEA interface allows the camera to communicate with radar, GPS, or other third-party devices using the National Marine Electronics Association (NMEA) 0183 or 2000 protocol. NMEA 0183 and NMEA 2000 are combined electrical and data specifications for communication between marine electronic devices.

- For information on the NMEA 0183 sentences which are supported by the camera, refer to:
  - **p.149 — Supported NMEA 0183 sentences**
- For information on the NMEA 2000 PGNs which are supported by the camera, refer to:
  - **p.149 — Supported NMEA 2000 PGNs**
- For additional information regarding the NMEA 0183 and NMEA 2000 protocols, refer to:
  - https://www.nmea.org

When it receives valid NMEA 0183 sentences from connected devices, the camera can automatically point itself towards vessels and other objects in its field of view, and track their movement.

Important:
In order for NMEA features to work correctly, the camera's altitude above the waterline must be set via the camera's Web browser configuration interface. For more information, refer to:

- **p.87 — Camera configuration and operation via Web browser**

10.2 NMEA 0183 connection

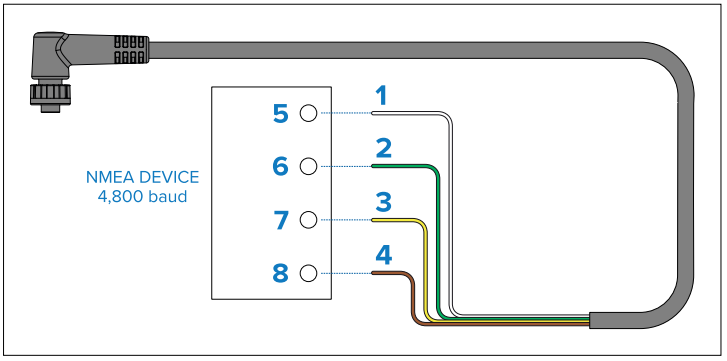
NMEA 0183 devices can be connected to your camera using the separately-available right-angled Bulkhead to NMEA 0183 bare wires adapter cable.

One NMEA 0183 port is available:

- **Port 1**: Input and output: 38400 baud rate only.

Note:
For Port 1, both the input and output communicate at the same baud rate. For example, if you have one NMEA 0183 device connected to the camera's Port 1 INPUT, and another device connected to the camera's Port 1 OUTPUT, both devices must use the same baud rate.

Up to 4 devices can be connected to the camera's NMEA **output**; only 1 device can be connected to the camera's NMEA **input**:



	Device	Cable color	Port	Input / output	(+) / (-)
1	Camera	White	1	Input	Positive (+)
2		Green	1	Input	Negative (-)
3		Yellow	1	Output	Positive (+)
4		Brown	1	Output	Negative (-)
5	NMEA device	*	*	Output	Positive (+)
6		*	*	Output	Negative (-)
7		*	*	Input	Positive (+)
8		*	*	Input	Negative (-)

Note:
* For connection details, refer to the instructions provided with your NMEA 0183 device.

10.3 NMEA tracking

For more information on the camera's supported NMEA features and how to enable them, refer to:

- **p.120 — NMEA radar tracking**

CHAPTER 11: NETWORK CONNECTIONS

CHAPTER CONTENTS

11.1 Network connections

Your camera features RayNet (Ethernet), DeviceNet (NMEA 2000) and Bulkhead (NMEA 0183) network connectors for connection to your vessel's wider electronics network.

The specific details of the network connections between the camera, video display (Web browser, video monitor, or compatible chartplotter), Joystick Control Unit (JCU) (for example, a JCU-4) and the rest of your installation will depend on:

- How you want to control the camera (for example, using a Web browser, a chartplotter with an ONVIF-compatible video application, a JCU controller, or a combination of these).
- How you want to view the camera's IP video feed (for example, via a laptop / PC, a compatible chartplotter, or a combination of these).
- The equipment already installed on your vessel (for example, network switches or multiplexers with free ports).

The following sections show some possible network connections, starting with a basic system with a single camera directly connected to Web browser, and finishing with a more complex system.

Important:
If you are powering a JCU via the separately-available PoE Injector (2nd Generation; 5 Gbit) (A80811), do NOT connect the power input labelled "*VIN1+*" on the PoE Injector.

Note:
Power connections to the VCM150 and external LED indicator are required, but not shown throughout each of the following illustrations. For more information, refer to:

• **p.73 — Power connections**

For power connection information on the other network devices shown, refer to the documentation which accompanies each device.

Note:
An Ethernet network switch is only required in the scenarios shown when the camera needs to be connected to more than one Ethernet device. For a high speed connection, ensure that equipment is connected to your network switch via an available Gigabit (Gbit)-speed port.

Multicasting

Multicasting is a method of transmitting a stream of data (e.g. an IP video feed) from a single source (e.g. thermal camera) to multiple destinations (e.g. video displays) on a network, eliminating the need for the stream to be transmitted individually from the source to each destination device.

Multicasting is effective at optimizing bandwidth in systems where multiple users on the same network require access to the same live IP video stream. With multicasting, the network bandwidth remains the same between the camera and the core of the network, even as the number of destination devices increases. This reduces the traffic strain on network infrastructure, and makes it easier to plan and manage predictable bandwidth requirements.

However, multicasting is not suitable for all systems, and there are a number of important considerations to make before implementing multicasting in your network:

- Multicasting is often only required in large systems featuring multiple receivers of the IP video stream(s). For smaller networks consisting of up to 2 or 3 displays receiving the IP video stream, unicast may be the preferred option, due to the added complexity of configuring and managing multicast networks.
- Multicasting is only possible when ALL network devices receiving the multicast stream (switches, routers, displays, etc) are also multicast compatible and enabled. Refer to the documentation which accompanies your network devices for multicast compatibility information and additional configuration instructions.
- When using multicasting, your network must be capable of managing multiple transmission methods within the same network (i.e. multicast and unicast). This is because IP video sources may not always transmit identically, and certain devices in a network may not necessarily support multicasting.

Enabling multicasting

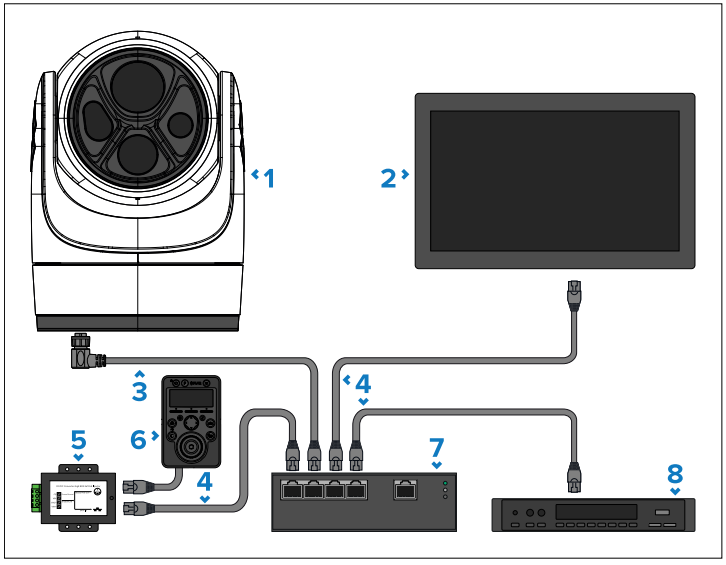
In order to enable the *[multicast]* setting, you must first setup a network connection to the camera and log in to the camera's Web browser configuration interface by following the instructions found under the following section:

• **p.87 — Camera configuration and operation via Web browser**

With the Web browser configuration interface displayed:

1. Navigate to: *[Video > Enable Multicast]*.
2. Select *[Yes]*.

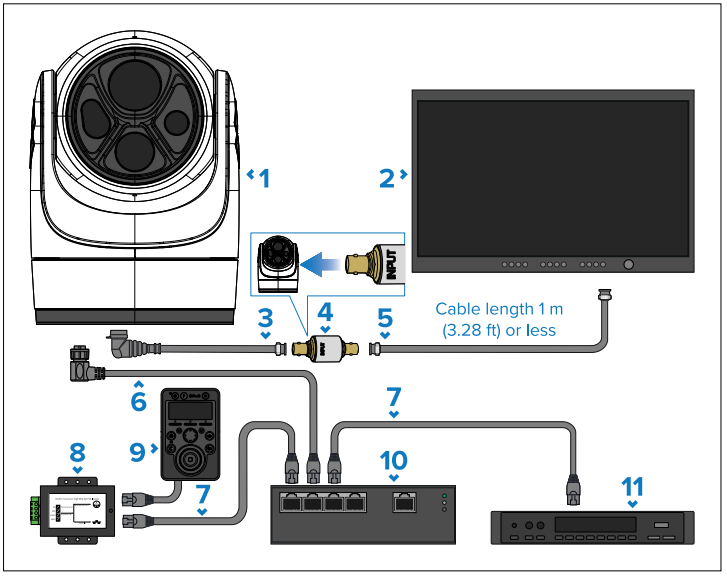
Camera system with a compatible chartplotter and JCU



	Description
1	Camera
2	Compatible chartplotter, available separately
3	Right-angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
4	RJ45 to RJ45 Ethernet cable, available separately
5	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-4, available separately
6	Joystick Control Unit (JCU-4 currently illustrated), available separately
7	Ethernet network switch, available separately
8	Network Video Recorder (NVR), available separately from third-party retailers

Camera system with a digital video (6G-SDI) display and JCU

For this system, a device running a Web browser is not required. The camera's video feed is routed through the camera's 6G-SDI video connection to a digital video monitor. Camera control is provided by a JCU (available separately).

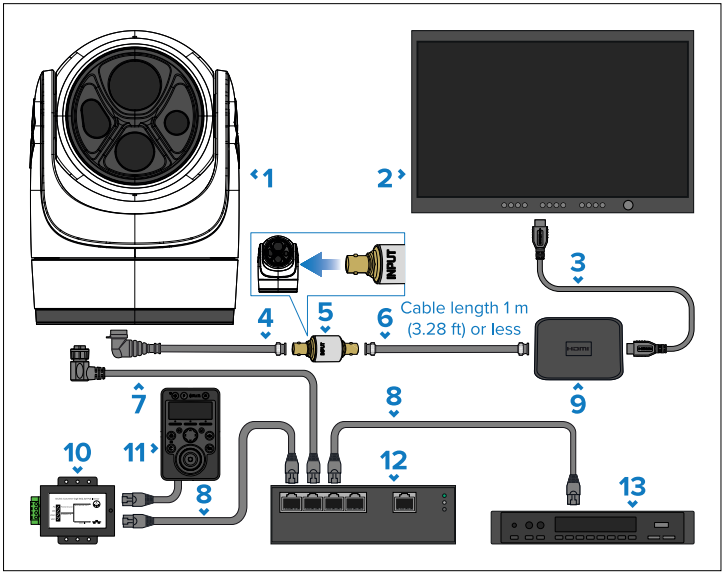


	Description
1	Camera
2	Digital video (6G-SDI) monitor, available separately from third-party retailers
3	6G-SDI video cable (Right-angled BNC to BNC connectors), available separately

	Description
4	6G-SDI video isolation transformer, available separately from third-party retailers **Important:** An appropriate 6G-SDI video isolation transformer must be fitted to camera 6G-SDI connections. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
5	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers **Note:** The 6G-SDI video cable connected between the 6G-SDI video isolation transformer and your digital video (6G-SDI) monitor or video converter must be maximum 1 m (3.28 ft) in length. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
6	Right angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
7	RJ45 to RJ45 Ethernet cable, available separately
8	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-4, available separately
9	Joystick Control Unit (JCU-4 currently illustrated), available separately
10	Ethernet network switch, available separately
11	Network Video Recorder (NVR), available separately from third-party retailers

Camera system with a digital video (HDMI) display and JCU

For this system, a device running a Web browser is not required. The camera's video feed is routed through the camera's 6G-SDI video connector via a third-party 6G-SDI to HDMI video converter (not supplied) to a digital video display. Camera control is provided by a JCU (available separately).

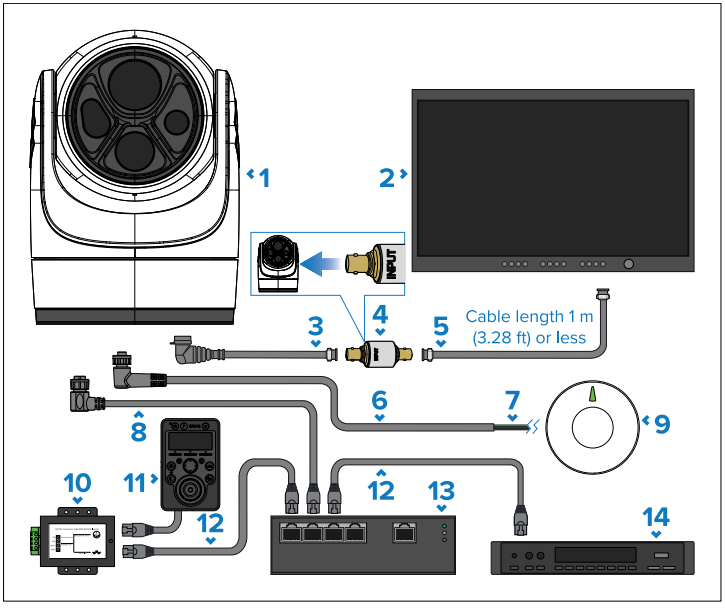


	Description
1	Camera
2	Digital video (HDMI) display, available separately from third-party retailers
3	HDMI cable, available separately from third-party retailers
4	6G-SDI video cable (Right-angled BNC to BNC connectors), available separately

	Description
5	6G-SDI video isolation transformer, available separately from third-party retailers **Important:** An appropriate 6G-SDI video isolation transformer must be fitted to camera 6G-SDI connections. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
6	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers **Note:** The 6G-SDI video cable connected between the 6G-SDI video isolation transformer and your digital video (6G-SDI) display or video converter must be maximum 1 m (3.28 ft) in length. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
7	Right-angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
8	RJ45 to RJ45 Ethernet cable, available separately
9	6G-SDI to HDMI video converter, available separately from third-party retailers
10	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-4, available separately
11	Joystick Control Unit (JCU-4 currently illustrated), available separately
12	Ethernet network switch, available separately
13	Network Video Recorder (NVR), available separately from third-party retailers

Camera system with a digital video display and JCU, connected to a basic NMEA 0183 network

For this example system, a device running a Web browser is not required. The camera's video feed is routed through the camera's 6G-SDI video connection to a digital video display. Camera control is provided by a JCU (available separately). Connection to a NMEA 0183 network can enable the use of additional camera features, depending on the sentences transmitted to the camera.

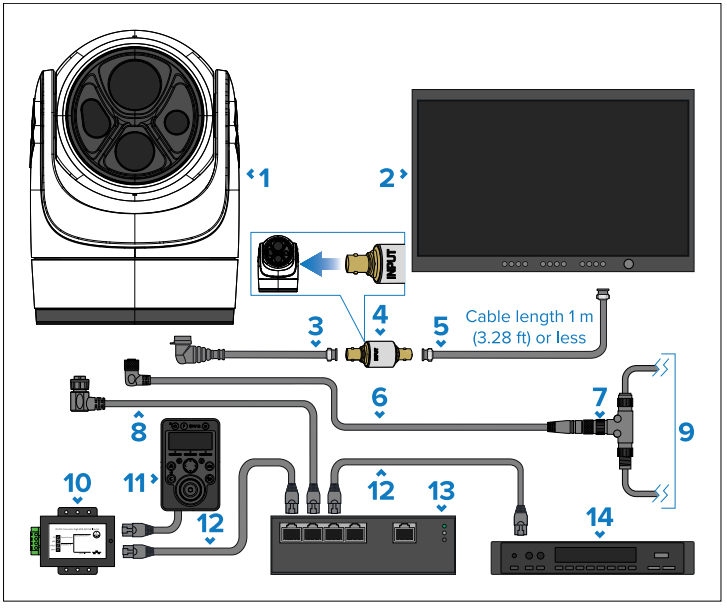


	Description
1	Camera
2	Digital video (6G-SDI) display, available separately from third-party retailers
3	6G-SDI video cable (Right-angled BNC to BNC connectors), available separately

	Description
4	6G-SDI video isolation transformer, available separately from third-party retailers **Important:** An appropriate 6G-SDI video isolation transformer must be fitted to camera 6G-SDI connections. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
5	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers **Note:** The 6G-SDI video cable connected between the 6G-SDI video isolation transformer and your digital video (6G-SDI) display or video converter must be maximum 1 m (3.28 ft) in length. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
6	Right-angled Bulkhead to NMEA 0183 bare wires adapter cable, available separately
7	NMEA 0183 connection. For more information on how to connect NMEA 0183 devices to the camera, refer to: • **p.63 — NMEA 0183 connection**
8	Right angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
9	Heading sensor, available separately from third-party retailers
10	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-4, available separately
11	Joystick Control Unit (JCU-4 currently illustrated), available separately
12	RJ45 to RJ45 Ethernet cable, available separately
13	Ethernet network switch, available separately
14	Network Video Recorder (NVR), available separately from third-party retailers

Camera system with a digital video display and JCU, connected to a basic NMEA 2000 network

For this example system, a device running a Web browser is not required. The camera's video feed is routed through the camera's 6G-SDI video connection to a digital video display. Camera control is provided by a JCU (available separately). Connection to a NMEA 2000 network can enable the use of additional camera features, depending on which PGNs are transmitted to the camera.

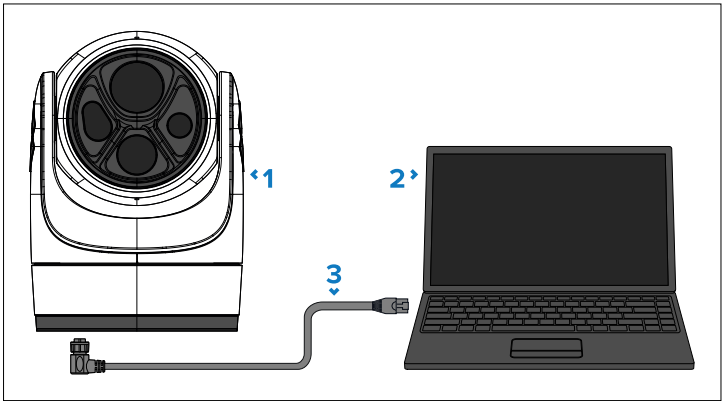


	Description
1	Camera
2	Digital video (6G-SDI) display, available separately from third-party retailers
3	6G-SDI video cable (Right-angled BNC to BNC connectors), available separately

	Description
4	6G-SDI video isolation transformer, available separately from third-party retailers **Important:** An appropriate 6G-SDI video isolation transformer must be fitted to camera 6G-SDI connections. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
5	6G-SDI video cable (BNC connectors) (1 m / 3.28 ft or less), available separately from third-party retailers **Note:** The 6G-SDI video cable connected between the 6G-SDI video isolation transformer and your digital video (6G-SDI) monitor or video converter must be maximum 1 m (3.28 ft) in length. For more information, refer to: • **p.60 — 6G-SDI isolation transformer**
6	Right-angled DeviceNet to DeviceNet cable, available separately from third-party retailers
7	DeviceNet T-piece connector, available separately from third-party retailers.
8	Right-angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
9	NMEA 2000 backbone.
10	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-4, available separately
11	Joystick Control Unit (JCU-4 currently illustrated), available separately
12	RJ45 to RJ45 Ethernet cable, available separately
13	Ethernet network switch, available separately
14	Network Video Recorder (NVR), available separately from third-party retailers

Camera system with direct connection to a Web browser

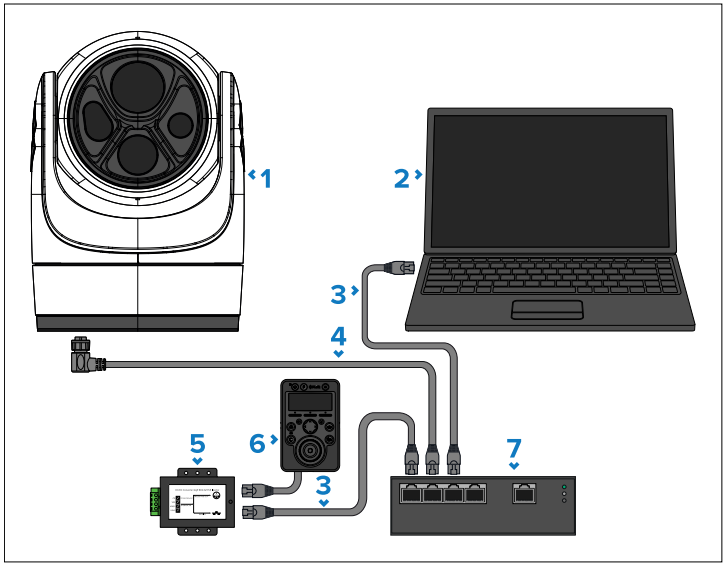
The network connection scenario illustrated below is primarily intended for configuration and diagnostic purposes.



	Description
1	Camera
2	Laptop (or other Ethernet-connected device running a Web browser), available separately from third-party retailers
3	Right-angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera

Camera system with a Web browser and an optional JCU

The network connection scenario illustrated below is primarily intended for configuration and diagnostic purposes.



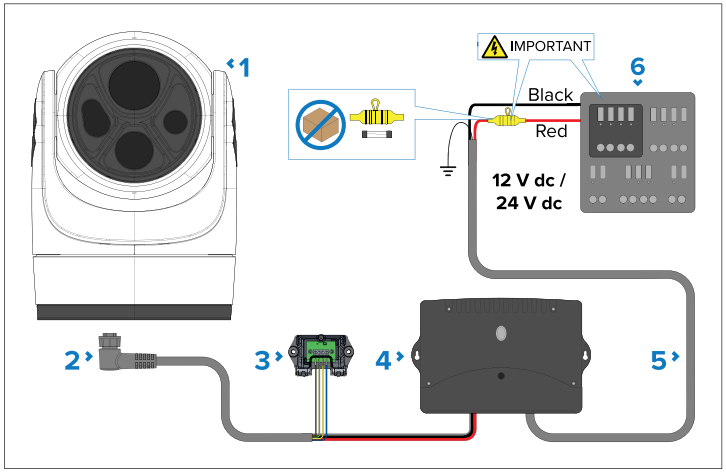
	Description
1	Camera
2	Laptop (or other Ethernet-connected device running a Web browser), available separately from third-party retailers
3	RJ45 to RJ45 Ethernet cable, available separately
4	Right angled RayNet (Ethernet) to RJ45 adapter cable (1 m / 3.28 ft), 1x supplied with camera
5	PSE (Power Sourcing Equipment — e.g. a PoE Injector or PoE network switch) providing PoE (Power over Ethernet) to the JCU-2, available separately
6	Joystick Control Unit (JCU-4 currently illustrated), available separately
7	Ethernet network switch, available separately

CHAPTER 12: POWER CONNECTIONS

CHAPTER CONTENTS

12.1 Camera power connections

The camera must be powered via the supplied VCM150 (Voltage Converter Module).



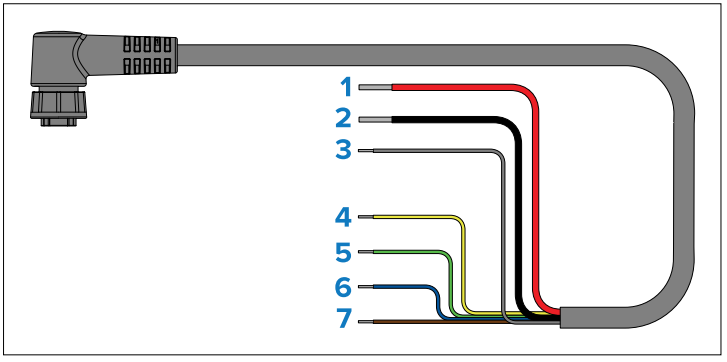
	Description
1	Camera.
2	Right-angled power cable, supplied.
3	External LED indicator, supplied.
4	VCM150 power converter, supplied.
5	Vessel power supply to VCM150 power cable, not supplied.
6	Vessel power supply.

The camera is intended for use on vessel DC power systems operating at 12 or 24 Volts DC.

- The camera's power connection must be made via the VCM150 Voltage Converter Module.
- The camera must NOT be connected directly to a battery.
- Only one camera must be connected per VCM150 unit. Each camera in your system requires a dedicated VCM150 unit.
- The power connection between the camera and the VCM150 must be via an official FLIR power cable (a power cable is supplied with the camera).
- Do NOT cut and re-join any part of the power cable. A range of cable lengths are available for longer cable runs. For more information, refer to:
  - **p.140 — Spares and accessories**
- The camera must be connected to the POWER OUT terminals of the VCM150.
- The screen (drain) strands of the camera's power cable must be connected to one of the VCM150 SCREEN terminals.

The following diagram illustrates the power connections of the supplied power cable.

Camera power cable connections:



	Wire	Connects to:	Terminal name
1	Red	VCM150	POWER OUT (Positive)
2	Black	VCM150	POWER OUT (Negative)
3	Screen (drain)	VCM150	SCREEN
4	Yellow	External LED indicator	YLLW (Negative)
5	Green	External LED indicator	GRN (Negative)
6	Blue	External LED indicator	BLUE (Positive)
7	Brown	External LED indicator	BRWN (Positive)

Important:
Fuses (not supplied) are required for circuit protection for the camera. For information, refer to:

• **p.75 — Circuit breaker and fuse ratings**

Circuit breaker and fuse ratings

All power connections between the VCM150 and its power source MUST be protected by a single circuit isolator switch AND either a thermal circuit breaker or in-line fuse, fitted close to the power connection. The connection from the output of the VCM150 to the camera base does not require a fuse or circuit breaker.

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

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

Power supply	Protection	Rating
12 V	Fuse	30A
	Thermal breaker	30A
	Isolator switch	> 50A
24 V	Fuse	15A
	Thermal breaker	15A
	Isolator switch	> 50A

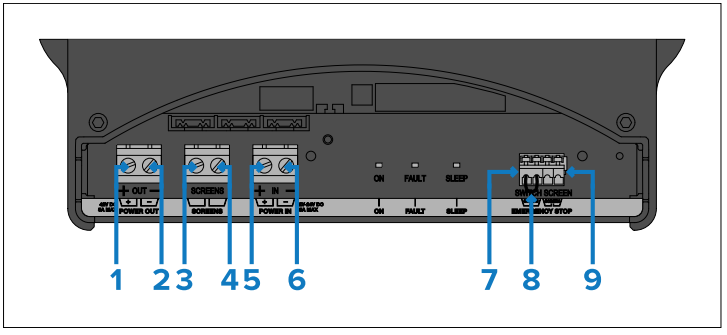
VCM150 power connections

VCM150 power and grounding requirements.

The VCM150 is intended for use on a vessel's DC power system, operating from 12 to 24 Volts DC.

- The VCM150 must be connected to a battery isolator switch, or a DC distribution panel.
- The battery isolator switch or DC distribution panel must be connected to the POWER IN terminals of the VCM150.
- Do NOT connect additional power switches to the cable providing the power feed to the VCM150.
- All power connections between the VCM150 and the power source must have appropriate fuse protection.
- All power connections must be of high quality to minimize resistance and to remove the risk of accidental shorts.
- The VCM150 SCREEN terminals must be connected to your vessel's RF ground system.
- The distribution point should be fed from the vessel's primary power source by 8 AWG (8.36 mm^2) cable.
- Ideally, all equipment should be wired to individual suitably-rated thermal breakers or fuses, with appropriate circuit protection. Where this is not possible and more than 1 item of equipment shares a breaker, use individual inline fuses for each power circuit to provide the necessary protection.
- Do NOT connect the M460 / M560-Series or the VCM150 to a positively-grounded power system.

The following diagram illustrates the power connections of the VCM150:



1. **POWER OUT (Positive)** — connect to the RED wire of the M460 / M560-Series power cable.
2. **POWER OUT (Negative)** — connect to the BLACK wire of the M460 / M560-Series power cable.
3. **SCREEN** — connect to the bare screen (drain) strands of the M460 / M560-Series power cable.
4. **SCREEN** — connect to your vessel's RF ground system.
5. **POWER IN (Positive)** — connect to the positive terminal of the vessel's power supply (ideally a battery isolator switch or DC distribution panel).
6. **POWER IN (Negative)** — connect to the negative terminal of the vessel's power supply (ideally a battery isolator switch or DC distribution panel).

7. **EMERGENCY STOP (Switch)** — if you have an optional VCM150 emergency stop button, remove the wire bridging link from the VCM150 EMERGENCY STOP terminals, and connect the emergency stop button SWITCH wire to the VCM150 EMERGENCY STOP SWITCH terminal.
8. **EMERGENCY STOP wire bridging link** — only remove if fitting the optional emergency stop button.
9. **EMERGENCY STOP (Screen)** — if you have an optional VCM150 emergency stop button, remove the wire bridging link from the VCM150 EMERGENCY STOP terminals, and connect the emergency stop button SCREEN (drain) wire to the VCM150 EMERGENCY STOP SCREEN terminal.

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 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.

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

VCM150 power wire gauge

You must provide suitable power wires to connect the VCM150 to the vessel's DC distribution panel or battery isolator switch.

It is essential that both power cores and the screen (drain) are connected and that the connection is of very low resistance, as considerable power passes through this connection.

The following table provides recommended total power cable lengths and gauges. These figures relate to the maximum round-trip length of power cables from the vessel's DC distribution panel or battery isolator switch to the VCM150. Exceeding these lengths or using a smaller wire gauge may cause unreliable operation.

AWG (American Wire Gauge)	mm^2	Maximum distance (12 V supply)	Maximum distance (24 V supply)
6	13.3	12 m (39.4 ft.)	40 m (131.2 ft.)
7	10.5	9 m (29.5 ft.)	35 m (114.8 ft.)
8	8.37	7 m (23.0 ft.)	25 m (82.0 ft.)

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

VCM150 screen (drain) wire gauge

You must provide and connect a suitable screen (drain) wire between the VCM150's SCREEN terminal and your vessel's RF ground system.

The screen (drain) wire should use an 8 mm braid or AWG 10 (5.26 mm^2) multi-stranded cable.

Warning: Product grounding

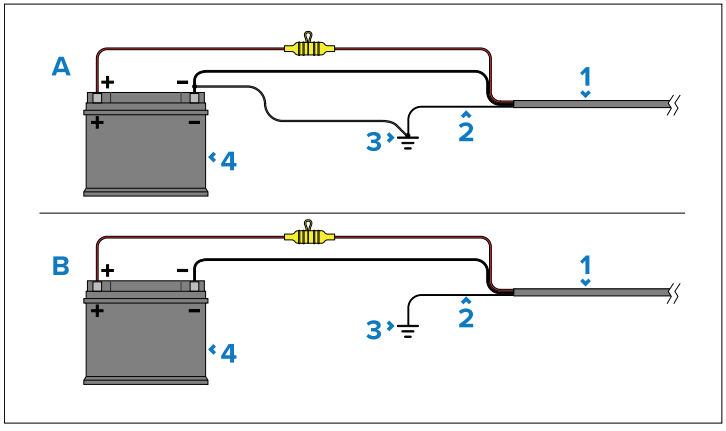
Before applying power to this product, it MUST be correctly grounded, in accordance with the instructions provided.

VCM150 grounding requirements

VCM150 grounding requirements.

Note:
The camera is not grounded directly, but is connected to ground via the VCM150. The following grounding requirements apply to the VCM150:

- The VCM150 power cable screen must be connected to the vessel's common ground point.
- It is recommended that the common ground point is a bonded ground, i.e. with the ground point connected to battery negative, and situated as close as possible to the battery negative terminal. If a bonded ground system is not possible, a non-bonded RF ground may be used.



- **A** — Bonded ground system (preferred)
- **B** — RF ground system (alternative)

1. Power cable to VCM150.
2. VCM150 drain (screen).
3. Bonded (preferred) or non-bonded RF ground.
4. Power supply.

Implementation

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

- for runs of <1 m (3 ft), use 6 mm^2 (#10 AWG) or greater.
- for runs of >1 m (3 ft), use 8 mm^2 (#8 AWG) or greater.

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

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

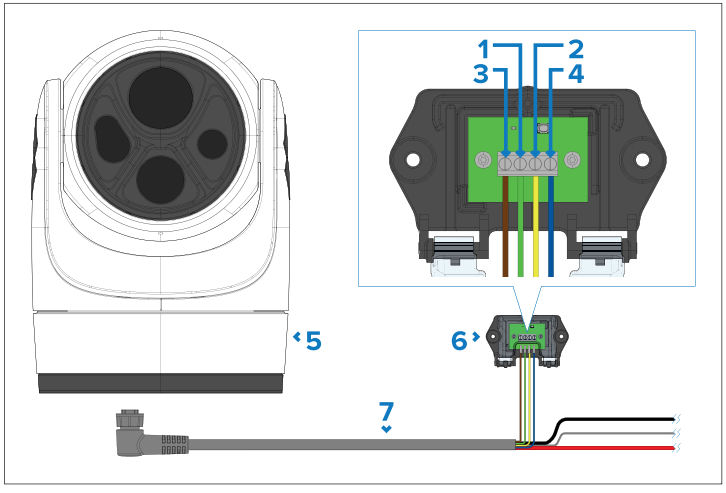
References and best practice

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

External LED power connections

The following diagram illustrates the power connections of the external LED indicator:



1. **GRN (Negative)** — connect to the GREEN wire on the camera power cable.
2. **YLLW (Negative)** — connect to the YELLOW wire on the camera power cable.
3. **BRWN (Positive)** — connect to the BROWN wire on the camera power cable.
4. **BLUE (Positive)** — connect to the BLUE wire on the camera power cable.

CHAPTER 13: CAMERA CONTROL OPTIONS

CHAPTER CONTENTS

13.1 Camera control options

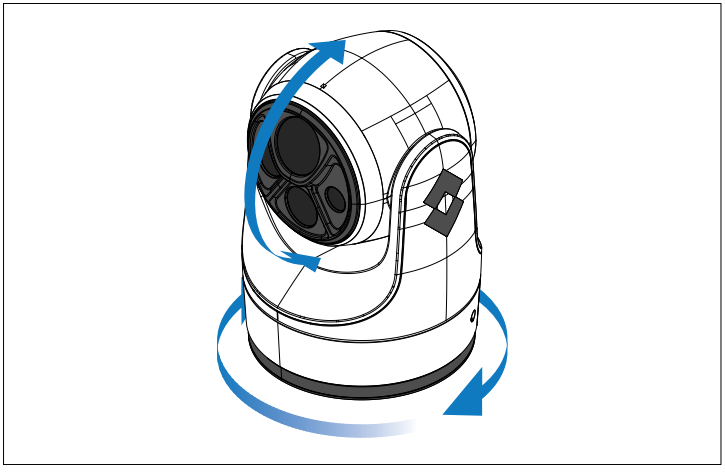
There are a number of different ways of controlling the camera remotely.

- **Via a compatible chartplotter** — With the camera connected to the chartplotter or the chartplotter network via Ethernet, you can either use a Web browser or an ONVIF (Profile S)-compatible video / camera application (if supported by your display) to view and control the camera remotely.
- **Via a Raymarine LightHouse 4 multifunction display (MFD)** — For further information, refer to the operation documentation which accompanies your display.
- **Via a Joystick Control Unit (JCU)** — With the JCU connected to the camera via a network switch, you can use the JCU's physical controls to control the camera remotely.
- **Via a Web browser** — With the camera connected to a laptop or another Ethernet device with a Web browser, you can use the camera's Web browser configuration interface or Web browser operation interface to view and control the camera remotely.

13.2 Camera control

Pan, tilt and zoom (PTZ)

The camera controls allow for pan (azimuth) and tilt (elevation) of the camera, as well as zoom (magnification) of the thermal / visible-light image.



- Pan continuously through 360°
- Tilt to +120° / -90°, relative to the camera base.
- Optically zoom the visible-light image by 25x / Digitally zoom the visible light image by 12x, and;
  - (M460-Series): Optically zoom the thermal image by 5.4x / Digitally zoom the thermal image by 8x.
  - (M560-Series): Optically zoom the thermal image by 15.26x / Digitally zoom the thermal image by 8x.

You can control pan, tilt and zoom, using:

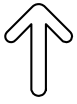
- The camera's Web browser configuration interface or operation interface, see:
  - **p.87 — Camera configuration and operation via Web browser**
- The joystick on a JCU remote keypad, see:
  - **p.101 — Camera operation via JCU**
- A compatible multifunction display / chartplotter, see:
  - **p.103 — Camera operation via MFD / Chartplotter**

Changes made to the camera's azimuth, elevation and payload magnification will be reflected on the camera's video feed.

Forward position

The forward position is a preset position for the camera.

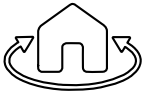
The forward position defines a position facing forward relative to your vessel — for example, straight ahead and level with the horizon.

Icon	Information
	You can set the forward position as required, using: • The camera's Web browser configuration interface or operation interface, see: – **p.87 — Camera configuration and operation via Web browser** • A JCU remote keypad, see: – **p.102 — Compatible joystick controllers (JCU)** • A compatible multifunction display / chartplotter, see: – **p.103 — Camera operation via MFD / Chartplotter**

Home position

The home position is a preset position for the camera.

The home position usually defines a useful reference point — for example, a view outward from the vessel's beam or aft position.

Icon	Information
	You can set the home position as required, and return the camera to the park position, using: • The camera's Web browser configuration interface or operation interface, see: – **p.87 — Camera configuration and operation via Web browser** • A JCU remote keypad, see: – **p.101 — Camera operation via JCU** • A compatible multifunction display / chartplotter, see: – **p.103 — Camera operation via MFD / Chartplotter**

Park position

The park position is a preset position for the camera.

When activated, the camera will move to the fixed park position and the camera's video feeds will be temporarily disabled until activity is resumed.

While parked, the camera's heater / cooler will continue to run so that the camera is ready for use once activity is resumed.

Icon	Information
	You can set the park position as required, and return the camera to the park position, using: • The camera's Web browser configuration interface, see: – **p.87 — Camera configuration and operation via Web browser** • A compatible multifunction display / chartplotter, see: – **p.103 — Camera operation via MFD / Chartplotter**

Surveillance scan mode

[Surveillance scan] mode causes the camera to continuously pan left and right, automatically scanning the scene.

Once the *[Surveillance scan]* mode has been enabled, the camera will continue to scan until you:

- Disable the *[Surveillance scan]* mode.
- Manually pan or tilt the camera.
- Command the camera to move to the home or park position.
- Initiate a tracking mode.

You can initiate *[Surveillance scan]* mode, and change the associated scan speed and scan width, using:

- The camera's Web browser configuration interface or operation interface, see:
  - **p.87 — Camera configuration and operation via Web browser**
- The user-programmable buttons on a JCU remote keypad, see:
  - **p.101 — Camera operation via JCU**
- A compatible multifunction display / chartplotter, see:
  - **p.103 — Camera operation via MFD / Chartplotter**

CHAPTER 14: IP ADDRESS DISCOVERY

CHAPTER CONTENTS

14.1 Camera IP address discovery

Before you can access the camera's web interface page(s), you first need to know the camera's IP address. The way in which you obtain this IP address depends on: 1) **which device** in the network is allocating the IP addresses; and 2) **how** the IP network addresses are allocated. The majority of IP networks are configured to allocate IP addresses to connected devices automatically. However, on some networks, it will be necessary to configure the camera's IP address manually.

IP address allocation methods

Method	Description
Automatic: via DHCP or link local address	The majority of networks will allocate an IP address for the camera automatically, via DHCP (*Dynamic Host Configuration Protocol*). Windows PCs also have *link local* support, which means that if a DHCP server is not found on the IP network, the camera will fallback to using a link local address, in the 169.254.x.x range. In this scenario, no further IP configuration is required, and you will be able to access the camera's web interface page by entering its IP address into the web browser's address bar. **How to find the camera's IP address:** Refer to the *How to find an IP address* section below.
Manual: via a static IP address	Networks that do NOT use DHCP or link local IP addressing require a **static IP** address to be permanently assigned to each connected device. An IP address can be assigned manually using the camera's Configuration page. However, before you can access this page and change the camera's default IP address to a static address of your choosing, you must first find out the camera's existing factory-configured IP address. **How to find the camera's IP address:** Refer to the *How to find an IP address* section below.

Note:
When setting a static IP address, be aware that some IP network policies impose IP address *octet filtering* rules, which may require the numbers in a specific octet of the address to be within a specific range. In this scenario, it may not be possible to assign a static IP address to the device if the address is not in the correct range, and it will be necessary to refer to the vessel's IP network administrator.

Note:
IP addresses are self-allocated by certain Raymarine equipment in the following range: 198.18.0.32 to 198.18.3.255 (inclusive). On networks featuring Raymarine-branded IP devices, you must avoid placing any devices in this range using manual (static) IP addresses.

How to find an IP address

There are a variety of ways for discovering a device's IP address, and the method differs depending on the platform:

On a Windows PC or laptop:

Method 1:

1. Start a command prompt by entering "*cmd*" in the Windows search bar.
2. Type: "*ipconfig /all*" in the command prompt, followed by the Enter key.
3. All connected IP devices will be listed, along with an IP address for each. Find the camera in the list.

Method 2:

1. Open Windows **File** Explorer, and click on the "*Network*" category in the sidebar on the left.
2. Find the camera via its serial number in the list of devices, and then right-click on its icon and select "*Properties*" in the .
3. The IP address will be listed in the displayed web page.

Method 3:
Use third-party IP scanning software (such as *Wireshark*) to scan the devices on your IP network. The IP address of all devices will be listed in the scan results.

On a network router:

1. Access the router's web interface page via a web browser (the router's IP address is typically *192.168.1.1* or *192.168.0.1*). It is also usually printed on the Router's product label.
2. Navigate to the "*Device List*", "*Connected Devices*", or "*DHCP Clients*" section.
3. The camera and its IP address will be listed.

On an MFD / chartplotter:

The IP address for connected devices is usually displayed on a *Diagnostics* page. Refer to the display's *Operation Instructions* document for instructions on how to access the Diagnostics page.

14.2 Setting a static IP address

In some circumstances, you may need to set a static IP address for the camera's IP-network, rather than relying on the automatic IP addresses provided by the DHCP server (the camera's default setting).

Note:
Unless you are specifically instructed in FLIR documentation, or have previous experience of configuring IP networks, you should NOT attempt to set the camera's IP-network parameters manually. If you mis-configure the IP-network parameters, your camera may stop working correctly or become inaccessible on the network.

This procedure assumes that you have already established a network connection, and can access the camera's Web browser configuration interface. To configure the camera's IP network parameters manually:

1. Log into the camera's Web browser configuration interface.
   For more information on logging in, refer to:
   - **p.88 — Logging in to the configuration interface**
2. From the Web browser configuration interface video feed, select *[System Settings]* from the bottom left of the screen.
3. Select *[Network]*.
4. Select the *[DNS Mode]* drop down menu and select *[Static]*.
5. Select the *[Host Name]* drop down menu and select *[Static]*.
6. Adjust the values for *[IP Address]* and *[Netmask]* as required.

Note:
Keep a record of the changes made. You will need this address to access the camera's Web browser configuration interface and Web browser operation interface in future.

7. At the bottom of the page, select *[Save]*.

14.3 Accessing the camera's web interface pages

M460 / M560-Series cameras support 2 different web browser interfaces, both of which serve a different function.

The 2 available web browser interfaces are:

1. **Configuration** interface — this provides access to the settings for configuring the video feeds and control of your camera
2. **Operation** interface — this provides access to the camera's core functions, such as camera position, and zoom level, etc.

Before you can access the web browser interfaces, you need to know the IP address for your camera. For information on how to obtain this, refer to: **p.84 — Camera IP address discovery**

Once you know the camera's IP address, you can access the interface using a web browser:

Configuration interface	Operation interface
Camera's IP address (e.g. **http://xxx.xx.x.xxx**)	Camera's IP address followed by '/live' (e.g. **http://xxx.xx.x.xxx/live**)
For more information, refer to: • **p.88 — Web browser configuration interface overview**	For more information, refer to: • **p.96 — Web browser operation interface overview**

14.4 Supported browsers

The camera's configuration and operation interface pages can be accessed by using one of the following Web browsers:

- Google Chrome
- Microsoft Edge

- Apple Safari

Important:

- For the best compatibility with the camera's configuration and operation interface pages, ensure that your browser is running the latest available version.
- Be aware that you may experience limited menu and setting functionality when attempting to use the camera's configuration or operation interface with a different Web browser to those listed above.

CHAPTER 15: CAMERA CONFIGURATION AND OPERATION VIA WEB BROWSER

CHAPTER CONTENTS

15.1 Web browser configuration interface overview

The Web browser configuration interface is used to configure the camera's settings or diagnose a potential issue with the camera.

The following camera control options and settings are available via the Web browser configuration interface:

Available controls	Available settings
• Pan, tilt, zoom (PTZ) controls • (1) Laser range finder (LRF) distance measurement • Home / Park positions • Surveillance mode • On-screen display (OSD) menu controls	• Video settings • Visible settings • Thermal settings • Pan, tilt, zoom (PTZ) settings • Illumination settings • Georeference settings • System settings • On-screen display (OSD) menu settings

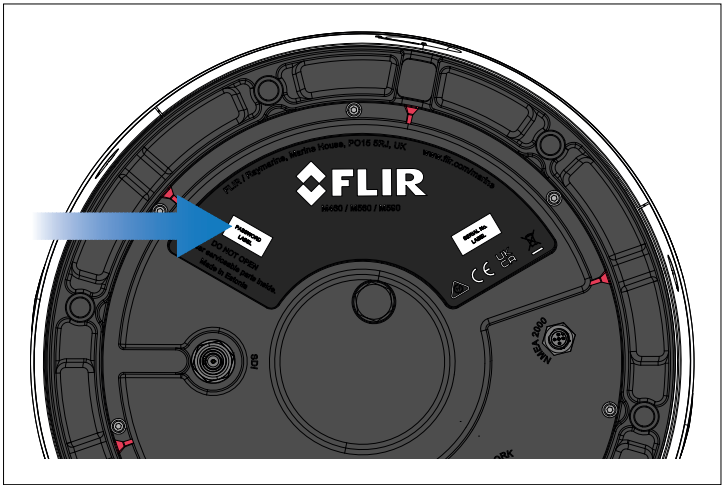
Note:
(1) This option is only available for camera variants which support a laser range finder (LRF).

For information on how to discover the camera's IP address and access the camera's Web browser user interfaces, refer to:

- **p.83 — IP address discovery**

Logging in to the configuration interface

You can log in to the camera's Web browser configuration interface using the User Name and unique Password supplied in the box and / or on the underside of your product:



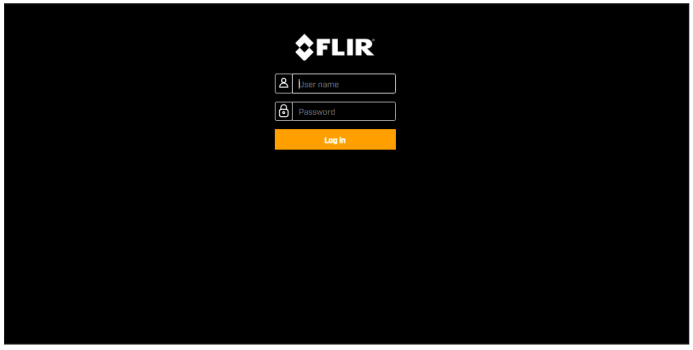
Important:
You should change the default login password to prevent unauthorized access.

Note:
It is recommended that only one Web session is active at any given time.

To log in:

1. Open the camera's Web browser configuration interface by following the instructions listed under the following section:
   - **p.85 — Accessing the camera's web interface pages**

   Once opened, the following login screen is displayed:



2. Enter the applicable login information referenced above, then click *[Log in]*.

First time login

After logging in to the Web browser configuration interface for the first time, it is highly recommended that you set a new secure password.

Password requirements	
Your password must:	Your password must NOT:
• Contain at least 12 characters. • Contain at least 1 lowercase character. • Contain at least 1 uppercase character. • Contain at least 1 number.	• Contain special characters (e.g. !"£$%^&*)

Note:

• In low security / leisure camera installations, it is recommended you create an easy to remember password and save a copy of the password in a safe, secure and memorable location.

• If you forget your password, contact FLIR support for help with resetting your camera:

– https://maritime-support.flir.com

Important:
Resetting a lost password can only be accomplished with the aid of a FLIR support agent. This action will cause the internal user setting to be reset to the factory setting.

Configuration interface video feed

After you have logged in to the Web browser configuration interface, a live image from the camera's current video stream will be shown on-screen.

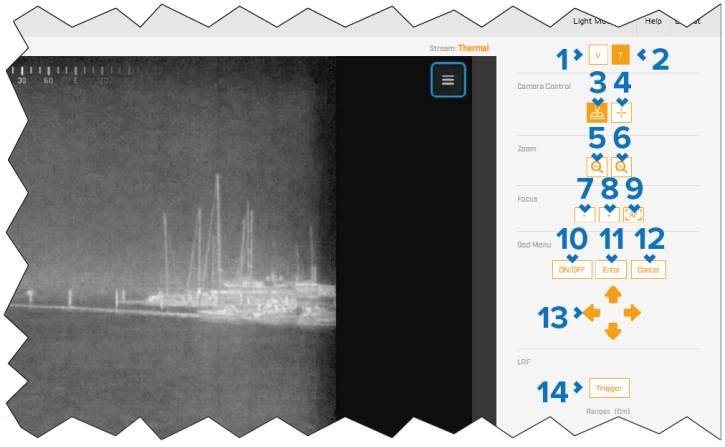
Note:
Your Web browser must support the MJPEG video codec in order for a video stream image to be displayed.

For more information on the video feed status icons and visual indicators shown, refer to:

- **p.115 — Camera status icons and visual indicators**

Configuration interface on-screen controls

While using the Web browser configuration interface, the following on-screen camera control options are available:



	Options
1	*[V (Visible)]* Select to switch to the camera's visible video feed.
2	*[T (Thermal)]* Select to switch to the camera's thermal video feed.
3	*[Joystick mode]* When enabled, selecting a position on the video feed will cause the camera to pan and tilt toward the chosen direction.
4	*[Crosshair mode]* When enabled, selecting a position on the video feed will cause the camera's field of view to re-center on the chosen location.
5	(1) *[Zoom –]* Select to increase the zoom level of the active video feed.
6	(1) *[Zoom +]* Select to decrease the zoom level of the active video feed.
7	*[Focus –]* Select to adjust the camera's focus manually.
8	*[Focus +]* Select to adjust the camera's focus manually.
9	*[Auto focus]* Select to automatically adjust the camera's focus.
10	*[ON / OFF]* Select to display / hide the OSD (On-Screen Display) menu. For more information, refer to: • **p.105 — OSD Menu and status icons**
11	*[Enter]* Select to confirm the highlighted OSD (On-Screen Display) menu option.
12	*[Cancel]* Select to return the OSD (On-Screen Display) menu to the previous screen.
13	*[Directional arrows]* Select to change the highlighted OSD (On-Screen Display) menu option.
14	(2) *[Trigger]* Select to trigger the camera's laser range finder (LRF) and measure the distance from the camera to the position located at the center of the camera's field of view.

Note:

• (1) If *[Zoom sync]* is enabled, any changes to the camera's zoom level will be synchronized across both thermal and visible-light payloads.

• (2) This option is only available for camera variants which support a laser range finder (LRF).

Configuration interface camera settings menus

You can access different camera settings menus on the left side of the Web browser configuration interface. The settings contained in these menu pages can be used to configure your camera.

- *[Video]* — Edit general video settings.
- *[Visible]* — Edit the visible-light camera settings.
- *[Thermal]* — Edit the thermal camera settings.

- *[PTZ (Pan Tilt Zoom)]* — Edit the Pan Tilt and Zoom settings and control the camera.
- *[Illumination]* — Enable or disable the camera's spotlight.
- *[Georeference]* — Edit the camera's altitude above the waterline.

Video settings

Changes to the following settings will only have an effect on the camera's primary and secondary streams, and will not impact the video feed displayed on either the Web browser configuration interface or the Web browser operation interface.

Settings	Options
[Video profile]	• *[T1]* (Primary thermal profile) • *[T2]* (Secondary thermal profile) • *[V1]* (Primary visible profile) • *[V2]* (Secondary visible profile)
[Codec]	• *[H.264]* • *[MJPEG]* • *[Baseline Profile]* • *[Main Profile]* • *[High Profile]*
[Resolution]	• *[640 x 360]* • *[854 x 480]* • *[960 x 540]* • *[1280 x 720]* • (1) *[1920 x 1080]* • (2) *[2560 x 1440]* • (2) *[2688 x 1512]* • (2) *[3840 x 2160]*
[Frame Rate]	• *[5]–[30]*
[Rate control]	• *[CBR]* • *[VBR]*
[Bit Rate (Kbps)]	• *[32]–[102400]*
[I-frame Interval]	• *[1]–[300]*
[Enable Multicast]	• *[No]* • (3) *[Yes]*
[Destination Address]	• *[Enter Value]*
[Destination Port]	• *[Enter Value]*
[TTL]	• *[Enter Value]*

Note:

• (1) This option is only available if the *[T1]*, *[V1]* or *[V2]* video profile has been selected.

• (2) This option is only available if the *[V1]* video profile has been selected.

• (3) When enabled, the Multicast setting reduces the total amount of network traffic on your system by simultaneously distributing the camera's video feed data to multiple configured devices. For more information, refer to:

– **p.66 — Multicasting**

Visible settings

Settings	Options
[E-Flip]	• *[On]* • *[Off]*
[Reverse]	• *[On]* • *[Off]*
[Freeze]	• *[On]* • *[Off]*

Settings	Options
[Picture Effect]	• *[Off]* • *[Negative Art]* • *[Black & White]*
[Contrast Adjustment]	• *[0%] –[100%]*
[Color Gain]	• *[0%] –[100%]*
[Auto Exposure Mode]	• *[Full Auto]* • *[Manual]* • *[Shutter Priority]* • *[Iris Priority]*
[Exposure Comp]	• *[On]* • *[Off]*
[Spot Auto Exposure]	• *[On]* • *[Off]*
[Slow Shutter]	• *[On]* • *[Off]*
[Backlight Compensation]	• *[On]* • *[Off]*
[Exposure]	*[0] –[14]*
[Shutter]	*[0] –[21]*
[Gain]	*[0] –[15]*
[Iris]	*[1] –[17]*
[ICR Mode (Low Light)]	• *[On]* • *[Off]* • *[Auto]*
[Wide Dynamic Range Mode]	• *[Off]* • *[On]* • *[Visibility Enhancer On]*

Settings	Options
[Display Brightness]	• *[0] –[6]*
[Brightness Compensation]	• *[Very Dark]* • *[Dark]* • *[Standard]* • *[Bright]*
[Compensation Level]	• *[Low]* • *[Mid]* • *[High]*
[White Balance Mode]	• *[Auto]* • *[Outdoor]* • *[Indoor]* • *[One Push]* • *[ATW]* • *[Manual]*
[Defog]	• *[Off]* • *[Low]* • *[Mid]* • *[High]*
[Lens]	• *[Manual]* • *[Auto]*
[Focus %]	• *[0%] –[100%]*
[Autofocus Mode]	• *[Normal]* • *[Interval]* • *[Zoom Trigger]*
[Autofocus Sensitivity]	• *[Normal]* • *[Low]*
[Focus Rate]	• *[0] –[100]*

Settings	Options
[Zoom Rate]	• *[0] –[100]*
[Initialize Lens]	• *[Select]*
[Focus to Infinity]	• *[Select]*
[Autofocus Push]	• *[Select]*
[Aperture — High Sensitivity]	• *[On]* • *[Off]*
[Aperture control]	• *[0] –[15]*
[Noise Reduction]	• *[Off]* • *[1]* • *[2]* • *[3]* • *[4]* • *[5]* • *[2D NR/3D NR]*
[Gamma Mode]	• *[Standard]* • *[Straight]*
[Offset]	• *[0] –[100]*
[Ezoom]	• *[On]* • *[Off]*
[Input LVDS Mode]	• *[Enter value]*
[Input Output Mode]	• *[Enter value]*
[Input HD Mode]	• *[Enter value]*
[Input Resolution]	• *[Enter value]*
[Input Frame Rate]	• *[Enter value]*

Thermal settings

Settings	Options
[AGC ROI]	• *[Custom]* • *[Full Screen]* • *[Horizon]* • *[Sky]* • *[Ground]* • *[Centre 75]* • *[Centre 50]* • *[Centre 25]*
[Brightness]	• *[0] –[100]*
[Contrast]	• *[0] –[100]*
[Sharpness]	• *[0] –[8]*
[AGC Filter]	• *[0] –[100]*
[Tail Rejection]	• *[0] –[49]*
[Plateau Value]	• *[1] –[100]*
[Linear Percent]	• *[1] –[100]*
[Detail Headroom]	• *[0] –[127]*
[Smoothing Factor]	• *[0] –[8191]*
[Information-Based Mode]	• *[On]* • *[Off]*

Settings	Options
[Colorization]	• *[WhiteHot]* • *[BlackHot]* • *[RedHot]* • *[RedHot Inverse]* • *[Fusion]* • *[Fusion Inverse]* • *[Firelce]* • *[Firelce Inverse]*
[Blend Mode]	• *[Off]* • *[CTV]* • *[MSX]* • *[0] –[100]*
[Blending Registration Offset:] • *[X]* • *[Y]* • *[Width]* • *[Height]*	• *[–32] –[32]*
[FFC]	• *[Manual]* • *[Auto]* • *[Ext.]*
[FFC Period (Seconds)]	• *[Enter Value]* • *[Apply]*

Settings	Options
[Temp Change (0.1 °C)]	• *[Enter Value]* • *[Apply]*
[FFC Integration Period (Frames)]	• *[2]* • *[4]* • *[8]* • *[16]* • *[Perform FFC]*

PTZ settings

Settings	Options
[Pan / Tilt]	• *[Tilt up]* • *[Tilt down]* • *[Pan left]* • *[Pan right]*
[Speed]	• *[1] –[10]*
[Pilot Mode]	• *[Yes]* • *[No]*
[Zoom]	• *[Zoom out]* • *[Zoom in]*
[Sync Visible Zoom]	• *[Enabled]* • *[Disabled]*
[Home Position]	• *[Go to]* • *[Set]*
[Park Position]	• *[Go to]* • *[Set]*
[Preset Position]	• *[Select Position]*
[Set Preset]	• *[Select]*

Settings	Options
[Startup Mode]	• *[None]* • *[Home Position]* • *[Park]* • *[Autoscan]* • *[Track Scan]*
[Stabilization]	• *[On]* • *[Off]*
[Horizontal Stabilization]	• *[On]* • *[Off]*
[Ball-Down]	• *[On]* • *[Off]*
[Forward Position]	• *[Set]*
[Relative Auto Scan — Width]	• *[Narrow]* • *[Medium]* • *[Wide]*
[Relative Auto Scan — Speed]	• *[Low]* • *[Medium]* • *[High]*
[Relative Auto Scan]	• *[Save]* • *[Start]* • *[Stop]*

Illumination settings

Settings	Options
[State]	• *[On]* • *[Off]*

Georeference settings

Settings	Options
[Altitude (Meters)]	• *[Enter Value]*
[Apply]	• *[Select]*

System settings

You can access advanced camera settings and diagnostic information by selecting the *[System Settings]* menu located at the bottom of the screen.

Once selected, the following submenus will be displayed on-screen:

- *[Network]*
- *[Date & Time]*
- *[Users]*
- *[JCU]*
- *[Temperature]*
- *[ONVIF]*
- *[Video Outputs]*
- *[Geotracking]*
- *[Firmware & Info]*

15.2 Web browser operation interface overview

The Web browser operation interface is used to view the camera's live video feed and control the camera.

The following camera control options and settings are available via the Web browser operation interface:

Available controls	Available settings
• Pan, tilt, zoom (PTZ) controls (includes *[Azimuth compass]* and *[Virtual joystick]* controls) • (1) Laser range finder (LRF) distance measurement • Home / Park positions • Surveillance mode • Spotlight toggle • Target classifier object tracking • NMEA 0183 radar tracking • On-Screen display (OSD) menu controls	• Quick adjustment mode settings • On-Screen display (OSD) menu settings

Note:
(1) This option is only available for camera variants which support a laser range finder (LRF).

For more information on how to discover the camera's IP address and access the camera's Web browser user interfaces, refer to:

- **p.83 — IP address discovery**

Operation interface video feed

When you access the camera's Web browser **operation** interface, a live image from the camera's current video stream will be shown on-screen.

Note:
When accessing the camera's Web browser **operation** interface (i.e. by specifying a '/live' suffix after the camera's IP address in the browser's address bar), your Web browser must support the H.264 video codec in order for a video stream image to be displayed.

The video feed can be directly interacted with to perform the following basic actions:

Input	Action
Left click:	Performs a select action; e.g. used to initiate an option.
Right click:	Displays a camera control options menu related to the position selected within the camera's field of view. For more information, refer to: • **Position selection**
Left click and hold:	Displays a virtual joystick controller. For more information, refer to: • **Camera virtual joystick controller**
Double left click:	Re-centres the camera's field of view at the position selected.

Input	Action
Scroll wheel up:	(1) Increases the zoom level of the active video feed.
Scroll wheel down:	(1) Decreases the zoom level of the active video feed.

Note:
(1) If *[Lock zoom]* is enabled, any changes to the camera's zoom level will be synchronized across both thermal and visible-light payloads.

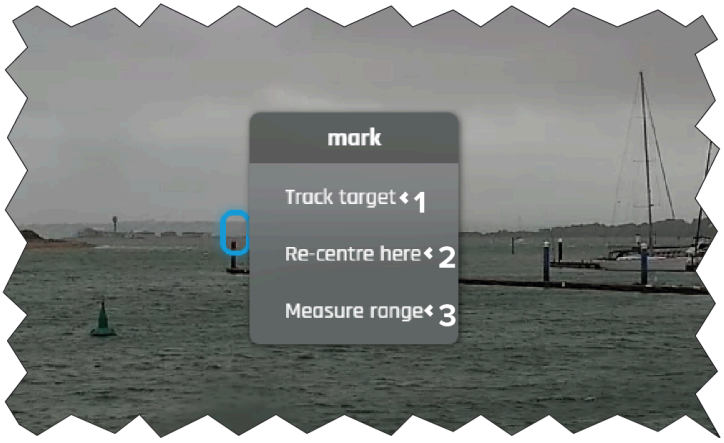
For more information on the video feed status icons and visual indicators shown, refer to:

- **p.115 — Camera status icons and visual indicators**

Position selection

A position within the camera's field of view can be selected on the video feed to display additional camera control options.

The following options menu will appear once a position has been selected:



	Options
1	(1) *[Track target]* Tracks the position of an object detected by the camera's target classifier tracking system. For more information, refer to: • **p.117 — Target classifier tracking**
2	*[Re-centre here]* Re-centres the camera's field of view on the selected position.
3	(2) *[Measure range]* Measures the distance from the camera to the selected position.

Note:

- (1) This option is only available if an object detected by the camera's target classifier tracking system is selected.
- (2) This option is only available for camera variants which support a laser range finder (LRF).

Operation interface on-screen controls

When using the Web browser operation interface to view the camera's video feed and control the camera, the following on-screen control options are available:

	Options
1	*[Spotlight]* Select to enable / disable the camera's spotlight.
2	*[Home]* Select to move the camera to the home position. For more information, refer to: • **Home position**
3	*[OSD Menu]* Select to display the OSD (On-Screen Display) menu. For more information, refer to: • **p.106 — OSD Menu**
4	*[Quick adjustment]* Select to display additional on-screen camera control options and settings. For more information, refer to: • **Quick adjustment mode**
5	*[Active feed switch]* Select to switch between the camera's thermal and visible video feeds.
6	*[Azimuth (3D)]* Select to display an interactive *[Azimuth compass]*, which can be used to pan the camera. For more information, refer to: • **Azimuth compass**
7	(1) *[Zoom –]* Select to increase the zoom level of the active video feed.
8	(1) *[Zoom +]* Select to decrease the zoom level of the active video feed.

Note:
(1) If *[Zoom sync]* is enabled, any changes to the camera's zoom level will be synchronized across both thermal and visible-light payloads.

Home position

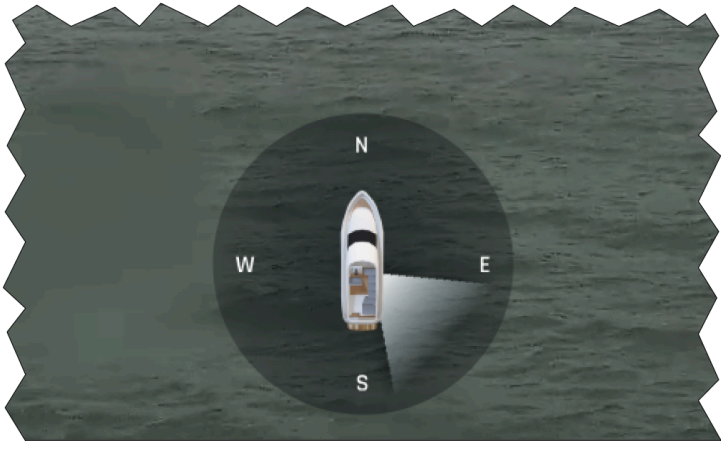
The home position is a configurable camera position.

The home position usually defines a useful reference point — for example, a view outward from the vessel's beam or aft position.

When initiated, the camera will move to the configured home position while the following is displayed on-screen:

Azimuth compass

The *[Azimuth (3D)]* indicator can be selected on the video feed to display an interactive *[Azimuth compass]*.

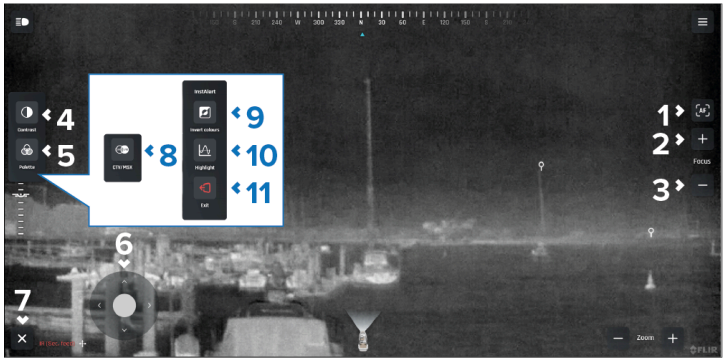


Once displayed, you can select a point (or direction) within the surrounding compass to pan the camera toward the corresponding location.

The *[Azimuth compass]* can be dismissed by tapping outside of the compass area, or will automatically self-dismiss after 10 seconds of inactivity.

Quick adjustment mode

The *[Quick adjustment]* mode enables you to access several additional on-screen controls.



Once selected, the following control options will be displayed:

	Option
1	*[Auto focus]* Select to automatically adjust the camera's focus.
2	*[Focus +]* Select to adjust the camera's focus manually.
3	*[Focus –]* Select to adjust the camera's focus manually.
4	*[Contrast]* Select to change the thermal video feed contrast level.
5	*[Palette]* Select to cycle between color palettes on the thermal video feed. For more information, refer to: • **Camera virtual joystick controller**
6	*[Virtual joystick]* Select to display a virtual joystick controller onscreen. For more information, refer to: • **Camera virtual joystick controller**
7	*[Quick adjustment]* Select to exit the *[Quick adjustment]* mode.

The following additional control options will be displayed if the *[CTV]* or *[MSX]* image blending mode is enabled. For more information, refer to: **Camera virtual joystick controller**

	Option
8	*[CTV / MSX]* Select to display the *[Blending level]* adjustable slider onscreen and an option to toggle between *[CTV]* and *[MSX]* blending modes.

The following additional control options will be displayed if the *[InstAlert]* thermal imaging mode is enabled. For more information, refer to: **InstAlert mode**

	Option
9	*[Invert colours]* Select to invert the polarity of the camera's thermal color palette. **Note:** This will not affect objects which are highlighted by the *[InstAlert]* setting.
10	*[Highlight]* Select to display the *[Highlight setting]* adjustable slider onscreen.
11	*[Exit]* Select to exit the *[InstAlert]* thermal imaging mode.

Camera thermal color palettes

A range of thermal color palettes are available to help you distinguish objects on-screen in different conditions.

The following thermal color palette options can be accessed by navigating to *[Quick adjustment > Palette]* via the camera's Web browser operation interface:

- *[Greyscale]*
- *[Fusion]*
- *[FireIce]*

By default, the camera's thermal color palette is set to *[Greyscale]*, which may improve your night vision.

Camera inverted thermal color palettes

You can invert the polarity of the camera's thermal color palette to change the appearance of objects on-screen.

The following inverted thermal color palettes can be accessed by navigating to *[Quick adjustment > Palette > Invert colours]* via the camera's Web browser operation interface:

- *[Greyscale Inverse]*
- *[Fusion Inverse]*
- *[Firelce Inverse]*

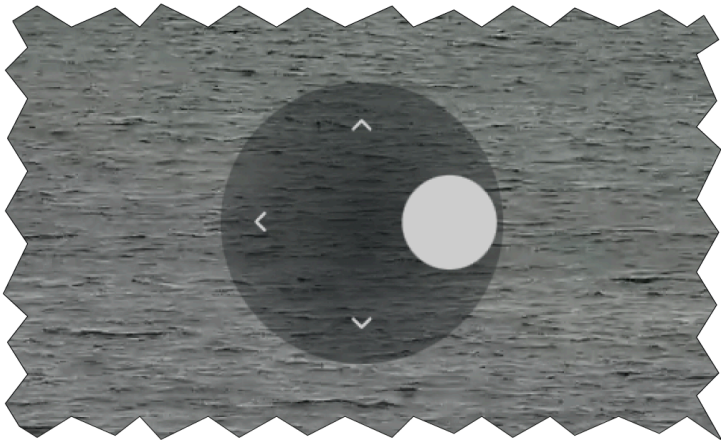
You may find it beneficial to experiment with the different options available to discover which setting is best suited for different environmental conditions.

Camera virtual joystick controller

The camera can be optionally panned and tilted using the on-screen *[Virtual joystick]* controller.

The *[Virtual joystick]* controller can be accessed by:

- Select and holding a position on the video feed, OR;
- Enabling the *[Quick adjustment]* mode.



With the *[Virtual joystick]* controller displayed on-screen, the camera can be moved by dragging the joystick across the surrounding pad or by selecting a position on the pad itself.

When performing a continuous movement, the speed of the camera's pan / tilt action is determined by how far the joystick is located from the center of the pad (the closer / further the joystick is located with respect to the center of the pad, the slower / faster the camera's movement).

CHAPTER 16: CAMERA OPERATION VIA JCU

CHAPTER CONTENTS

16.1 Compatible joystick controllers (JCU)

A Joystick Control Unit (JCU) is available to purchase as an optional accessory. With the JCU connected to the camera via a network switch, you can use the JCU's physical controls to control the camera remotely.

The camera's OSD (On-Screen Display) menu can also be accessed and further controlled using a connected JCU. For more information on the OSD menu options available, refer to:

- **p.105 — OSD Menu and status icons**

JCU-4

JCU variant	Documentation
• JCU-4 (E70695 / E70697)	www.bit.ly/jcu4-docs

CHAPTER 17: CAMERA OPERATION VIA MFD / CHARTPLOTTER

CHAPTER CONTENTS

17.1 Compatible MFDs / chartplotters

Some multifunction displays (MFDs) / chartplotters may support camera control options via an ONVIF (Profile S)-compatible video / camera application. The range of control options available is dependent on the support that the MFD / chartplotter manufacturer has implemented for the dedicated video / camera application. Refer to the MFD / chartplotter manufacturer for information on whether your display is compatible with the camera.

The image streamed via the camera's RayNet (Ethernet) connector can also be viewed on any MFD / chartplotter featuring a Web browser. The on-screen controls displayed in the Web browser will enable you to perform camera control operations from your MFD / chartplotter, including pan / tilt functions and setting menu changes. For more information, refer to:

- **p.87 — Camera configuration and operation via Web browser**

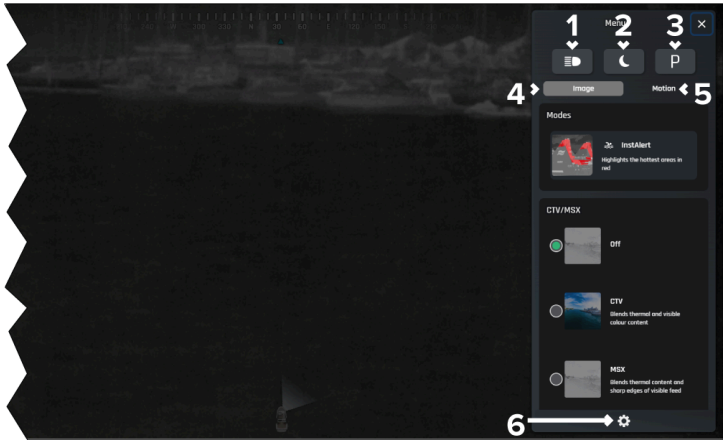
Note:
It is recommended that you use a dedicated video / camera application in order to avoid Web browser session expiration.

CHAPTER 18: OSD MENU AND STATUS ICONS

CHAPTER CONTENTS

18.1 OSD Menu

You can access the camera's OSD (On-Screen Display) Menu using either the Web browser configuration interface, the Web browser operation interface, or a compatible Joystick Control Unit. The menu will be overlaid on the camera's live video feed.



From the *[OSD menu]*, the following options are available:

	Options
1	*[Spotlight]* Select to enable / disable the camera's spotlight.
2	*[Night]* Select to change the on-screen color scheme to *[Night]* mode. For more information, refer to: • **p.106 — Night mode**
3	*[Park]* Select to command the camera to the park position. For more information, refer to: • **p.107 — Park position**
4	(1)*[Image]* Select to display additional on-screen functions related to the camera's image. For more information, refer to: • **p.107 — Image tab**
5	*[Motion]* Select to display additional on-screen functions related to the camera's motion. For more information, refer to: • **p.108 — Motion tab**
6	*[Settings]* Select to display configurable camera settings. For more information, refer to: • **p.109 — OSD Settings**

Note:
(1) This menu is only accessible if the thermal video feed is active.

Night mode

The camera's interface can be changed to a red color palette intended for night time use by selecting the *[Night]* mode icon.

OSD (On-Screen Display) Menu:

Night mode enabled	Night mode disabled
	

Video feed:

Night mode enabled	Night mode disabled
	

Important:
If you are using the *[Night]* mode color palette at night, be aware that your vision may be compromised when either disabling the *[Night]* mode or switching to a display screen with a higher level of brightness.

Note:
When enabled, the *[Night]* mode color palette is applied globally to all compatible devices on the network.

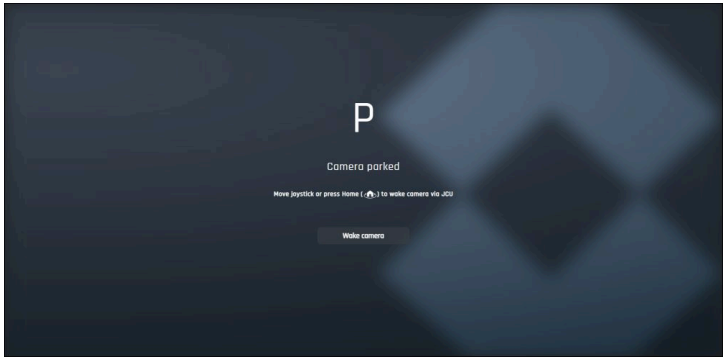
Park position

The park position is a fixed camera position.

When activated, the camera will move to the fixed park position and the camera's video feeds will be temporarily disabled until activity is resumed.

The camera's heater / (M560-Series only) cooler will continue to run while in the park position, so that the camera is ready for use once activity is resumed.

When the camera is parked, the following will be displayed on-screen:



Camera activity can be resumed by selecting the *[Wake camera]* on-screen option, moving the joystick of a compatible JCU or by commanding the camera to the home position.

Image tab

Thermal imaging modes

Thermal imaging modes create a colorized version of the camera's scene which only highlights areas according to a set temperature threshold.

The camera supports the *[InstAlert]* thermal imaging mode, which can be used to assist in MOB (Man OverBoard) situations. For more information, refer to:

- **InstAlert mode**

Warning: Thermal property variance

When relying on temperature readouts and the colorization of certain targets provided by thermal imaging functions, be aware that the varying thermal properties of target surfaces and atmospheric conditions may cause spurious results.

InstAlert mode

[InstAlert] mode assists in marine Man OverBoard (MOB) situations, where it is beneficial to understand which locations are warmer than the surrounding sea-water (e.g. indicating the presence of a Man OverBoard (MOB)).

Depending on the set temperature threshold, areas within the camera's scene will be highlighted according to the following criteria:

Measured temperature	Color
At or above the temperature threshold:	Red
Below the temperature threshold:	Greyscale

InstAlert highlight setting

Once the *[InstAlert]* thermal imaging mode has been enabled, a *[Highlight setting]* option is available via the OSD (On-Screen Display) menu (accessible from the *[Image]* tab, or the video feed *[Quick adjust]* on-screen control option).

Selecting the *[Highlight setting]* option allows you to adjust the corresponding thermal imaging mode temperature threshold via an adjustable slider displayed on the video feed.

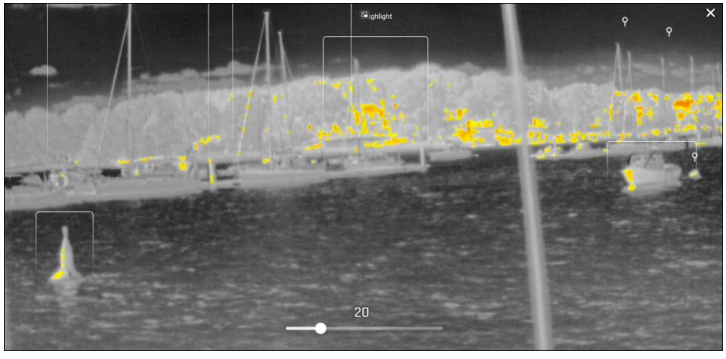


Image blending modes

Different image blending modes can be enabled to create a live image which combines visual elements from both the thermal and visible-light video feeds.

The following image blending modes are supported by the camera:

- **Multi-Spectral Dynamic Imaging (MSX)**
- **Color Thermal Vision (CTV)**

Multi-Spectral Dynamic Imaging (MSX)

Multi-Spectral Dynamic Imaging (MSX) superimposes details (e.g. outlines, words, numbers and other high-contrast edges) in real time from the visible-light video feed onto the thermal video feed for a sharper visual image.

Color Thermal Vision (CTV)

Color Thermal Vision (CTV) blends the thermal and visible-light video feeds together to enhance your ability to identify buoys, vessels and other targets at night.

MSX / CTV blending level

Once either the *[MSX]* or *[CTV]* image blending mode has been enabled, a *[Blending level]* option is available via the OSD (On-Screen Display) menu (accessible from the *[Image]* tab, or the video feed *[Quick adjust]* on-screen control option).

Selecting the *[Blending level]* option allows you to adjust the intensity of the enabled image blending mode, via an adjustable slider displayed on the video feed.

Motion tab

Surveillance scan mode

[Surveillance scan] mode causes the camera to continuously pan left and right, automatically scanning the scene.

Once the *[Surveillance scan]* mode has been enabled, the camera will continue to scan until you:

- Disable the *[Surveillance scan]* mode.
- Manually pan or tilt the camera.
- Command the camera to move to the home or park position.
- Initiate a tracking mode.

Scan width and scan speed

When using the *[Surveillance scan]* mode, the total area which is scanned by the camera is commonly referred to as the **scan width**, while the time it takes for the camera to pan from one side of the scanned area to the other is referred to as the **scan speed**.

The *[Surveillance scan]* mode's associated *[Scan width]* and *[Scan speed]* settings can be adjusted using the sliders shown via the OSD (On-screen Display) menu *[Motion]* tab.

Stabilization mode

The *[Stabilization]* mode is intended to minimize the effects of vessel pitch and roll on the camera's aimed angle, while allowing the effects of **intentional** yaw on the camera's aimed angle.

This means that the camera will continue to aim at an elevation and horizontal rotation regardless of any motion, but will vary its azimuth to match the vessel's heading while rejecting small, unintentional, or cyclical variations in the vessel yaw (e.g. caused by the effects of sea state and swell).

NMEA tracking

For more information on the camera's supported NMEA features and how to enable them, refer to:

- **p.120 — NMEA radar tracking**

18.2 OSD Settings

You can access the following advanced camera setting and product information menus via the OSD (On-Screen Display) *[Settings]* menu: *[OSD Menu > Settings]*

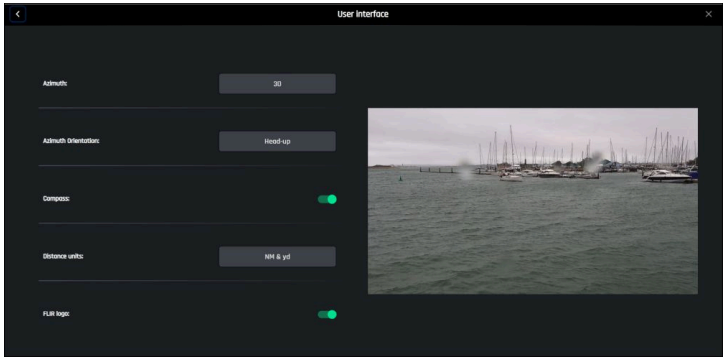
1. *[User interface]*
2. *[Camera]*
3. *[Image]*
4. *[Object detection & tracking]*
5. *[Calibration]*
6. *[About]*

Note:
Setting changes will only be applied to the camera which you are actively controlling. Each camera on your network must be configured separately.

User interface settings

The *[User interface]* menu includes settings which enable you to customize which visual indicators are shown on-screen, their appearance, and also the camera's distance measurement unit preferences.

The following settings can be accessed from the *[User interface]* menu:



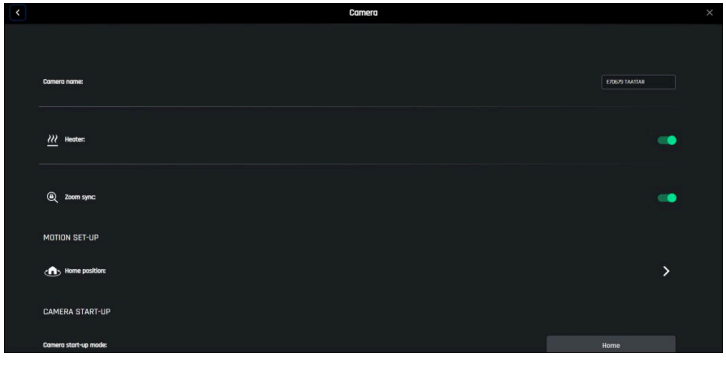
Setting	Description
[Azimuth]	Select to change the appearance of the azimuth visual indicator, which indicates the direction of the camera *relative to the vessel*. The following options are available: • *[3D]* • *[Classic]* For more information, refer to: • **p.115 — Camera status icons and visual indicators**
[Azimuth orientation]	Select to change the orientation of the on-screen azimuth visual indicator, which indicates the direction of the camera *relative to the vessel*. The following options are available: • *[Head-up]* — An on-screen icon representing the vessel and the camera's orientation, *relative to the vessel's heading*, will be overlaid onto the camera image. The *[Head-up]* setting displays an icon depicting the vessel's position as **static** (i.e. maintaining a *head-up* orientation), while an *outward triangle* (representing the orientation of the camera) rotates around the vessel, showing the camera's orientation, relative to the vessel's heading. • *[View-up]* — An on-screen icon representing the vessel and the camera's orientation, *relative to the vessel*, will be overlaid onto the camera image. The *[View-up]* setting displays an icon depicting the vessel's position as **dynamic** (i.e. changing direction as the vessel's heading changes), while an *outward triangle* (representing the orientation of the camera) remains static (i.e. maintaining a *view-up* orientation at all times), even while the vessel is underway and regardless of the vessel's heading.

Setting	Description
[Compass]	Select to enable or disable the *[Compass bar]* visual indicator. For more information, refer to: • **p.115 — Camera status icons and visual indicators**
[Distance units]	Select to change the unit of measurement used for displaying distance values on the camera's user interface. The following options are available: • *[NM & yd]* — Nautical Miles and Yards • *[NM & ft]* — Nautical Miles and Feet • *[NM & m]* — Nautical Miles and Meters • *[mi & ft]* — Statute Miles and Feet • *[km & m]* — Kilometers and Meters
[FLIR logo]	Select to enable or disable the FLIR logo displayed at the bottom right of the camera's video feed.

Camera settings

The *[Camera]* menu contains settings related to several core camera functions.

The following settings can be accessed from the *[Camera]* menu:



Setting	Description
[Camera name]	Select to rename the camera. By default, the camera is named according to the product name and serial number (e.g. M460 / M560-Series 123456). The camera's name will revert to its factory default setting if the *[Camera name]* field is empty.
[Heater]	Select to enable or disable the camera's heater.
[Zoom sync]	Select to enable or disable zoom synchronization between the camera's thermal and visible-light payloads. If enabled, changes to the camera's thermal payload magnification will also apply to the visible-light payload — and vice versa.
[Home position]	Select to set a new camera home position. For more information, refer to: • **Setting the home position**
[Camera start-up mode]	Select to set a specific function that the camera will initiate after each power-up. The following options are available: • *[None]* — Normal operation. • *[Home]* — The camera will move to the home position. • *[Park]* — The camera will move to the park position. • *[Surveillance scan]* — The camera will initiate a surveillance scan. For more information, refer to: **Surveillance scan mode** • *[Radar target tracking]* — The camera will initiate NMEA Radar target tracking (TTM), if a Radar target is present.

Setting	Description
[Restart camera]	Select to restart the camera.
[Reset to factory defaults]	Select to reset the camera's settings to the factory default settings. If you are experiencing problems with the camera which cannot be resolved using the troubleshooting advice provided, you may need to perform a reset. Once selected, all camera configuration settings will revert to the default factory settings, and the camera will restart.

Home position

The home position is a configurable camera position.

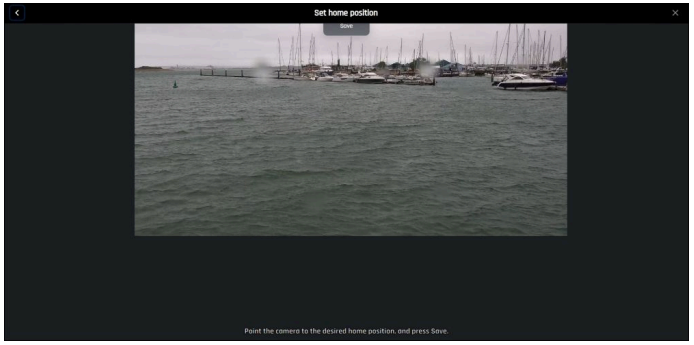
The home position usually defines a useful reference point — for example, a view outward from the vessel's beam or aft position.

When initiated, the camera will move to the configured home position while the following is displayed on-screen:

Setting the home position

The following steps detail how to set a new camera home position via the OSD (On-Screen Display) menu.

1. Navigate to: *[OSD Menu > Settings > Camera > Home position]*.
   Once the *[Home position]* option has been selected, the following screen will be displayed:

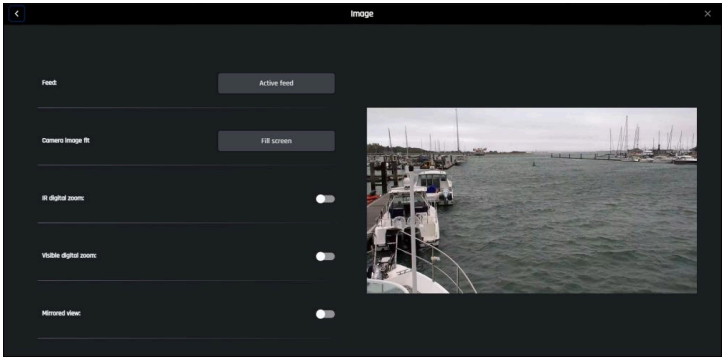


2. Pan / tilt the camera to your desired new position.
3. Select the *[Save]* option to confirm.

Image settings

The *[Image]* menu contains settings which enable you to change whether the thermal or visible-light video feed is displayed, and how the camera's video image is displayed on-screen.

The following settings can be accessed from the *[Image]* menu:

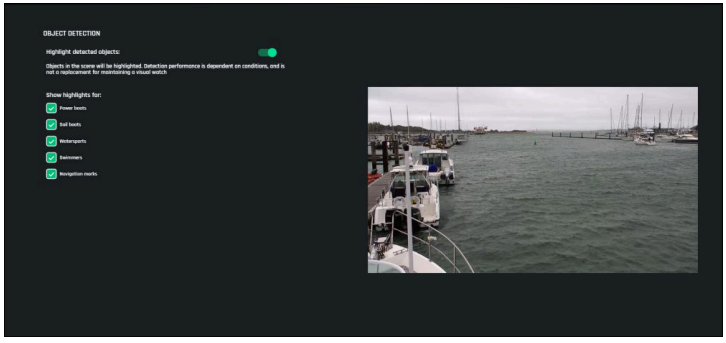


Setting	Description
[Feed]	Select to change the active camera video feed. The following options are available: • *[Active feed]* — This option is only accessible if a compatible joystick control unit (JCU) is connected to the camera network. Select to display the active video feed. • *[Secondary feed]* — This option is only accessible if a compatible joystick control unit (JCU) is connected to the camera network. Select to display the secondary video feed. • *[Visible]* — Select to display a fixed visible-light camera video feed. If enabled, an *[Active feed switch]* option will be accessible from the camera's Web browser operation interface. For more information, refer to: – **p.97 — Operation interface on-screen controls** • *[IR]* — Select to display a fixed thermal camera video feed. If enabled, an *[Active feed switch]* option will be accessible from the camera's Web browser operation interface. For more information, refer to: – **p.97 — Operation interface on-screen controls**
[Camera image fit]	Select to change how the camera's video feed image is displayed on-screen. The following options are available: • *[Fit to screen]* • *[Fill screen]*
[IR digital zoom]	Select to enable or disable the ability to digitally zoom the camera's thermal video feed. Digital payload zooming will commence after the payload's maximum optical magnification has been reached.
[Visible digital zoom]	Select to enable or disable the ability to digitally zoom the camera's visible-light video feed. Digital payload zooming will commence after the payload's maximum optical magnification has been reached.
[Mirrored view]	Select to enable or disable video feed image mirroring. When enabled, the camera's video feed image will be reversed.
[E-stabilization]	Select to enable or disable electronic stabilization. When enabled, image processing will compensate for camera vibration by creating a slight image degradation near the edge of the frame — causing the centered image to appear more stable.
[Low light mode]	Select to change if and when the camera's low light mode is activated. The following options are available: • *[Auto]* • *[On]* • *[Off]*
[Wide dynamic range]	Select to enable or disable wide dynamic range. When enabled, image processing will provide a clearer, more detailed image in high-contrast or backlit environments, by enhancing shadows and blown-out highlights in accordance with the intensity difference.
[Defog mode]	Select to enable or disable defog mode for the camera lens.

Object detection and tracking settings

The *[Object detection and tracking]* menu contains settings which change the range of on-screen visual information provided by the camera's target classifier tracking system.

The following settings can be accessed from the *[Object detection and tracking]* menu:

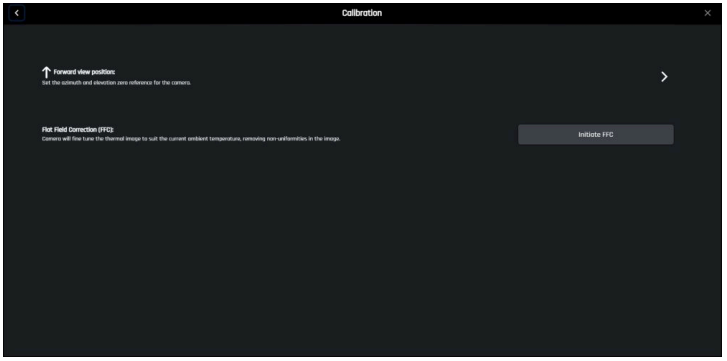


Setting	Description
[Highlight detected objects]	Select to enable or disable the highlighting of objects detected by the camera's target classifier tracking system.
[Show highlights for]	This setting is only available if the *[Highlight detected objects]* setting is set to *[Enabled]*. Select to toggle which categories of detected objects are highlighted by the camera's target classifier tracking system. The following options are available: • *[Power boats]* • *[Sail boats]* • *[Watersports]* • *[Swimmers]* • *[Navigation marks]*

Calibration

The *[Calibration]* menu contains settings which enable you to recalibrate the camera if required.

The following settings can be accessed from the *[Calibration]* menu:



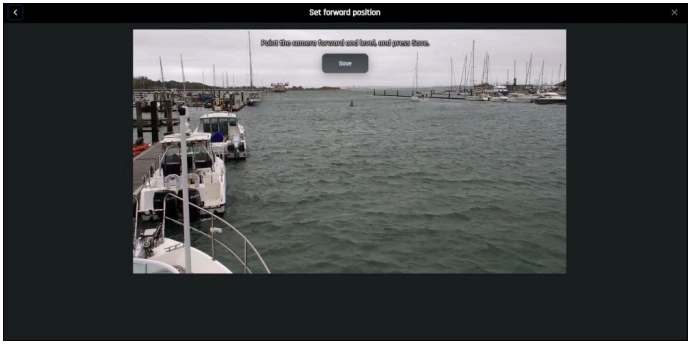
Setting	Description
[Forward view position]	Select to access the *[Set forward position]* page. For more information, refer to: **Setting the forward position**
[Initiate FFC]	Select to initiate Flat Field Correction (FFC).

Setting the forward position

The following steps detail how to set a new camera forward position via the OSD (On-Screen Display) menu.

1. Navigate to: *[OSD Menu > OSD Settings > Calibration > Forward view position]*.

   Once the *[Forward view position]* option has been selected, the following screen will be displayed:



2. Pan / tilt the camera to your desired new position.
3. Select the *[Save]* option to confirm.

About this device

The *[About]* menu contains additional information related to the camera unit which you are currently operating.

The following information can be found from the *[About]* menu:

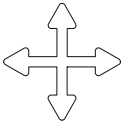
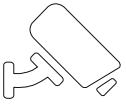
Item	Description
[Camera name]	Provides a description of the camera's name, as defined via the *[Camera]* settings menu. For more information, refer to: • **p.111 — System settings**
[Camera model]	Provides a description of the camera's model.
[Product ID]	Provides a description of the camera's product ID number.
[Serial number]	Provides a description of the camera's serial number.
[PCB Serial number]	Provides a description of the camera's PCB serial number.
[Software version]	Provides a description of the camera's current software version number.
[Camera uptime]	Provides a description of the camera's uptime during this operation session.
[Operating hours]	Provides a description of the camera's total operating hours across all operation sessions.

18.3 Camera status icons and visual indicators

The camera image includes various overlaid status icons and visual indicators which reflect the current state of the camera.

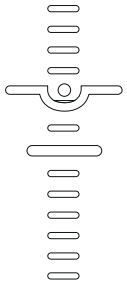
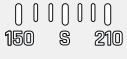
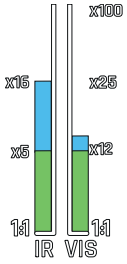
Status icons:

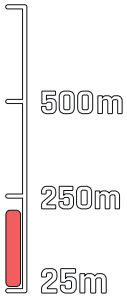
Status icons can be monitored via the status area located at the bottom-left of the video feed.

Icon	Description
	*[IR Feed]* Indicates that the currently displayed video feed is produced by the camera's IR (thermal) sensor.
	*[VIS Feed]* Indicates that the currently displayed video feed is produced by the camera's visible-light sensor.
	Indicates that camera stabilization is active. For more information, refer to: • **Stabilization mode**
[InstAlert ON] 	*[Stabilization ON]* Indicates that the camera's *[InstAlert]* thermal imaging mode is active. For more information, refer to: • **InstAlert mode**
	*[Surveillance ON]* Indicates that the camera's *[Surveillance]* mode is active. For more information, refer to: • **Surveillance scan mode**
	*[NMEA tracking — Radar target]* Indicates that Radar target (TTM) tracking is active. For more information, refer to: • **p.121 — NMEA tracking — Radar target (TTM)**

Visual indicators:

Visual indicators can be monitored along the edges of the video feed.

Indicator	Description
	*[Elevation (Tilt)]* Indicates the vertical tilt of the camera. The triangle shows the approximate camera position.
	*[Compass bar]* Indicates the camera's bearing.
	*[Azimuth (Classic)]* Indicates both the azimuth (or direction) of the camera *relative to the vessel*, and the elevation (or vertical tilt) of the camera. The outward triangle represents the camera's approximate Field of View (FoV).
	*[Azimuth (3D)]* Indicates the azimuth (or direction) of the camera *relative to the vessel*. The outward triangle represents the camera's approximate Field of View (FoV).
	*[Zoom scale]* Indicates the zoom level of the active video feed.

Indicator	Description
	*[Zoom sync]* Indicates that both the thermal and visible-light video feed zoom levels are synchronized.
	*[Focus scale]* Indicates the focus level of the active video feed.

CHAPTER 19: TARGET CLASSIFIER TRACKING

CHAPTER CONTENTS

19.1 Target classifier tracking system

The camera supports a target classifier tracking system, which uses CNNs (Convolutional Neural Networks) in conjunction with other advanced algorithms to provide object detection, classification and tracking.

Important:
The target classifier tracking system performance is dependent on variable conditions (e.g. environmental weather, object shape and object orientation), and is NOT a replacement for maintaining an objective visual watch, at all times.

19.2 Target classifier object detection

The target classifier tracking system is able to detect the following object categories within the camera's field of view:

- *[Power boats]*
- *[Sail boats]*
- *[Water sports]*
- *[Swimmers]*
- *[Navigation marks]*

Objects detected by the target classifier tracking system will be automatically highlighted with a surrounding frame if the *[Highlight detected objects]* camera setting is enabled:

The surrounding frame for each object category can be independently enabled or disabled. For more information, refer to:

- **p.114 — Object detection and tracking settings**

19.3 Target classifier object tracking

Tracking methods for objects detected by the camera's target classifier tracking system.

Web browser operation interface:

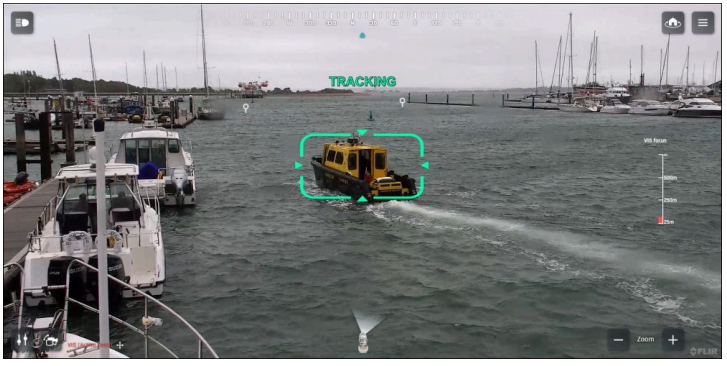
- By selecting the detected object on the camera's live video feed, then choosing *[Track target]* via the menu displayed on-screen.

JCU-4:

- By pressing the JCU-4's *[Video tracking]* button to enter the camera and JCU-4 into *[Ready to Track]* mode. Once *[Ready to Track]* mode is enabled, a crosshair will be displayed on the camera's live video feed. The crosshair can be moved to highlight a detected object using:
  - The JCU-4's joystick. OR;
  - The JCU-4's *[Previous]* and *[Next]* softkey buttons to cycle the crosshair's position between detected objects.

  Once the detected object that you wish to track is highlighted, press the JCU-4's *[Video track]* button or *[TRACK]* softkey button to initiate target tracking.

The following message will be displayed on the camera's video feed once target tracking has been initiated:



While target tracking is active, the camera will automatically move to ensure that the target is always positioned within the center of its field of view.

19.4 Cancelling target tracking

Target tracking via the camera's target classifier tracking system can be canceled at any time using one of the following methods.

Web browser configuration interface:

- By pan / tilting the camera.

Web browser operation interface:

- By pan / tilting the camera.
- By selecting the tracked target on the camera's live video feed, then choosing *[Stop tracking]* via the menu displayed on-screen.

JCU-4:

- By pan / tilting the camera.
- By pressing the JCU-4's *[Back]* button.
- By pressing the JCU-4's *[Cancel]* softkey button.

CHAPTER 20: NMEA RADAR TRACKING

CHAPTER CONTENTS

20.1 NMEA overview

The NMEA interface allows the camera to communicate with radar, GPS, or other third-party devices using the National Marine Electronics Association (NMEA) 0183 or 2000 protocol. NMEA 0183 and NMEA 2000 are combined electrical and data specifications for communication between marine electronic devices.

- For information on the NMEA 0183 sentences which are supported by the camera, refer to:
  - **p.149 — Supported NMEA 0183 sentences**
- For information on the NMEA 2000 PGNs which are supported by the camera, refer to:
  - **p.149 — Supported NMEA 2000 PGNs**
- For additional information regarding the NMEA 0183 and NMEA 2000 protocols, refer to:
  - https://www.nmea.org

When it receives valid NMEA 0183 sentences from connected devices, the camera can automatically point itself towards vessels and other objects in its field of view, and track their movement.

Important:
In order for NMEA features to work correctly, the camera's altitude above the waterline must be set via the camera's Web browser configuration interface. For more information, refer to:

- **p.87 — Camera configuration and operation via Web browser**

20.2 NMEA tracking — Radar target (TTM)

The camera can use radar target tracking (also known as "slew to cue") to point itself toward a selected target on your Radar display, using the NMEA 0183 *Tracked Target Message* (**TTM**) sentence / NMEA 2000 *Tracked Target Data* (128520) PGN.

Multiple radar targets can be tracked. Once targets are selected, the camera will automatically pan to "track" each target sequentially. In this scenario, the camera will remain "locked-on" to each target for approximately 10 seconds, before moving to the next target. Due to the way that Radar operates, it is possible to lose a target momentarily. To ensure that the tracking process continues after the momentary loss of a target, the TTM function maintains the last known position of the target in its queue for 60 seconds after receiving the last valid message. After 60 seconds, that target is removed from the queue.

Note:
The total number of targets that are being tracked by the camera and the rate at which messages are transmitted to the camera will have an impact on Radar target tracking performance. To guarantee optimum Radar tracking performance, ensure that:

- Your network is configured to support the fastest possible message transmission rate.
- Your camera is set to track only necessary Radar targets.

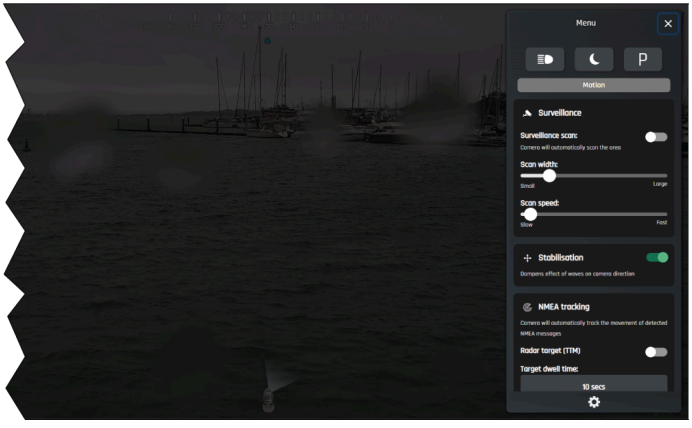
20.3 Enabling NMEA tracking via the camera's on-screen display menu

You can enable NMEA tracking via the camera's On-Screen Display (OSD) menu.

In order to enable NMEA tracking:

1. Access the camera's *[OSD Menu]*, by either:
   - Pressing the corresponding menu button on a compatible Joystick Control Unit. For more information, refer to the documentation supplied with the device; OR:
   - Accessing the camera's Web browser configuration interface or Web browser operation interface, and selecting the *[OSD Menu]* option via the video feed view. For more information, refer to:
     - **p.85 — Accessing the camera's web interface pages**

   The following menu will be displayed:



2. (If required) select the *[Motion]* tab.
3. Navigate to the bottom of the *[Motion]* tab and set the *[Target dwell time]*.

   Dwell time is the length of time the camera will focus on each radar target before switching focus to the next target.
4. Select the NMEA tracking option that you wish to enable.

CHAPTER 21: MAINTENANCE

CHAPTER CONTENTS

21.1 Service and maintenance

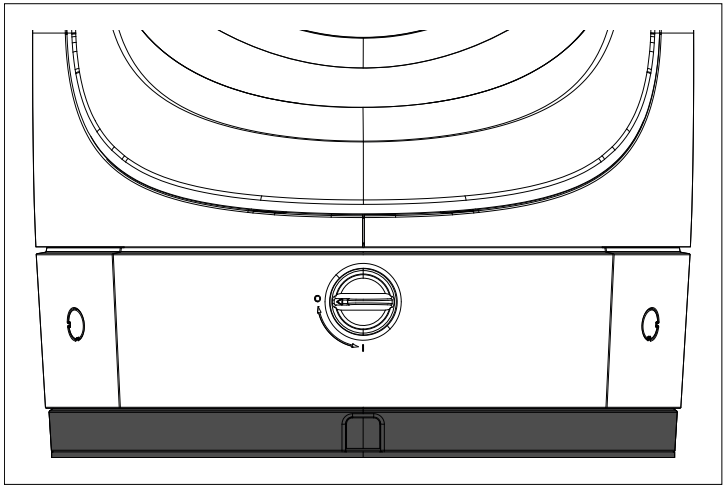
This product contains no user serviceable components. Please refer all maintenance and repair to authorized FLIR dealers. Unauthorized repair may affect your warranty.

21.2 Safety switch

The camera's power / safety switch can be used to quickly stop the camera from rotating.

The camera's power / safety switch is located at the rear of the camera base.

To quickly stop the camera from rotating, turn the switch OFF (i.e. turn the switch to the 9 o'clock position), as shown below:



Note:
It is also possible to quickly stop the camera from rotating by switching off the power to the VCM150, via the appropriate fuse / thermal breaker at the vessel's power distribution panel.

21.3 Routine camera inspections

It's important to routinely inspect cameras and associated mounting hardware.

Important:
Routinely inspect the camera and its mounting surface. When the camera is powered off, grasp it firmly at the base and confirm it is rigid and secure. Then hold the camera above the base and confirm it is rigid, while rotating freely.

- Conduct both visual and mechanical checks during your inspection, including the use of torque wrenches to ensure that all mounting fixings are secured to the recommended torque, as stated in the installation instructions.
- Ensure that the camera and weight-bearing mountings (including any risers) are installed securely, that the coated surfaces are intact, and that there are no signs of damage.
- Maintain a regular inspection schedule. Both visual and mechanical checks should be included in each inspection. Maintain a record of all inspections.

21.4 Cleaning the thermal camera

The camera housing and windows require occasional cleaning. You should clean the windows if excessive contaminant buildup is seen, or when a degradation is noticed in image quality / spotlight performance, or, for LRF-variant cameras only, laser range finder performance. Clean the interface between the yoke and base often to prevent accumulation of debris or salt deposits.

Important:
Before attempting to clean the camera, its power / safety switch must be set to OFF. For more information, refer to:

- **p.124 — Safety switch**

When cleaning this product:

• Do NOT wipe the windows 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 windows, which have 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. If required, moisten the cloth with fresh water and a mild detergent.
3. Clean the camera windows:
   - Rinse the windows 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 windows with a clean microfibre cloth or soft cotton cloth.
   - If necessary, use a mild detergent to remove any remaining spots or marks.

CHAPTER 22: SYSTEM CHECKS AND TROUBLESHOOTING

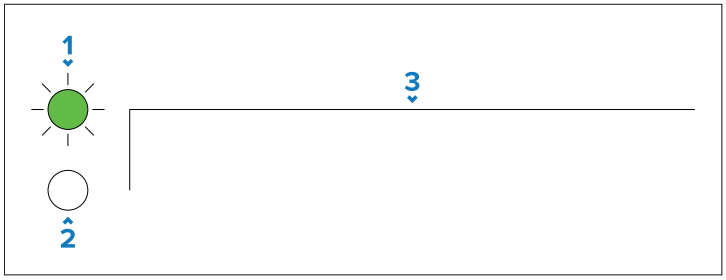
CHAPTER CONTENTS

22.1 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.

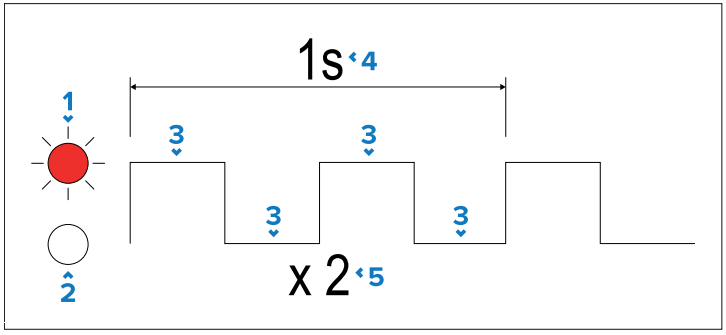
The following section provides two basic examples of how to interpret the LED diagnostic patterns included in this publication.

Example solid LED diagnostic pattern:



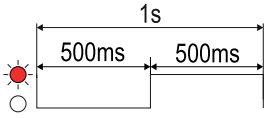
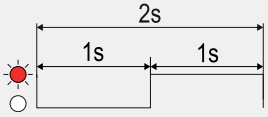
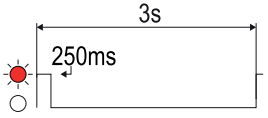
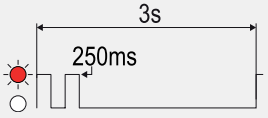
1. **LED ON** — Indicates the color assigned to the unit's diagnostic LED, and confirms that the diagnostic LED is active (switched **on**).
2. **LED OFF** — Indicates that the unit's diagnostic LED is inactive (switched **off**).
3. **Diagnostic pattern** — Indicates a diagnostic pattern based on the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

22.2 LED diagnostics

LED Indication	LED status and action required
	(Red) Powering on Normal operation — no user action is required.
	(Red) Software update in progress Normal operation — no user action is required.
	(Red) Fault Consider contacting your local dealer or FLIR Product Support. For FLIR contact details, refer to the following section: • **p.133 — FLIR Maritime product support and servicing**
	(Red) Factory reset initiated (via external LED) Normal operation — no user action is required.
	(Red) Factory reset in progress Normal operation — no user action is required.
	(No color) No power • Ensure that you have read and understood the information found under the following section: – **p.73 — Power connections** • Refer to the advice found in the following section: – **p.130 — Power up troubleshooting**

22.3 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 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 and servicing* section of this manual for useful links and contact details.

Camera not shown in your PC / laptop / tablet's device list

In some circumstances, the camera may not appear in the device list.

Possible causes	Possible solutions
Incorrect IP address configuration:	Depending on your network configuration, it may take up to 5 minutes for the camera to appear in the list of devices. If the camera is not listed after 5 minutes, double-check that your IP address is configured correctly. Afterward, attempt to renew your IP device's IP address. For Windows 7, 8, 10, and 11: 1. Go to *[Start > Run]*, then type "cmd" (without quotes), and click *[OK]*. 2. In the Command Prompt window that opens, type "ipconfig /release" (without quotes), then press Enter. 3. Type "ipconfig /renew" (without quotes), then press Enter. 4. Type "exit" (without quotes), then press Enter to close the window.
VPN software enabled:	Ensure that any VPN (Virtual Private Network) software installed on your IP device is disabled.

Video not displayed

In the event that the camera is not displaying video:

Possible causes	Possible solutions
Camera is in Standby mode:	The camera will not display video if it is in Standby mode. Use the camera controls (either the thermal camera application or JCU) to "wake" the camera from standby.
Problem with the thermal camera network connections:	Check thermal camera network cables are sound and properly connected.
Problem with power supply to the camera or JCU (if used as the primary controller):	• Check the power connections to the camera and JCU / PoE injector (if used). • Ensure that the power switch / breaker is on. • Check the fuse / breaker state.

Cannot control camera from MFD / chartplotter

In the event that the camera cannot be controlled from a connected multifunction display (MFD) or chartplotter:

Possible causes	Possible solutions
Incorrect MFD / chartplotter application in use:	Ensure that you are attempting to use the correct MFD / chartplotter application in order to control the camera. For further information on which application(s) can be used to control the camera, refer to the documentation which accompanies your MFD / chartplotter.

Erratic or unresponsive controls

In the event that the camera's controls are responding erratically, or not responding at all:

Possible causes	Possible solutions
Network problem:	• Check that the controller and thermal camera are correctly connected to the network. (Note: This may be a direct connection or via a network switch.) • Check the status of the network switch. • Check that the network cables are free from damage.
Control conflict, e.g. caused by multiple users at different stations:	Ensure that no other controllers are in use at the same time.
Problem with the controller:	• Check power / network cabling to the controller and PoE injector (PoE only used with optional Joystick Control Unit). • Check other controllers (if available). If other controllers are operating, this will eliminate the possibility of a more fundamental camera fault.

Camera image too dark or too light

Possible causes	Possible solutions
Display brightness is set too low:	Use the brightness controls at the display to adjust accordingly.

Camera image is inverted

In some circumstances, the camera image may appear inverted.

Possible causes	Possible solutions
Camera "Ball down" (upside down) setting is incorrect:	Ensure that the relevant Ball down (upside down) setting is set correctly.

22.4 Power up troubleshooting

Problems at power up and their possible causes and solutions are described here.

Product does not turn on or keeps turning off

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

Product will not start up (re-boot loop)

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

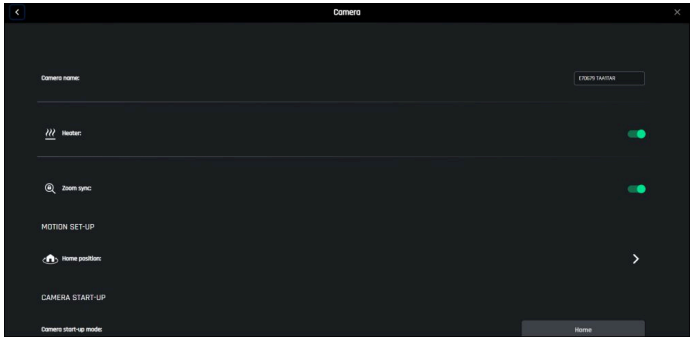
22.5 Factory reset

If you wish to restore the camera's default setting configuration, or, if you are experiencing problems with the camera which cannot be resolved using the troubleshooting advice provided, you may need to perform a factory reset.

Performing a factory reset via the OSD menu

To reset the camera to factory settings via the OSD (On-Screen Display) menu:

1. Navigate to: *[OSD Menu > Settings > Camera]*.

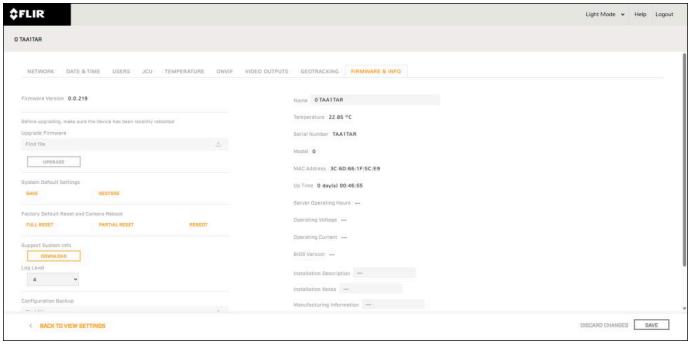


2. Scroll to the bottom of the page and select *[Reset to factory defaults]* to reset the camera to factory settings.

Performing a factory reset via the Web browser configuration interface

To reset the camera to factory settings via the Web browser configuration interface:

1. Navigate to: *[System settings > Firmware & info]*.

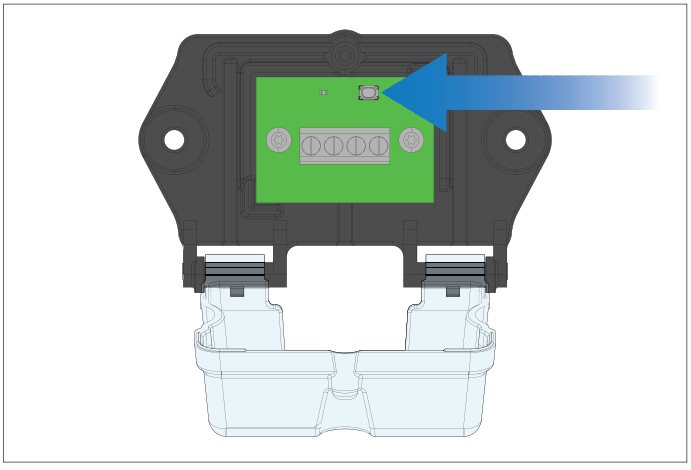


2. Select *[Full reset]* to reset the camera to factory settings.

Performing a factory reset via the External LED indicator

To reset the camera to factory settings via the External LED indicator:

1. While powering on the camera, press and hold the factory reset button located on the External LED indicator, as shown below:



22.6 FLIR Maritime product support and servicing

FLIR provides a comprehensive product support service, as well as warranty, service, and repairs. You can access these services using the contact details provided below.

Product information

For the latest support information, go to:

- https://marine.flir.com/support

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

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

You can obtain this product information using the menus available when using your product.

Warranty policy and registration

Visit the Raymarine website to **read the latest warranty policy**, and **register** your product's warranty online:

- www.bit.ly/455XYGZ

Servicing and contact information

FLIR and Raymarine offer dedicated service departments for servicing and repairs. Contact details:

Region	Contact details
United Kingdom (UK), EMEA, and Asia Pacific:	**Telephone:** +44 (0)1329 246 932 **Address:** Marine House, Cartwright Drive, Fareham, PO15 5RJ, UK. https://maritime.teledyne.com/Messages
United States (US):	**Telephone:** Tel: +1 (603) 324 7900 (Toll-free: +800 539 5539) **Address:** 110 Lowell Road, Hudson, NH 03051, USA. https://maritime.teledyne.com/Messages

CHAPTER 23: TECHNICAL SPECIFICATION

CHAPTER CONTENTS

23.1 Physical specification

Specification	
Dimensions:	For product dimension information, refer to: • **p.34 — Product dimensions**
Weight:	36.5 kg (80.47 lb)
Pan / tilt / roll:	• 360° continuous pan • - 90° to + 120° tilt • - 35° to + 35° roll

23.2 Power specification

Specification	
Supply voltage (using VCM150):	• Nominal: 12 V dc or 24 V dc • Minimum: 10.8 V dc • Maximum: 31.2 V dc
Current:	Peak 23 A
Power consumption (typical):	• Heaters on: 230 W • Heaters off: 150 W
Power consumption (max):	240 W
Circuit breaker / Inline fuse:	For more information on the recommended circuit breaker / inline fuse ratings, refer to: • **p.75 — Circuit breaker and fuse ratings**
Startup time:	60 seconds

23.3 Environmental specification

Specification	
Operating temperature:	-25 °C to +55 °C (-13 °F to 131 °F)
Storage temperature:	-30 °C to +70 °C (-22 °F to 158 °F)
Operating pressure:	• Minimum: 870 millibar. • Maximum: 1084 millibar.
Storage pressure:	• Minimum: 116 millibar. • Maximum: 1084 millibar.
Automatic window defrost:	Standard at power-up (5 minute duration)
Relative humidity:	max 95%
Water ingress protection:	IEC/EN 60529:1992+A2:2013 (IPX6 and IPX7)
Wind:	100 knots
Sand / Dust:	• IEC/EN 60529:1992+A2:2013 (IP6X) • MIL-STD-810H
Vibration:	IEC/EN 60945:2002 (exposed)
Salt Mist:	IEC60945
Altitude:	MIL-STD-810H
Lightning Protection:	Near Strike at 2 kV
Electromagnetic compliance:	• IEC/EN 60945:2002

23.4 Network specification

Specification	
Network connections:	• 1x RayNet (Ethernet) connection. • 1x BNC (6G-SDI) connection. • 1x DeviceNet (NMEA 2000) connection. • 1x Bulkhead (NMEA 0183) connection.
IEEE Standard:	Conforms to IEEE 802.3ab

23.5 Video specification

Specification	
Video output:	• IP digital video format: H.264-encoded IP video stream • IP digital video format: MJPEG-encoded IP video stream • SDI video format, 6G-SDI compatible.
Visible-light sensor:	• Sensor resolution; refer to comparison table: – **p.137 — Sensor specification** • Field of View; refer to comparison table: – **p.137 — Sensor specification** • Optical Zoom: 25x • Digital Zoom: 12x
Thermal sensor:	• Sensor resolution; refer to comparison table: – **p.137 — Sensor specification** • Field of View (FOV); refer to comparison table: – **p.137 — Sensor specification** • Optical zoom; – (M460-Series): 5.4x – (M560-Series): 15.26x • Digital zoom; – (M460-Series): 8x – (M560-Series): 8x

23.6 Laser specification

Specification	
Classification:	• Spotlight: Class 3R (IEC 60825–1:2014) • Laser Range Finder (LRF): Class 1 (IEC 60825–1:2014)
Wavelength:	• Spotlight: 450 nm • Laser Range Finder (LRF): 1.55 µm
Beam divergence:	• Spotlight: 2.2° • Laser Range Finder (LRF): 1.0 x 0.8 mrad (horizontal x vertical)
Maximum power output:	Spotlight: < 300 mW @ 100 mm
Maximum range:	• Spotlight: 1 km (0.5 NM) • Laser Range Finder (LRF): 12 km (6.5 NM).

23.7 Conformance specification

This product is compliant or approved to the following standards or by the listed entities.

Specification	
EN 60945:2002 (Europe, Australia / New Zealand)	ISED ICES-003 (UK, Europe, Australia / New Zealand)
NMEA 2000 certified	EN IEC 62368–1:2020
IEC 60825–1	

23.8 Product markings

This product includes the following approval / compliance markings and/or IDs.

Markings		
UKCA	CE	FCC
ISED	Australian Tick	WEEE Directive

23.9 Sensor specification

Model	Visible-light sensor		Thermal sensor	
	Resolution and frame rate	*HFOV range*	*Resolution*	*HFOV range*
M460 (30 Hz)	3840 x 2160 pixels @ 30 fps	2.4° – 49.5°	640 x 512 pixels	5.86° – 30.68°
M460-LRF (30 Hz)	3840 x 2160 pixels @ 30 fps	2.4° – 49.5°	640 x 512 pixels	5.86° – 30.68°
M560 (30 Hz)	3840 x 2160 pixels @ 30 fps	2.4° – 49.5°	640 x 512 pixels	1.9° – 28°
M560-LRF (30 Hz)	3840 x 2160 pixels @ 30 fps	2.4° – 49.5°	640 x 512 pixels	1.9° – 28°

23.10 Target classifier object detection ranges

The following values indicate the distances at which the camera's target classifier tracking system is able to detect objects from each object category **50%** of the time.

Note:
Before proceeding, please note that the object detection range values listed below do NOT take into account any view distance limitations imposed by the camera's mounting height. For example:

- In instances where the camera is mounted 6 m (19.69 ft) above the waterline, the maximum viewable distance from the camera to the visible horizon (in optimum conditions) is approximately 10 km (5.40 NM).
- In instances where the camera is mounted 30 m (98.43 ft) above the waterline, the maximum viewable distance from the camera to the visible horizon (in optimum conditions) is approximately 20 km (10.80 NM).

(1) Where the object detection range values listed below are limited by your camera's maximum view distance, the associated object detection rate will exceed 50%.

M460-Series & M560-Series visible-light sensor (no zoom):

MOB / Swimmer	Sailboat	Small boat	Large boat	Marker / Buoy
111 m (0.06 NM)	6.67 km (3.60 NM)	1.78 km (0.96 NM)	(1) 16.89 km (9.12 NM)	0.44 km (0.24 NM)

M460-Series & M560-Series visible-light sensor (fully zoomed):

MOB / Swimmer	Sailboat	Small boat	Large boat	Marker / Buoy
2.29 km (1.24 NM)	(1) 137.51 km (74.25 NM)	(1) 36.67 km (19.80 NM)	(1) 348.36 km (188.10 NM)	9.17 km (4.95 NM)

M460-Series thermal sensor (no zoom):

MOB / Swimmer	Sailboat	Small boat	Large boat	Marker / Buoy
50 m (0.03 NM)	1.63 km (0.88 NM)	1.33 km (0.72 NM)	(1) 12.62 km (6.81 NM)	171 m (0.09 NM)

M460-Series thermal sensor (fully zoomed):

MOB / Swimmer	Sailboat	Small boat	Large boat	Marker / Buoy
261 m (0.14 NM)	8.53 km (4.61 NM)	6.95 km (3.75 NM)	(1) 66.05 km (35.66 NM)	0.89 km (0.48 NM)

M560-Series thermal sensor (no zoom):

MOB / Swimmer	Sailboat	Small boat	Large boat	Marker / Buoy
54 m (0.03 NM)	1.76 km (0.95 NM)	1.44 km (0.78 NM)	(1) 13.65 km (7.37 NM)	185 m (0.10 NM)

M560-Series thermal sensor (fully zoomed):

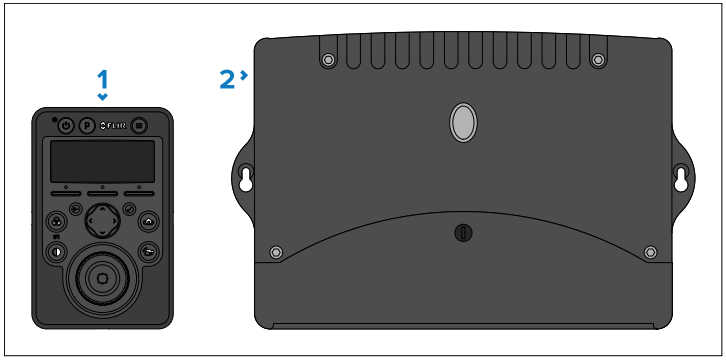
MOB / Swimmer	Sailboat	Small boat	Large boat	Marker / Buoy
0.80 km (0.43 NM)	(1) 26.32 km (14.22 NM)	(1) 21.44 km (11.58 NM)	(1) 203.72 km (110 NM)	2.76 km (1.49 NM)

CHAPTER 24: SPARES AND ACCESSORIES

CHAPTER CONTENTS

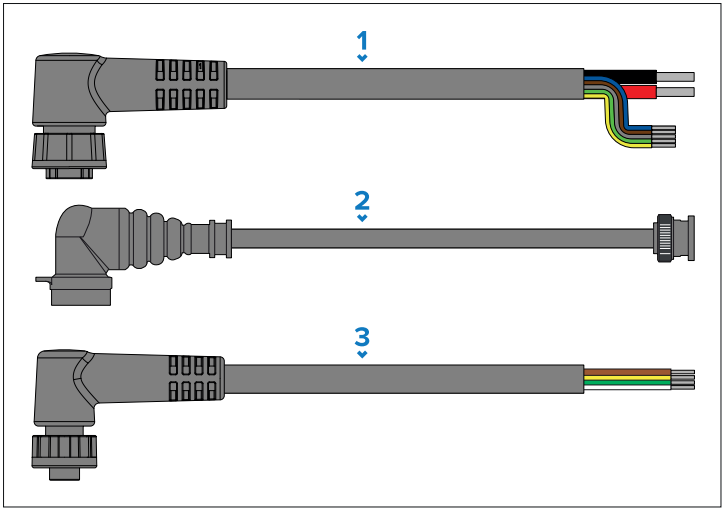
24.1 Accessories

The following accessories are available for your product:



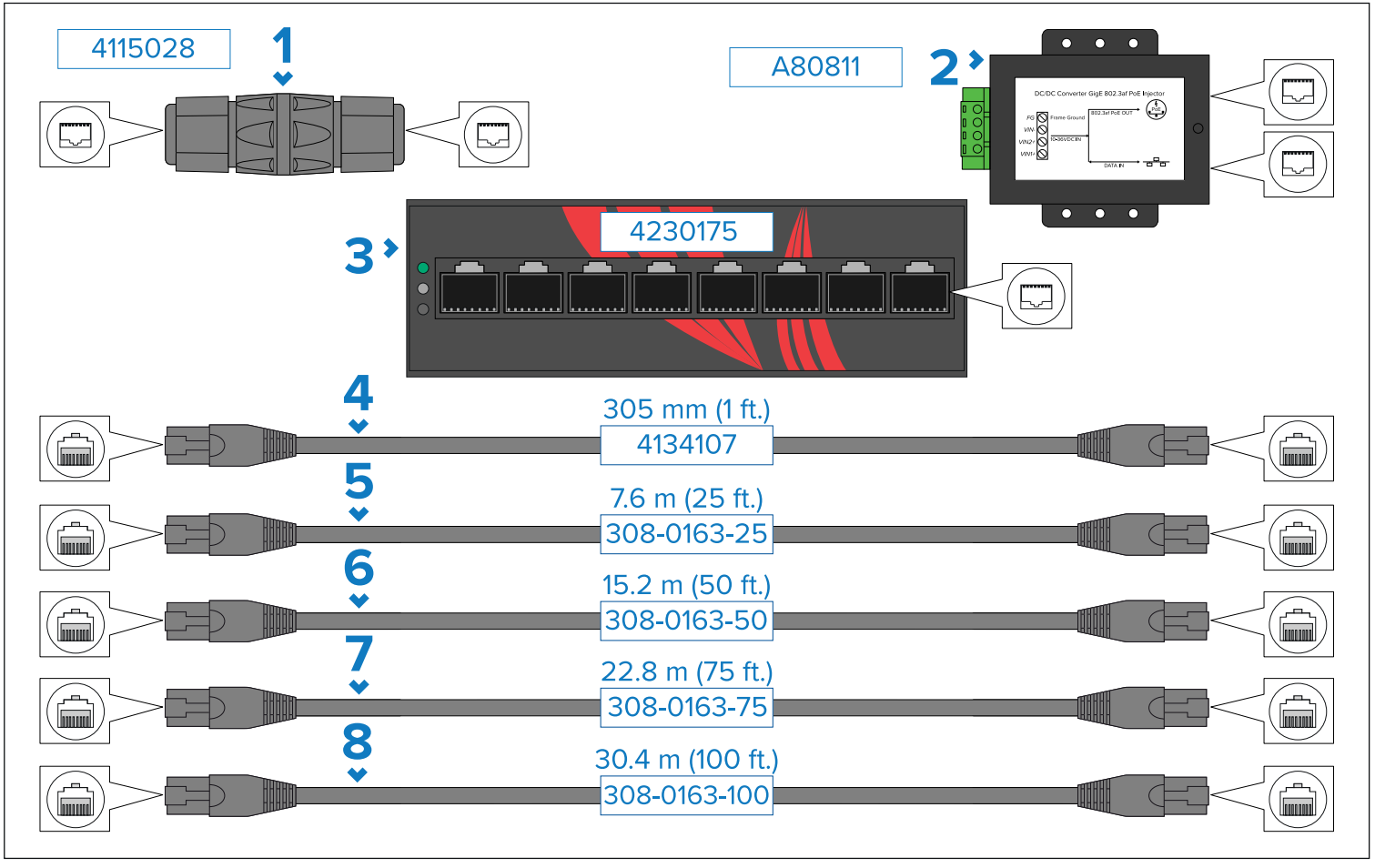
	Description
1	(E70648) — VCM150 Voltage Converter Module.
2	• (E70695) — JCU-4 remote control unit. • (E70697) — JCU-4 remote control unit, without cables.

Camera accessory cables



	Description
1	Right-angled camera power cable: • **1 m (3.28 ft)** — (A80785). • **10 m (32.81 ft)** — (A80787).
2	Right-angled bulkhead to NMEA 0183 bare wires adapter cable: • **1 m (3.28 ft)** — (A80782). • **10 m (32.81 ft)** — (A80784).
3	6G-SDI video cable (RA BNC to BNC connectors): • **1 m (3.28 ft)** — (A80778). • **10 m (32.81 ft)** — (A80780). • **30 m (98.43 ft)** — (A80781).

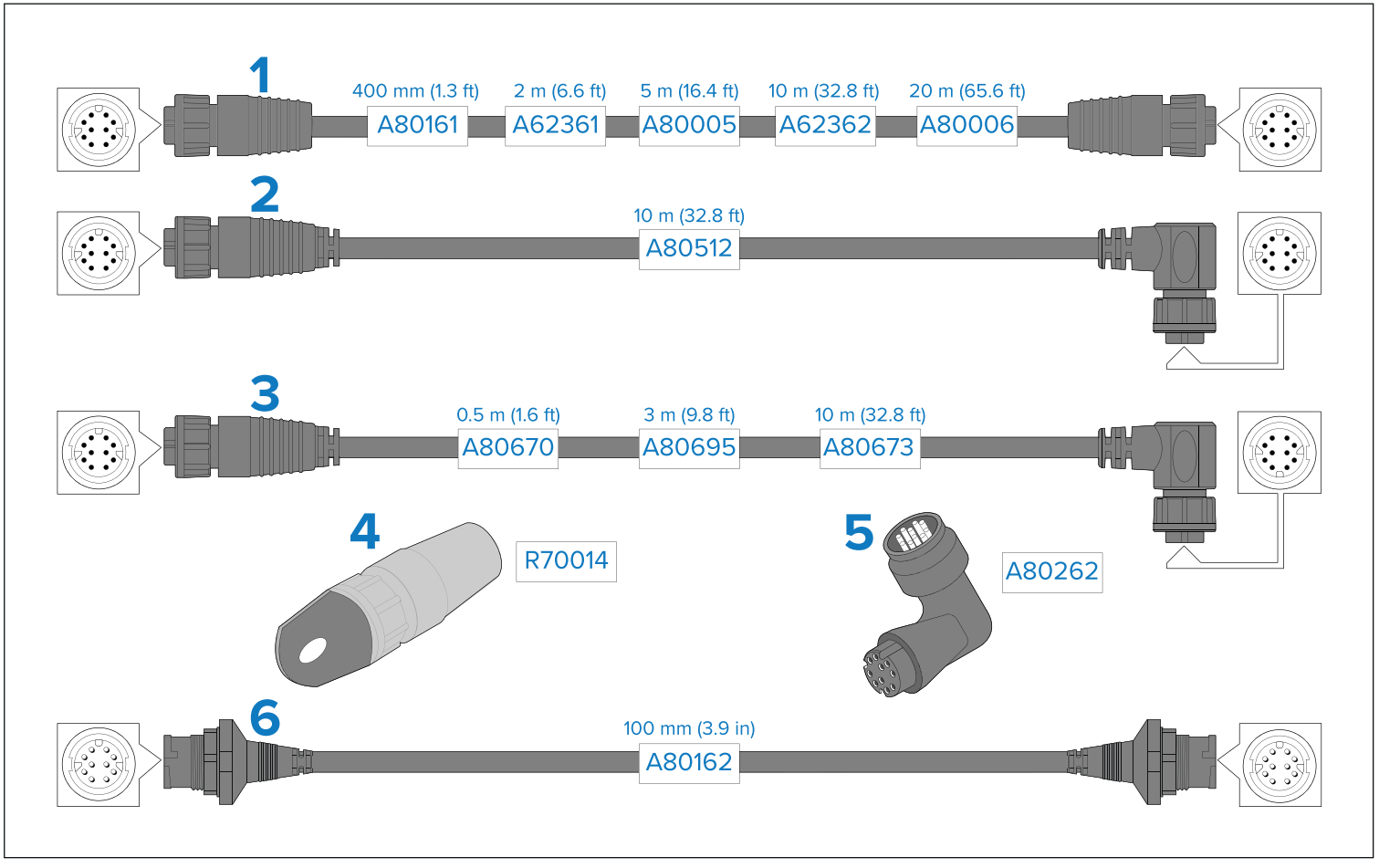
24.2 FLIR networking accessories



1. RJ45 coupler, for joining 2 separate RJ45 network cables together to achieve longer cable runs.
2. PoE Injector (2nd Generation; 5 Gbit). Supplies power to a non-PoE network connection. Typical use is for powering a JCU-Series controller connected to a non-PoE network switch.
3. PoE 8-port Gigabit Network Switch.
4. 305 mm (1 ft.) RJ45-to-RJ45 Ethernet cable, double shielded with LSZH low interference jacket.
5. 7.6 m (25 ft.) RJ45-to-RJ45 Ethernet cable, double shielded with LSZH low interference jacket.
6. 15.2 m (50 ft.) RJ45-to-RJ45 Ethernet cable, double shielded with LSZH low interference jacket.

7. 22.8 m (75 ft.) RJ45-to-RJ45 Ethernet cable, double shielded with LSZH low interference jacket.
8. 30.4 m (100 ft.) RJ45-to-RJ45 Ethernet cable, double shielded with LSZH low interference jacket.

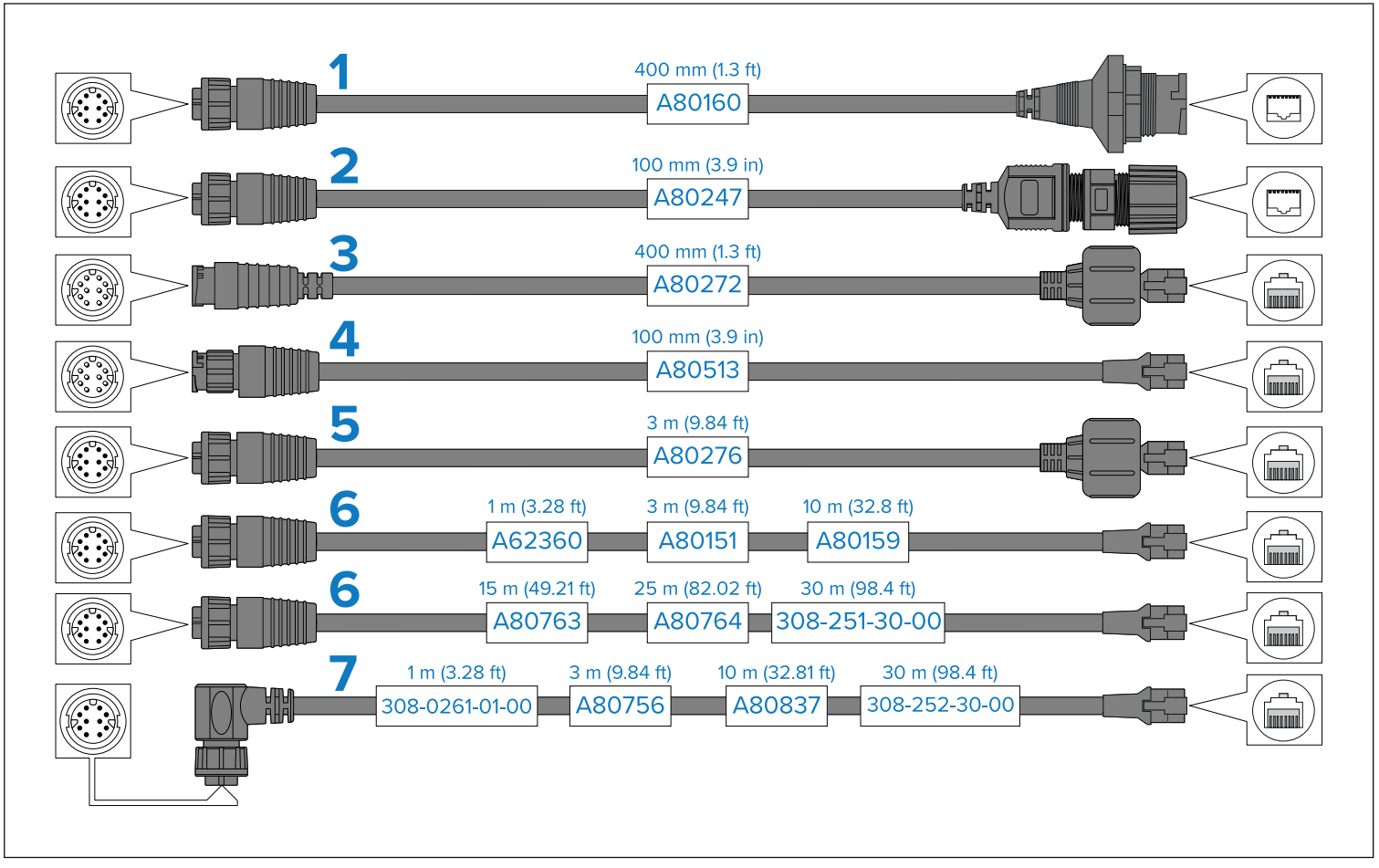
24.3 RayNet to RayNet cables and connectors



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. 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. Available as an alternative to the (A80512) accessory cable, for installations which require an alternate cable routing direction.
4. RayNet cable puller (5 pack).

5. RayNet to RayNet right-angle coupler / adapter. Suitable for connecting RayNet cables at 90° (right angle) to devices, for installations where space is limited.
6. Adapter cable with a RayNet (male) plug on both ends. Suitable for joining (female) RayNet cables together for longer cable runs.

24.4 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.

Appendix A Supported NMEA 0183 sentences

- **TTM** — Tracked Target Message (Receive)
- **GLL** — Geographic Position — Latitude / Longitude (Receive)
- **GGA** — Global Positioning System Fix Data (Receive)
- **VTG** — Course Over Ground & Ground Speed (Receive)
- **RMC** — Recommended Minimum Navigation Information — Specific GPS Data (Receive)
- **VHW** — Water Speed and Heading (Receive)
- **HDG** — Heading — Deviation & Variation (Receive)
- **HDM** — Heading — Magnetic (Receive)
- **HDT** — Heading — True (Receive)

Appendix B Supported NMEA 2000 PGNs

Administration PGNs

- **59392** — ISO Acknowledge (Receive / Transmit)
- **59904** — ISO Request (Receive / Transmit)
- **60160** — ISO Transport Protocol, Data Transfer (Receive)
- **60416** — ISO Transport Protocol, Connection Management (Receive)
- **60928** — ISO Address Claim (Receive / Transmit)
- **65240** — ISO Commanded Address (Receive)
- **126208** — NMEA — Request, Commanded, Acknowledge Group Function (Receive / Transmit)
- **126464** — PGN Transmit and Receive List (Transmit)
- **126993** — Heartbeat (Transmit)
- **126996** — Product information (Transmit)
- **126998** — Configuration information (Transmit)

Data PGNs

- **127250** — Vessel heading (Receive)
- **127251** — Rate of turn (Receive)
- **127258** — Magnetic variation (Receive)
- **128259** — Speed, water referenced (Receive)
- **128520** — Tracked Target Data (Receive)
- **129025** — Position, rapid update (Receive)
- **129026** — COG & SOG, rapid update (Receive)
- **129029** — GNSS position data (Receive)

Appendix C Software release history

The list below is a cumulative list of the new features introduced in subsequent releases of the M460 / M560-Series software, since the initial release (v1.0.8).

This list includes *new features* only. It does NOT include software maintenance items, such as bug fixes or performance improvements.
To download the software, and view the complete list of all software updates, including new features, bug fixes, and performance improvements, visit:

Software download link
www.bit.ly/3FyByn8

M460 / M560-Series, v1.0.8 new features:
(Software release date: *September 2025*)

- Initial public release.

Appendix D Ethernet (IPv4) networking of Raymarine devices with third-party products

Raymarine uses a custom Ethernet (IPv4) networking configuration. Use the following information to help you understand how Raymarine's Ethernet (IPv4) implementation interacts with third-party Ethernet (IPv4) devices on your vessel, such as routers, switches, Access Points (APs) etc.

Important:

- Third-party networking products such as routers, switches, and Access Points (APs) *may* work when connected to Raymarine networks, when configured correctly. However, correct operation is not guaranteed. It's important to refer to the instructions provided by the relevant third-party device manufacturer, to ensure that your intended use of a third-party device is consistent with the device's design intent.
- Raymarine does not warrant that Raymarine products are compatible with products manufactured by any person or entity other than Raymarine.
- When using third-party products in your Raymarine electronics network, you should be aware of, and understand, the concepts and limitations described in the following Disclaimer:

Overview

- Ethernet (IPv4) networking is a method for interconnecting multiple electronic devices, allowing many devices to function in a network and share data using only a single RJ45 or RayNet connection for each device.
- In order to function correctly, every Ethernet (IPv4) device (whether Raymarine or third-party) must have a unique IP address allocated to it, and it must not conflict with that of any other device.
- IPv4 addresses can be centrally-allocated to devices either **automatically**, using a method known as *DHCP* (Dynamic Host Configuration Protocol), or **manually** (i.e. allocated a static IP address). The most common method for allocating IPv4 addresses on vessel electronics networks is *DHCP*. In this configuration, the *server* device is known as a *DHCP server*.

Client / Server device	Example(s)
Raymarine IPv4 DHCP **client**	• Radar scanner (e.g. Quantum-Series) • Sonar module (e.g. CP470) • IP camera (e.g. CAM300)
Raymarine IPv4 DHCP **server** and self-addressing device	• Chartplotter (MFD), running LightHouse 3 or LightHouse 4 (e.g. Axiom-Series) • Marine Router (e.g. YachtSense Link)
Third-party IPv4 DHCP **client**	IP camera
Third-party IPv4 DHCP **server**	• Router • Switch • Access Point (AP)

Note:
The DHCP server maintains a pool of IP addresses and "leases" an address to any DHCP-enabled client, when the client device first powers up and announces its presence on the network. Because the IP addresses are dynamic (leased) rather than static (permanently assigned), addresses no longer in use are automatically returned to the DHCP server's pool, for subsequent reallocation.

It's also possible to have multiple DHCP servers issuing addresses on an IPv4 network, but to avoid addressing conflicts, all DHCP servers must be carefully configured to only allocate IP addresses in distinct address ranges. The *subnet mask* must also be carefully configured, to ensure that devices can correctly communicate with one another.

Implementation

- Raymarine Ethernet (IPv4) devices expect to use a private **Raymarine IPv4 network**, which is designed to be internal to the vessel only. Raymarine has carefully chosen a specific IP address range (**198.18.0.0/21**) to ensure that it does not interfere with any external IP address ranges, or other legacy and real-world addressing constraints (including but not limited to marina Wi-Fi networks).

Note:
Raymarine's IP address range is for **local traffic** within the **vessel's private Raymarine network only**, and does NOT traverse across Raymarine products to external networks, or to the Internet.

- In a Raymarine Ethernet (IPv4) network, IP addresses are self-allocated by certain Raymarine equipment in the following range: **198.18.0.32 to 198.18.3.255** (inclusive). **You must avoid placing any devices in this range using manual (static) IP addresses.**
- Whether your network includes only Raymarine Ethernet (IP) devices, or a mixture of Raymarine and third-party Ethernet (IPv4) devices, you have 3 options for configuring the Ethernet (IPv4) network and managing the IP addresses for your devices:

1. Use a Raymarine device as the sole DHCP server to allocate IP addresses automatically to all Raymarine and third-party Ethernet (IPv4) devices on the network. **For the purposes of simplicity and reliability, this is the recommended option for most vessels.** The following Raymarine devices can act as DHCP servers:

   a. **Raymarine chartplotter (MFD)**, running LightHouse 3 or LightHouse 4; or:

   b. **Raymarine YachtSense Link router**

Note:
If both a Raymarine chartplotter (MFD) **and** YachtSense Link router are present in the same network, the YachtSense Link router MUST be configured as the DHCP server for that network. To facilitate this, the Raymarine chartplotter's (MFD's) DHCP setting defaults to *Automatic* as standard. On power up, if the YachtSense Link router is detected on the Ethernet network, any chartplotters (MFDs) in the network will disable their own *DHCP Server*, to permit the YachtSense Link router to manage the network's IP addresses. Only Raymarine chartplotters (MFDs) running LightHouse 4 are compatible with the YachtSense Link router. Additionally, the most recent versions of the LightHouse 4 and YachtSense Link software must be used.

2. Use a third-party Ethernet (IPv4) device (such as a router or Access Point) to allocate IP addresses automatically, as a sole

DHCP server. To do this, refer to the *Configuring a third-party router as DHCP server* section, below.

Note:
Any Raymarine LightHouse 3 or LightHouse 4 chartplotters (MFDs) will still self-allocate their own IP address, even if a third-party DHCP server is being used to allocate IP addresses to other Raymarine or non-Raymarine *DHCP client* devices (Camera, Radar, Sonar etc.) on the network.

3. Manually configure static IP addresses for your devices. The address range **198.18.0.32 to 198.18.3.255** (inclusive) is used by Raymarine equipment, and any other third-party equipment on the network should not be set to a static IP address in this range. It should instead be set elsewhere in the 198.18.0.0/21 range.

Adding third-party devices to your Raymarine Ethernet (IP) network

- It is recommended that any third-party products connecting to a Raymarine Ethernet (IPv4) network (e.g., a third-party IP camera) are configured as DHCP clients, so that they automatically get allocated a correct IP address within the range used by the **Raymarine IPv4 network**. If this is not possible, (for example, in the scenario that your third-party IP Camera requires a static IP address), you should configure the product to have a static IP address within the following range: **198.18.0.1 to 198.18.0.31** (inclusive).
- Any third-party router in your network should be performing IPv4 *Network Address Translation* (NAT) from the private address to another one on an upstream interface.

Configuring a third-party router as DHCP server

In the scenario that you wish to use a third-party DHCP server to allocate the IP addresses for your vessel's IPv4 network, use the following information to help you configure the third-party DHCP server to work with Raymarine Ethernet (IPv4) client devices:

1. Configure the third-party DHCP server / router to use Raymarine's subnet details, which are as follows:
   a. Set the DHCP server's IP address to **198.18.0.1**
   b. Set the *netmask* to /21, i.e. **255.255.248.0**
   c. Set the DHCP range from **198.18.4.0 to 198.18.7.254** (inclusive). If this is not possible, ensure that the address range is smaller than this (but within the range of **198.18.4.0 to 198.18.7.254** (inclusive)).
   d. The address range **198.18.0.32 to 198.18.3.255** (inclusive) is used by Raymarine equipment, and therefore you must ensure that any other third-party equipment on the network is NOT set to a static IP address in this range.
2. It may be necessary to set the DHCP setting for **all** of the chartplotters (MFDs) on the vessel to *[Off]*. However, the default option (*[Auto]*) will likely work fine in many cases. If for any reason the third-party DHCP server starts up after the chartplotter (MFD) starts up, the user should manually set the chartplotter's (MFD's) DHCP switch to *[Off]*. This is because, when the chartplotter (MFD) starts up, its DHCP *[Auto]* feature tries to detect if another DHCP server is already present on the network.
3. In case of failure of the third-party device, the chartplotters (MFDs) can be easily configured to be the DHCP server again, by setting the chartplotter's (MFD's) DHCP setting back to *[Auto]*.

Adding third-party Wi-Fi Access Points / Wi-Fi routers to your Raymarine Ethernet (IPv4) network

- There is a large volume of multicast IPv4 traffic on the Raymarine Ethernet (IPv4) network. Many consumer Wi-Fi Access Points / Wi-Fi routers simply bridge all multicast traffic from the Ethernet interface to the Wi-Fi interface when there are connected Wi-Fi clients. This will result not only in poor Wi-Fi performance but also in a reduction of usable Wi-Fi spectrum to other Wi-Fi users and vessels in the vicinity. If using a third-party Wi-Fi Access Point or Wi-Fi router, Raymarine recommends that *IGMP Snooping* is enabled on the third-party device, and additional checks are performed, in order to ensure that your device is not bridging any unexpected multicast traffic to its Wi-Fi interface from the Raymarine Ethernet (IPv4) network.
- Raymarine's YachtSense Link router is pre-configured with IGMP Snooping enabled, and therefore does not bridge internal multicast traffic on the wired network to the Wi-Fi network. No additional configuration is required in this respect.

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