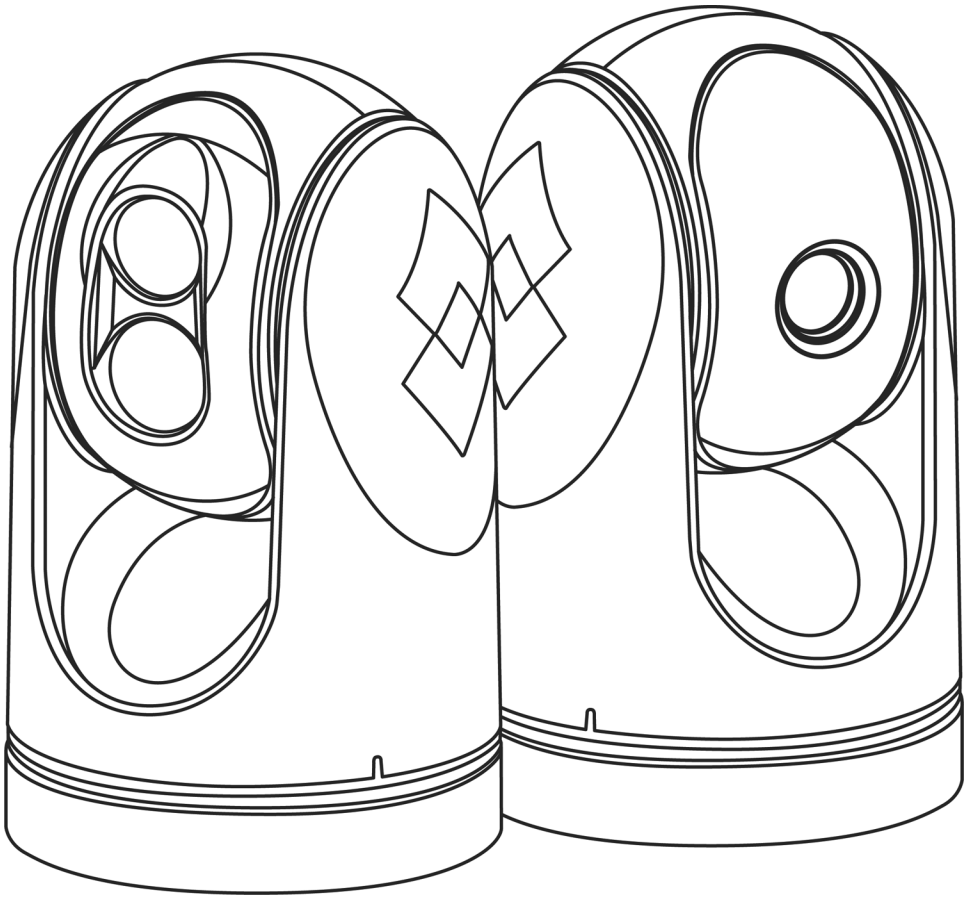
FLIR

Installation Guide

M-Series



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.

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Document History

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1

Installing M-Series Camera Systems

M-Series is a maritime thermal imaging system for use on most types of vessels. The system is available in two configurations:

- The single payload models have a single thermal imaging camera.
- The dual payload models are equipped with both a thermal imaging camera and a color visible-light (DLTV) camera with low-light capability.

The infrared (IR) thermal camera provides night-time imagery, even in total darkness, based on temperature differences. The thermal camera provides a clear video image even under completely dark conditions because it is sensitive to thermal infrared energy. The infrared camera supports continuous zoom to 4X.

On dual payload models, the integrated DLTV camera options provide black and white imagery in low-light conditions or color imagery. The DLTV cameras provide enhanced navigational abilities in a variety of conditions, for example, during twilight hours or when operating along intercoastal waterways and near harbor entrances.

All M-Series models include a mechanical stabilization feature that improves image stability. The stabilization feature compensates for the motion of the vessel and improves the utility of the camera video output when operating in rough seas or swell conditions.

For a complete list of models and a comparison of key features, see Feature Comparison of M-Series Models, pg. 20.

This manual includes information about the following topics:

- Installation overview
- Mounting the camera and its components
- Connecting the electronics
- Maintaining the camera
- Parts list and other reference information

Additional References

The M-Series camera comes with a complete documentation set on a USB flash drive. All documents are in PDF format and can be viewed with Adobe Acrobat Reader. Refer to the Resources Web page for the latest documentation:

http://www.flir.com/cvs/americas/en/maritime/resources/

- *M-Series Operator's Manual* (FLIR Doc. # 432-0003-60-10) contains information about how to configure, use, and operate the camera.
- *M-Series Quick Start Guide* (FLIR Doc. # 432-0003-60-11) is a double-sided card that shows the functions executed by the various JCU buttons.
- *M-Series Interface Control Document (ICD)* (FLIR Doc. # 432-0003-XX-YY) is an extensive set of CAD drawings with detailed component dimensions, wiring schemes, mounting dimensions, and several possible system configurations using more than one JCU.

Documentation Conventions

For safety, and to achieve the highest levels of performance from the M-Series system, always follow the warnings and cautions in this manual when handling and operating the M-Series camera system.

Warning!

Warning notices are used to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury or death exist with this equipment, or may be associated with its use.

Caution!

Caution notices are used where equipment might be damaged if care is not taken or an operation might have an unexpected outcome.

Note: Notes call attention to information that is especially significant to understanding and operating the equipment.

Warnings and Cautions

Warning!

Do not use the M-Series imaging system as the primary navigation system. Use it in conjunction with other navigation aids and a primary manual navigation system.

Use of insufficient wire gauge can result in fire.

The M-Series system is not designed to operate in an enclosed environment in the presence of flammable gases. Failure to follow this warning may result in explosion or fire.

The M-Series camera body is a remotely and automatically controlled device. Ensure camera motion has been disabled before cleaning surfaces that can cause pinch hazards.

Caution!

Do not open the M-Series camera unit for any reason. Disassembly of the camera (including removal of the cover) can cause permanent damage and will void the warranty.

Be careful not to leave fingerprints on the M-Series camera optics.

The M-Series requires a power supply of 12 Vdc to 24 Vdc nominal, 50 watt maximum. Absolute voltage range: 10 Vdc to 32 Vdc. Operating the camera outside of the specified input voltage range or the specified operating temperature range can cause permanent damage.

Ensure power is removed before accessing power wires during installation or removal of system components. DO NOT HOT SWAP components (such as the JCU). Damage to equipment or injury to personnel may result.

During installation, ensure the cables exiting the bottom of the camera are not in contact with sharp edges, do not bend at sharp angles, and are not pinched between the bottom of the camera and the mounting surface. Do not pull on the cables with excessive force.

Follow industry standard best practices to avoid subjecting the camera to galvanic corrosion and electrolytic corrosion (electrolysis), especially with regards to the camera connections, camera base, its mounting surface, and all fasteners.

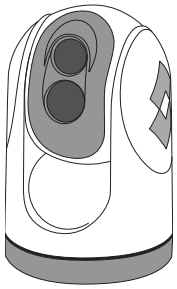
Ensure the camera is installed in a location that will allow it to be accessed for regular periodic cleaning (fresh water rinse), inspection of mounting point integrity and mechanical soundness, and preventative maintenance.

Installation Overview

The M-Series camera system includes these standard components:

- Pan/tilt camera unit
- Joystick control unit (JCU) and JCU cover
- 7.7 meter (25-foot) F-type to BNC video cable
- 7.7 meter (25-foot) double-shielded Ethernet cable
- Weather-tight Ethernet coupler
- Four (4) noise suppression ferrites

Joystick Control Unit



Dual Payload Pan/Tilt Camera

Note: The mounting hardware included with the camera includes the following. For installations with special requirements, you may need to substitute other mounting hardware:

- Mounting hardware and connectors
- Six M6 x 60 stainless steel-threaded studs with washers and nylock nuts or acorn nuts, for attaching the M-Series camera body. The length required depends on the mounting platform thickness. See Camera Mounting Options, pg. 8 for more details.

You will need to supply the following items; required lengths vary depending on your boat's configuration. These items are available in standard lengths through FLIR Systems, Inc.

- Electrical wire, for system power; up to 30.5 meters (100 feet), 3-conductor, gauge determined by cable length and supply voltage; see Electrical Connections, pg. 13 for details.
- Camera grounding strap.
- Additional coaxial RG59/U video cables, if required (F-style connector at the camera end).
- Ethernet cables, if required, up to 100 meters (328 feet).
- Miscellaneous electrical hardware, connectors, and tools.

Optional configurations have additional requirements:

- For a top-down installation, you may need an optional Top-Down Installation Kit. See Camera Mounting Options, pg. 8 for more information about the mounting kit.
- If you plan to install more than one JCU or additional cameras, additional network hardware (a PoE switch or a non-PoE switch with a PoE injector) is required. See Multiple JCU/Camera Installations, pg. 10 for more details.

Contact FLIR Systems, Inc. for more information regarding available accessories including JCUs, PoE equipment, video distribution amplifiers, cables, connectors, and mounting hardware.

Installation Planning

A number of factors must be considered when planning the installation of the M-Series camera and JCU. It is good practice to test the unit at the planned installation location with typical vessel electronics active prior to mounting the camera.

General Location Considerations

Determine a good location for mounting the M-Series camera unit and the JCU. The camera requires at least three connections:

- One for power
- One network connection to the JCU or a PC
- One or two connections for the analog video

Optionally, more than one JCU can be used to control the camera and more than one display can be used to view the video. Also a single JCU can be used to control more than one camera. The JCU and the video monitor are mounted close together, as a pair, so the video can be viewed when the camera position (pan or tilt) is changed with the JCU.

Consider the following points when determining the camera location:

- Mount the IP56-rated M-Series camera body as high as practical, without interfering with radar, navigational, or communications electronics.
- Minimize the degree to which vessel structures block the camera's 360° view.
- Mount the camera as close to the vessel's center line as possible so you will have a symmetrical view of on-coming traffic, obstacles, and other navigational hazards.
- The M-Series camera has a "forward" direction adjustment which has been set at the factory. This is the direction directly toward the front of the vessel. Icons on the video show the direction the camera is facing in relation to an outline of a ship. After installation, the forward direction of the camera may be verified and adjusted if required. Refer to *M-Series Operator's Manual* (FLIR Doc. # 432-0003-60-10).

- A camera mount suited for the camera mass and potential vibration and mechanical shock is important for proper camera functioning. The camera is tested to hold position for mechanical shock up to 9 g transverse and 15 g vertical. Improper mounts that are loose and/or resonate can magnify vessel impacts causing the camera to be unable to maintain pointing direction.
- A final location consideration is the camera's relation to other navigation devices. If you are relying on a magnetic compass for navigation and direction, you should establish a "compass safe distance" for any object placed in its vicinity, especially any electronic equipment. The magnetic compass safe distance for the camera is 20 cm (7.9 in).
- Ensure the camera is installed in a location that will allow it to be accessed for regular periodic cleaning (fresh water rinse), inspection of mounting point integrity and mechanical soundness, and preventative maintenance.

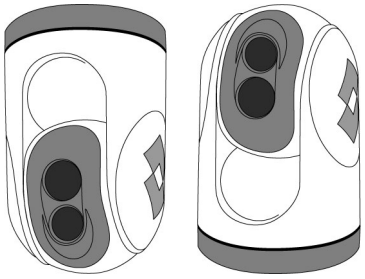
Camera Mounting Options

The M-Series camera can be installed in an upright or upside down position.

Caution!

When mounted in a ball-down position, ensure adequate drainage such that standing water does not collect above the cable glands. Standing water will eventually seep past the cable gland seals and compromise the electronics. Failure to properly install or seal these glands may void the camera warranty.

In most installations, the M-Series is mounted upright on a mounting surface, with the pan/tilt base below the camera—ball up orientation. Optionally, the unit can be hung upside down—ball down orientation. Unless otherwise noted, these mounting instructions assume an upright installation; refer to Mounting Upside Down, pg. 12 for information about ball down installations.



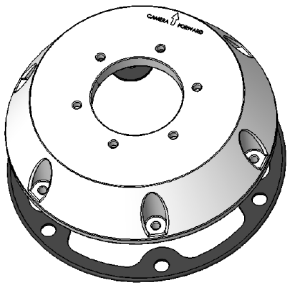
Upside down (ball down) **Upright (ball up)**

Verify that both sides of the mounting surface are accessible. With the supplied hardware, the camera can be mounted to a platform that is up to 41 mm (1.6 in.) thick. Depending on the thickness of the mounting platform, the installer can choose to provide other mounting hardware, rather than using the supplied threaded studs and nylock/acorn nuts. The camera mounting surface must be at least as large as the footprint of the camera itself to ensure an adequate seal with the O-ring.

You do not need to remove the screws in the base of the camera or disassemble the camera unit. The camera unit is sealed at the factory. Disassembling the camera will compromise the seals and will void the warranty.

Top-Down Installation Kit

If it is not possible to access the space on the other side of the mounting surface, you can mount the camera using the top-down mounting accessory kit. This type of installation makes use of a mounting riser, an optional accessory available from FLIR Systems, Inc.



Top-down riser

To install using the mounting riser, the camera is first mounted to the mounting riser, then the riser is secured to the surface with screws from above. The mounting riser allows space between the camera base and the mounting surface for the cable connections.

Camera Video Options

The M-Series camera assembly has either one or two video cables:

- The cable labeled IR is for the composite—also known as analog—video signal from the thermal (infrared) camera. This is the only cable on single payload cameras.
- On dual payload models, the cable labeled VIS/IR can source the video signal from the thermal camera or the DLTV camera as controlled from the JCU.

Joystick Control Unit (JCU)

Mount the JCU in a convenient area that is close to the monitor being used to display the M-Series video output. Ensure the area you choose has room for the cable under the JCU (refer to the M-Series ICD for dimensions). The magnetic compass safe distance for the JCU is 55 cm (21.7 in.).

The JCU can be mounted to the dash (or other surface) in any orientation, using four captive mounting screws that hold panel mounting clamps. When the mounting screws are tightened, the panel mounting clamps rotate and extend away from the JCU at a right angle, and come into contact with the mounting surface. The JCU can be mounted to dash thicknesses ranging from 0.16 cm to 4.45 cm (0.063 in. to 1.750 in.). A trim bezel snaps on top of the JCU to cover the mounting screws. See Installing the Joystick Control Unit (JCU), pg. 12 for detailed instructions.

Joystick Control Unit

JCU Connection to Camera

The JCU is a Power over Ethernet (PoE) device and can be connected to the camera directly with the included 7.6 meter (25 feet) double-shielded Ethernet cable or a user-supplied cable of sufficient length. In this case, the JCU draws its power from the camera.

Alternatively, the camera and the JCU can be connected together via an Ethernet switch, allowing more than one JCU or camera to be used. The JCU draws its power through the Ethernet connection, so a PoE injector or PoE switch is required.

Prior to Cutting/Drilling Holes

Determine if any interior trim panels must be removed in order to gain access to the mounting hardware, and remove them ahead of time.

When selecting a mounting location for the M-Series, consider cable lengths and cable routing. Ensure the cables are long enough, given the proposed mounting locations and cable routing requirements, and route the cables before you install the components.

If you are using the top-down installation kit, the riser should be used as a template for the location of the drill holes and cable access hole.

Caution: When installing the camera, do not tighten the fastener in the threaded hole so far that it contacts the bottom of the threaded hole. Maximum insertion should not exceed 6 mm (0.23 in.) and torque should not exceed 12 N·m (8.8 lb-ft).

Use power cables that have sufficient dimensions to ensure safety and video and communication cables that have sufficient dimensions to ensure adequate signal strength.

To ensure a proper seal between the camera unit and the vessel, an O-ring should be installed in the camera base. The O-ring will seal properly with a surface that is flat to within 0.15 cm (0.06 in) over the diameter of the base of the camera. If it is necessary to install on a surface that does not meet that criteria, a marine-grade sealant (3M 4200 or equivalent) must be used rather than the O-ring.

To ensure a proper seal around the JCU, the supplied gasket must be applied to the JCU and the cutout opening for the JCU should precisely match the template. If the cutout opening is too large, the gasket around the JCU may not cover the opening adequately.

Multiple JCU/Camera Installations

In some installations, the system may include additional components, such as additional cameras or JCUs, video equipment, or network equipment. More than one JCU can be used to control the camera, and more than one display can be used to view the video. Also a single JCU can be used to control more than one camera and optionally you can also use a PC to control the camera.

Refer also to the M-Series ICD (FLIR Doc. # 432-0003-XX-YY) for interconnect diagrams showing several possible system configurations using more than one JCU.

The following diagrams show dual-payload system configurations using a customer supplied PoE switch and a separate monitor for each video signal.

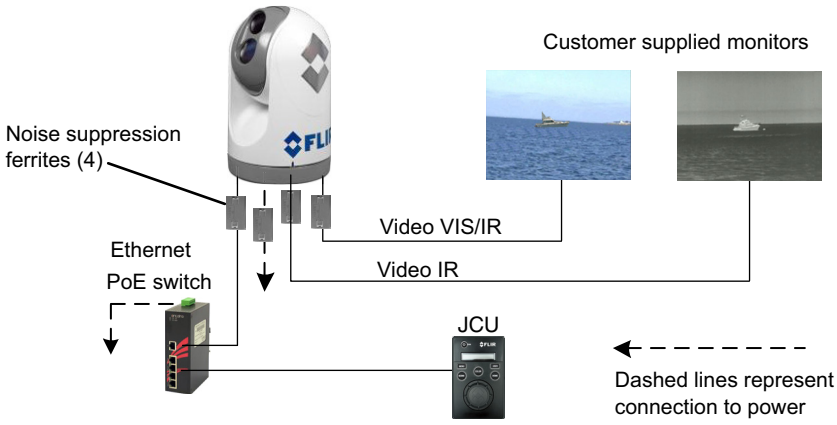


Figure 1-1: Basic installation using a customer PoE switch

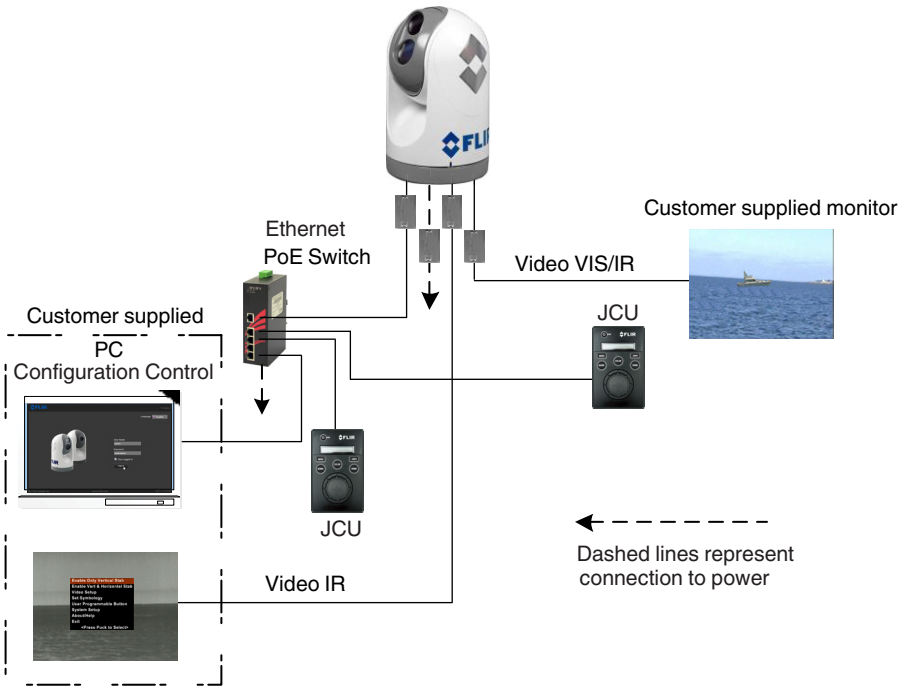


Figure 1-2: Two station installation with a PC

Physical Installation

Use a thread-locking compound such as Loctite 242 or equivalent with all metal-to-metal threaded connections.

Installing the Camera Unit

Two O-rings are provided for use during the camera installation. You should choose the one most appropriate for your configuration:

- Part # AS568A-427 is typically used for the upright installation.

  120 mm ID x 7 mm (4.75 in. ID x 0.25 in.) DIA
- Part # A3568A-334 is used for certain ball-down installations.

  67 mm ID x 5 mm (2.63 in. ID x 0.19 in.) DIA

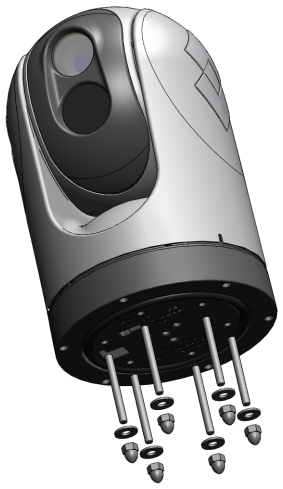
As an alternative to the mounting O-ring, you may use a marine-grade sealant such as 3M 4200 or the equivalent.

Mounting Upright

Caution!

> The cable connectors terminating the pigtail cables on the camera are not sealed connectors; therefore, appropriate sealing steps are needed to protect the connections and the camera.

Using the template supplied with the camera as a guide, mark the location of the holes for mounting the camera. Make sure the template is oriented properly relative to the bow of the vessel; observe that the forward direction is reversed for a ball-down installation. If the template is printed, be sure it is printed to scale so the dimensions are correct. If you are using the top-down installation kit, the riser itself should be used as a template for the location of the drill holes and cable access hole.



Install the six (6) threaded studs into the base of the camera with thread-locking compound. Install the rubber O-ring in the base of the camera. Thread the power supply, video, and Ethernet cables from the camera through the center hole, and then place the camera on the mounting surface so the threaded studs extend through the drilled holes. Secure the camera body to the mounting surface with the supplied nuts and washers. As needed, the threaded studs can be replaced with studs of a different length or cut to a shorter length.

Mounting Upside Down

When the camera unit is mounted in a ball down orientation, the base must be rotated 180 degrees relative to the bow of the vessel, so the internal position sensors are oriented correctly. Refer to the arrow designations on the bottom of the camera base. A camera configuration setting accessible through the camera on-screen display (OSD) menu system is used to configure the camera for the ball-down position. See the *M-Series Operator's Manual* for details.

When mounting the camera in a ball down position, the installer must ensure the camera is installed with adequate drainage so that standing water does not collect above the cable glands. Standing water will eventually seep past the cable gland seals and compromise the internal electronics.

If the base of the M-Series camera must be left exposed, the exit holes must be sealed with a Marine grade adhesive such as 3M 4200 or equivalent. Use a sufficient amount of sealant to prevent pooling of water above the glands.

Caution!

Failure to properly install or seal these glands could void the camera warranty.

Installing the Joystick Control Unit (JCU)

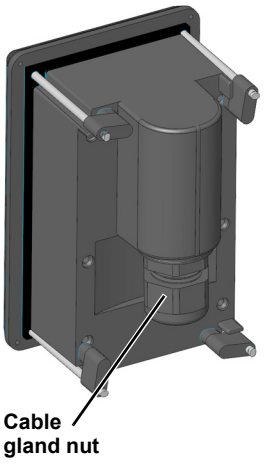
The cable gland seal is designed for use with double-shielded category 5 Ethernet cable. To ensure a good seal and to maintain compliance with EMI ratings, a double-shielded cable is required.

The JCU enclosure is rated IPX6 above the JCU mounting surface/gasket.

Caution!

An installation template is provided in the ICD. If you print the template from the PDF file, ensure that it was printed to the correct scale by checking the dimensions prior to cutting any holes.

Standard JCU Mounting Instructions

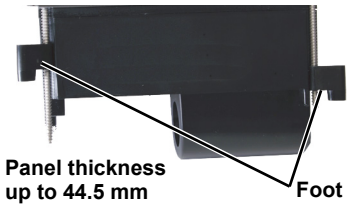


1. Using the JCU template supplied as a guide in FLIR Doc. # 432-0003-XX-YY, mark the location of the rectangular opening that will allow the JCU to be recessed in the vessel's control console. Ensure the corners are marked precisely and cut square.
2. Apply the adhesive side of the rubber gasket to the back of the JCU on the surface that faces the mounting platform. The JCU comes with 4 panel mounting clamps that can be reversed when the thickness of the panel material is less than 0.79 cm (5/16 or 0.31 in.); see instructions below. Ensure the mounting clamps are rotated inward and are recessed so the entire JCU fits into the hole
3. Remove boots from both ends of the Ethernet cable, as it may interfere with the coupling gland. The boot may cause the RJ45 connector tab to depress, which can lead to intermittent connections.
4. Loosen or remove the cable gland nut on the JCU, and insert the Ethernet cable RJ45 connector through the gland nut. Once the Ethernet cable is connected to the JCU, replace the gland nut and turn the nut 1/4 turn beyond hand tight.

5. Insert the JCU into the hole and secure by turning the 4 corner screws clockwise. Rotate each screw one full turn and ensure the mounting clamps are rotated outward from the JCU housing. Tighten the screws to draw the mounting clamps up against the mounting surface and then tighten another quarter or half turn. Do not overtighten the screws.

Mounting the JCU to a Thin Panel

As shipped from the factory, the JCU can be mounted to dash thicknesses ranging from 0.79 cm to 4.45 cm (0.31 in. to 1.75 in.). The clamps are set with the small foot on the clamp facing away from the panel and toward the front of the JCU, as shown below.



If you intend to mount the JCU to a panel of 0.79 cm (0.31 in.) thickness or less, remove the clamps from the mounting screws, turn them around and thread them back onto each of the four screws. In this configuration, the clamp foot faces the rear of the mounting surface and allows the clamp to contact thinner panel surfaces while still allowing for proper compression of the JCU mounting gasket to form a watertight seal.

Electrical Connections

Watertight connectors/enclosures should be used on each of the electrical connections. Table 1.1 shows the connections for the cables attached to the camera.

Installing Noise Suppression Ferrites

M-Series equipment and accessories conform to 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.

Ferrites are supplied with this equipment, the equipment was tested for compliance with EMC limits for a digital device with the ferrites installed.

The supplied ferrites must be installed as close to the camera as possible. Open the ferrite case and attach to each cable by clicking the case shut.

TABLE 1.1 Connections Quick Reference

Cable Label	Wire	Comment
Power	Red	Nominal 12 Vdc / 24 Vdc Absolute range 10 Vdc to 32 Vdc 50 watt maximum
	Black	DC return
	Green	Chassis ground
IR	F-Style Coax	Thermal camera video only
VIS/IR[a]	F-Style Coax	Use if only one display
JCU	RJ45	Use shielded Ethernet cable

a. VIS/IR cable is only present on dual payload models.

Caution!

Ensure power is removed including from PoE power sourcing equipment before installation or removal of system components. Damage to equipment may result.

During installation, ensure the cables exiting the bottom of the camera are not in contact with sharp edges, do not bend at sharp angles, and are not pinched between the bottom of the camera and the mounting surface. Do not pull on the cables with excessive force.

It is recommended that any built-up triboelectric charge on the Ethernet cable should be discharged *before* connecting it to the JCU and camera. This can be accomplished simply by pressing an ungloved finger across the Ethernet RJ45 connector of the cable for a few seconds.

Proper Grounding

Caution!

Ensure the camera is properly grounded. Following best grounding practices, the camera chassis ground should use the lowest resistance path possible.

Use the green wire to provide chassis ground for cable lengths under 2 m (6 ft). For longer cabling, a bonded grounding scheme with a common ground between the chassis ground and electrical return, with the connection made as close as possible to the negative terminal of the battery using a low-resistance grounding strap connected directly to one of the M6 mounting bolts. Failure to provide this connection may result in electrical interference between camera and other shipboard electronic systems.

Connecting Power

The camera itself does not have an on/off switch. Generally the M-Series camera will be connected to a circuit breaker and the circuit breaker will be used to apply or remove power to the camera. When power is supplied, the camera will be in one of three modes: Booting Up. Standby, or Powered On. The *M-Series Operator's Manual* has detailed information about powering and operating the camera.

Install a fuse in line with the power connection to protect the camera from power surge or short circuit. Table 1.2 applies to all camera models.

TABLE 1.2 Fuse Recommendations

Voltage	Fuse
12 Vdc	5 amp
24 Vdc	3 amp

The installer must use power cable wires that are sufficient size gauge or diameter for the supply voltage and total load (camera and length of cable

run), to ensure proper supply voltage at the camera and adequate current carrying capacity. Table 1.3 lists recommended wire size for various cable lengths.

TABLE 1.3 Power Cable Wire Gauge Recommendation

Length in Meters (Feet)	Wire Gauge (AWG) for 12 Vdc Supply	Wire Gauge (AWG) for 24 Vdc Supply
8 (25)	16	16
16 (50)	14	16
24 (75)	12	16
32 (100)	10	16

Warning!

Use of insufficient wire gauge can result in fire. Suggested gauge depends on supply voltage shown. For lower supply voltages, lower gauge wire must be used.

Video Connections

The video cables from the camera are terminated with F-type male connectors. Video cables of various lengths with F-type female connectors at one end and BNC-connectors at the other end are available from FLIR. The video cable used should be rated as RG59/U or better to ensure an adequate quality video signal.

Another alternative is to interconnect the camera video cable to a longer video cable using an optional F-type female-to-female adapter. For cable runs in excess of 100 feet, a video amplifier should be used.

Ethernet Connections

The Ethernet cable from the camera can be connected to another Ethernet cable with the included RJ45 waterproof enclosure connector (FLIR PN 4115028).

The Ethernet network cable should be rated for use with PoE devices (IEEE802.3af) and should be 8-conductor T568B, Ethernet, double-shielded for EMI considerations (FLIR PN 308-0163-25 or equivalent).

M-Series Reference

Introduction

This chapter includes the following reference information:

- A summary of maintenance procedures
- A table of camera specifications
- Information about standards referenced during the installation procedure
- A glossary of acronyms
- A table comparing features of various M-Series models
- A table of M-Series accessories

M-Series Maintenance

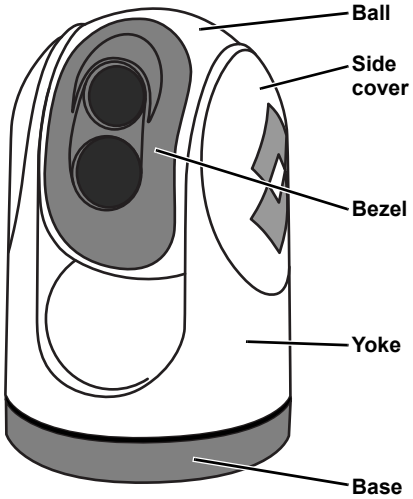
The M-Series components are designed for years of rugged, trouble-free use. When the system is not in use, keep the JCU cover in place for additional protection.

Cleaning the JCU

To clean the JCU, use a soft cloth and clean water. Mild household cleaner such as Windex can also be used to remove tougher stains or spots. Do not use alcohol based cleaners or any type of solvents as this may discolor or damage the unit.

Cleaning the Camera Optics

Great care should be used with your camera's optics. They are delicate and can be damaged by improper cleaning. The M-Series thermal camera lenses are designed for the harsh outdoor environment and have a coating for durability and anti-reflection, but may require cleaning occasionally. FLIR Systems Inc. suggests that you clean the lens when image quality degradation is noticed or excessive contaminant build-up is seen on the lens.



Rinse the camera housing and optics with low pressure fresh water to remove any salt deposits and to keep it clean. If the front window of the camera gets water spots, wipe it with a clean soft cotton cloth dampened with fresh water. If the window requires further cleaning, use a soft moist cotton-based cloth with isopropyl alcohol or dish soap.

Do not use abrasive materials, such as paper or scrub brushes as this will possibly damage the lens by scratching it. Only wipe the lens clean when you can visually see contamination on the surface. Never use ammonia-based cleaning products on the optics.

Caution!

The M-Series is sealed at the factory against liquid water, suspended particulates, and other contaminants. It is important that you not open the camera for any reason, as it will compromise this seal and possibly damage the unit. Opening the M-Series camera will void the manufacturer's warranty.

Camera Body Cleaning and Inspection

Caution: If a camera becomes loose from its mounting point unexpectedly, it could potentially cause great bodily harm or even death. Ensure the camera is accessible for regular cleaning and inspection. Routinely inspect for mounting point integrity, mechanical soundness, and any signs of corrosion or unusual wear.

Routinely inspect the camera and its mounting surface to ensure it is installed securely, the coated surfaces are intact, and there are no signs of corrosion. 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 will rotate freely and without noticeable wobble or looseness around pan bearing.

Do not pressure wash the camera, especially around the FLIR logos, as that could force water through the camera seals. Clean the interface between the yoke and base often to prevent accumulation of debris or salt deposits.

If you have a problem with your thermal camera, do not attempt to repair it yourself. The M-Series camera is a sealed unit and can not be opened or serviced in the field. Consult your installation dealer or FLIR Systems Inc. for repair information.

Specifications

Table 1.1 lists details about physical characteristics, power usage, and environmental features of your M-Series camera.

TABLE 1.1 Specifications

Physical Characteristics	
Camera Size	17.8 cm (7 in.) diameter by under 29.2 cm (11.5 in.) tall
Camera Weight	Under 5.4 kg (12 lb), depending on the camera model
Joystick Size	9.1 cm X 14.2 cm X 8.13 cm (3.6 in. X 5.6 in. X 3.2 in.) 3.17 cm (1.25 in.) above platform including joystick
Joystick Weight	0.45 kg (1 lb)
Power	
Camera Input Power	12 Vdc to 24 Vdc nominal, 50 watt max Absolute range 10.2 Vdc to 32 Vdc (–10%/+30% per IEC 60945)
Camera Output Power (to JCU)	Power Over Ethernet (PoE) per IEEE 802.3af 48V mode B PoE, RJ45
JCU Input Power	Power over Ethernet (PoE) per IEEE 802.3af
Power Consumption	25 watt nominal 50 watt max (dual payload)

TABLE 1.1 Specifications

Environmental	
Operating temperature range	–25 °C to +55 °C (–13 °F to +131 °F)
Storage temperature range	–40 °C to +85 °C (–40 °F to +185 °F)
Automatic window defrost	Standard (automatic at unit power-up)
Manual window defog	Select defog from the OSD or the Web Toolbar.
Sand/dust	Mil-Std-810E
Water Ingress	IPX6
Shock	15 g vertical, 9 g horizontal
Vibration	IEC 60945; MIL-STD-810E
Lightning Protection	Standard
Salt Mist	IEC 60945
Wind	100 knot (115.2 mph)
EMI	IEC 60945

External Standards

Table 1.2 lists other sources of information and standards definitions that may be useful during the installation of your M-Series camera.

TABLE 1.2 External References

Standard	Description
ANSI/SCTE 01 2006 “F” Port, Female, Outdoor	http://www.scte.org
IEC 60169-24	Radio-frequency coaxial connectors with screw coupling, typically for use in 75 Ohm cable distribution systems (Type F)
IEC 60945	Maritime navigation and radio communication equipment and systems general requirements
IEC 60529	Degrees of Protection Provided by Enclosures (IPX6)
IEC 60068	Basic Environmental Testing Procedures, Part 2: Tests
89/336/EEC	Electromagnetic Compatibility (EMC) directive
Directive 2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment (European Union)
Directive 2002/96/EC	Waste Electrical and Electronic Equipment Reg. 2006
TIA/EIA T568B	CAT5/RJ-45 wiring standard
IEEE 802.3 / IEEE 802.3u	10Base-T/100Base-TX Ethernet
IEEE 802.3af	Power over Ethernet (PoE) standard (48V/400mA/15.4W)
ANSI/SMPTE 170M - 1994	Composite Analog Video Signal (Supersedes RS-170A)
Directive 96/98/EC	Marine Electronics Directive (MED)

Acronyms

The following table lists each acronym that is used in this manual and its meaning.

Acronym/Term	Definition
AGC	Automatic Gain Control
ANSI	American National Standards Institute
API	Application Programming Interface
DLTV	Daylight TV, used to reference visible-band cameras
EAR	Export Administration Regulations
EMI	Electromagnetic Interference
FFC	Flat Field Correction
FLIR	Forward Looking Infrared
FoV	Field of View
FPS	Frames per Second (refresh rate)
HFoV	Horizontal Field of View
ICD	Interface Control Document
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IR	Infrared or thermal
JCU	Joystick Control Unit
LCD	Liquid Crystal Display
LWIR	Long-wave infrared
MFD	Multifunction display
NMEA	National Marine Electronics Association
NTSC	National Television System Committee
PAL	Phase Alternating Line
P/T	Pan/Tilt
PoE	Power over Ethernet
SCTE	Society of Cable Telecommunications Engineers
SDK	Software Developer's Kit
UPnP	Universal Plug and Play
Vdc	Volts, Direct Current
VIS	Visible (visible-band camera reference)

Feature Comparison of M-Series Models

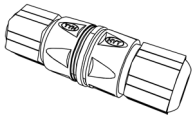
The following table lists each M-Series model and its supported features. Each model is available in four variations, identified by a unique part number:

- <9 Hz thermal frame refresh rate (FPS), NTSC video format
- 30 Hz thermal frame refresh rate (FPS), NTSC video format

Model	Part Numbers	Camera Payload	Video Format	IR Video	Color Video (DLTV)	IR Video Resolution	IR Frame Refresh Rate	Mechanical Stabilization	HFoV	IR Continuous eZoom
M-324S	432-0003-66-00S	Single	NTSC	Yes	No	336 x 256	<9 Hz	Yes	24°	to 4x
	432-0003-66-00	Single	NTSC	Yes	No	336 x 256	30 Hz	Yes	24°	to 4x
	432-0003-67-00S[a]	Single	NTSC	Yes	No	336 x 256	<9 Hz	Yes	24°	to 4x
	432-0003-67-00[a]	Single	NTSC	Yes	No	336 x 256	30 Hz	Yes	24°	to 4x
M-625S	432-0003-64-00S	Single	NTSC	Yes	No	640 x 480	<9 Hz	Yes	25°	to 4x
	432-0003-64-00	Single	NTSC	Yes	No	640 x 480	30 Hz	Yes	25°	to 4x
	432-0003-65-00S[a]	Single	NTSC	Yes	No	640 x 480	<9 Hz	Yes	25°	to 4x
	432-0003-65-00[a]	Single	NTSC	Yes	No	640 x 480	30 Hz	Yes	25°	to 4x
M-324CS	432-0003-62-00S	Dual	NTSC	Yes	Yes	336 x 256	<9 Hz	Yes	24°	to 4x
	432-0003-62-00	Dual	NTSC	Yes	Yes	336 x 256	30 Hz	Yes	24°	to 4x
	432-0003-63-00S[a]	Dual	NTSC	Yes	Yes	336 x 256	<9 Hz	Yes	24°	to 4x
	432-0003-63-00[a]	Dual	NTSC	Yes	Yes	336 x 256	30 Hz	Yes	24°	to 4x
M-625CS	432-0003-60-00S	Dual	NTSC	Yes	Yes	640 x 480	<9 Hz	Yes	25°	to 4x
	432-0003-60-00	Dual	NTSC	Yes	Yes	640 x 480	30 Hz	Yes	25°	to 4x
	432-0003-61-00S[a]	Dual	NTSC	Yes	Yes	640 x 480	<9 Hz	Yes	25°	to 4x
	432-0003-61-00[a]	Dual	NTSC	Yes	Yes	640 x 480	30 Hz	Yes	25°	to 4x
M-617CS	432-0003-68-00S	Dual	NTSC	Yes	Yes	640 x 480	<9 Hz	Yes	17°	to 4x
	432-0003-68-00	Dual	NTSC	Yes	Yes	640 x 480	30 Hz	Yes	17°	to 4x
	432-0003-69-00S[a]	Dual	NTSC	Yes	Yes	640 x 480	<9 Hz	Yes	17°	to 4x
	432-0003-69-00[a]	Dual	NTSC	Yes	Yes	640 x 480	30 Hz	Yes	17°	to 4x

a. Joystick Control Unit is not included. Camera and cables only.

M-Series Accessories

	Part number	Description
	308-0163-25	Ethernet cable, Double shielded, RJ-45, LSZH, 25 ft
	308-0163-50	Ethernet cable, Double shielded, RJ-45, LSZH, 50 ft
	308-0163-75	Ethernet cable, Double shielded, RJ-45, LSZH, 75 ft
	308-0163-100	Ethernet cable, Double shielded, RJ-45, LSZH, 100 ft
	308-0164-25	Video cable, F-Type terminated on camera end, BNC terminated on monitor end, 25 ft
	308-0164-50	Video cable, F-Type terminated on camera end, BNC terminated on monitor end, 50 ft
	308-0164-75	Video cable, F-Type terminated on camera end, BNC terminated on monitor end, 75 ft
	308-0164-100	Video cable, F-Type terminated on camera end, BNC terminated on monitor end, 100 ft
	4115028	Connector, RJ45 Waterproof Enclosure
	500-0393-00	Deluxe Dual Station Accessory Kit for M-Series (Includes Joystick Control Unit with weather cover, 25' Shielded Ethernet cable (RJ-45), 25' Video Cable, 50' Video Cable, Video Amplifier/splitter, Qty 2 12V Power over Ethernet injector, and mounting hardware)
	500-0394-00	Standard Dual Station Accessory Kit for M-Series (Includes Joystick Control Unit with weather cover, 25' Shielded Ethernet cable (RJ-45), Qty 2 12V Power over Ethernet injectors, and mounting hardware)
	500-0395-00	Joystick Control unit for M-Series (Includes Joystick Control Unit with weather cover, and mounting hardware)
	4113315	Weather Cover for Joystick Control Unit
	4113746	12V Power over Ethernet Injector
	500-0399-00	Glass Filled ABS Top-Down Riser Kit for M-Series (Includes Top Down riser, deck seal gasket, fastener kit)
	4108996	Video distribution amplifier with fusible link
	4112907	DC-DC Converter

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