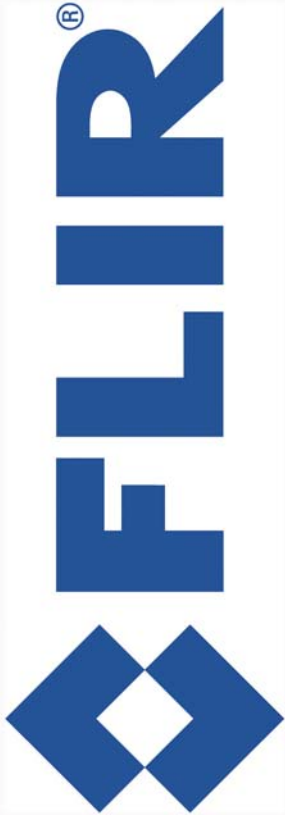

M-Series



432-0003-00-12
Revision 100
June 2009

Installation Guide

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The M-Series thermal imaging system is controlled by US export laws. There are special versions of this system that are approved for international distribution and travel. Please contact FLIR Systems if you have any questions.

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Document Number: 432-0003-00-12, Version 100

Document History

Revision	Date	Comment
100	June 2009	Initial Release

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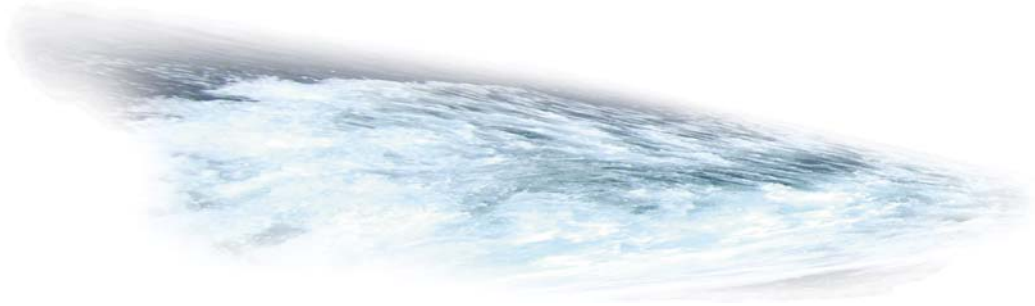
Contents

Warnings and Cautions	6
Installation Overview.....	7
Installation Components	7
Location Considerations	8
Camera Mounting Options	8
Camera Video Options	9
JCU Mounting Options	9
Prior to Cutting/Drilling Holes	10
Physical Installation	11
Camera Unit.....	11
Mounting Upside Down.....	11
Joystick Control Unit (JCU)	11
Electrical Connections	13
Connecting power	13
Video Connections.....	14
Ethernet Connections.....	14
M-Series Maintenance.....	15
Cleaning The JCU.....	15
Cleaning the camera body.....	16
Cleaning the Camera Optics.....	16
Drawings	16
Specifications	17
External References.....	18



Glossary

Acronym/Term	Definition
AGC	Automatic Gain Control
ANSI	American National Standards Institute
EMI	Electromagnetic Interference
FLIR	Forward Looking Infrared
ICD	Interface Control Document
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IR	Infrared
JCU	Joystick Control Unit
NMEA	National Marine Electronics Association
P/T	Pan/Tilt
PoE	Power Over Ethernet
SCTE	Society of Cable Telecommunications Engineers
VDC	Volts, Direct Current
VIS	Visible



Thank you for buying your new M-Series thermal imaging system. This manual describes the installation of the M-Series camera. If you need help during the installation process, call +1.888.747.3547 or +33 (0) 765.79.41.94 to speak with our support experts.



This manual includes information on the following topics:

- Installation Overview
- Mounting the camera and its components
- Connecting the electronics
- Camera maintenance

Refer to the M-Series Operator's Manual (FLIR Doc. # 432-0003-00-10) for information about how to configure, use and operate the camera.

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 in this publication 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.

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.

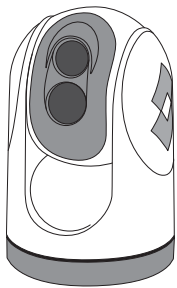
Caution: Do not open the M-Series camera unit for any reason. Disassembly of the camera (including removal of the cover) can cause permanent damage and will void the warranty.

Caution: Be careful not to leave fingerprints on the M-Series's infrared camera optics.

Caution: The M-Series requires a power supply of 12-24 VDC. Operating the camera outside of the specified input voltage range or the specified operating temperature range can cause permanent damage.

Note: The M-Series IR Thermal Imaging System is an Export Controlled item. Authorization by the U.S. Government must be obtained prior to export outside the United States.





Pan/Tilt Camera Unit



Joystick Control Unit



Top down installation using mounting plate

Installation Overview

Installation Components

The M-Series includes these standard components:

- Pan/Tilt Camera Unit
- Joystick Control Unit (JCU)
- JCU Cover
- M-Series Documentation Package (includes mounting templates, documentation CD, and so on)
- 25 foot double-shielded Ethernet cable
- Weathertight Ethernet coupler
- Mounting hardware and connectors

You will need to supply the following items, the lengths of which are specific to your boat's configuration. These items are available in standard lengths through FLIR.

- Electrical wire, for system power; up to 100' (3-conductor, gauge determined by cable length and supply voltage; Refer to the Electrical Connections section for additional information)
- Camera grounding strap
- Up to 2 coaxial RG59U video cables (with F-style connector at the camera end)
- Miscellaneous electrical hardware, connectors and tools

You may also need to purchase an optional Top Down Installation Kit. Refer to the Camera Mounting Options section for more information about the mounting kits.

If more than one JCU and/or camera are to be installed, additional network hardware (a PoE switch, or a non-PoE switch with a PoE injector) will be required.

Some installations may require you to substitute mounting hardware other than what is provided with the camera:

- Six (6) M6x60 stainless steel threaded studs with washers and nylock nuts or acorn nuts, for attaching the M-Series Camera Body. The length required will depend on the mounting platform thickness. Refer to the Camera Mounting Options section for more details.
- Four (4) captive screws for attaching the JCU as required

Contact FLIR (+1.888.747.3547 or +33 (0) 765.79.41.94) for more information regarding available accessories including JCUs, PoE equipment,



video distribution amplifiers, cables, connectors, mounting hardware, and so on.



Location Considerations

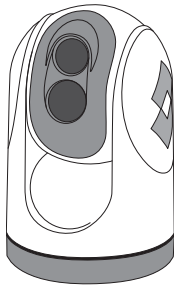
First determine a good location for mounting the M-Series camera unit and the JCU. The camera will require at least three connections: one for power, one for the JCU and one or two for the video display(s). Optionally more than one JCU can be used to control the camera, and more than one display can be used to view the video. Also a single JCU can be used to control more than one camera.

Mount the IP66-rated M-Series camera as high as practical, but without interfering with any radar, navigational or communications electronics. Choose a location that will provide the most unobstructed view. Due to its continuous-pan design, the camera will be able to rotate and point in all directions. Mount the M-Series as close to the vessel's center line as possible so it provides a symmetrical view of on-coming traffic.

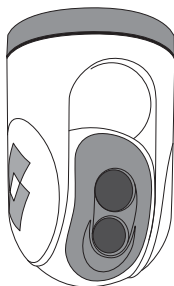
Most often, the JCU and the video monitor are mounted close together, as a pair, so the video can be viewed when the camera position (pan or tilt) is changed with the JCU.

When determining the component locations, consider how the system will be expanded in the future. For example, you may want to add an additional monitor, or perhaps a JCU and monitor pair.

Refer to the M-Series ICD (FLIR Document Number 432-0003-00) for interconnect diagrams showing several possible system configurations.



Upright installation
(ball up)



Upside down
(ball down)

Camera Mounting Options

If relying on a magnetic compass for navigation and direction, it is important to establish a "compass safe distance" for any object placed in its vicinity, especially any equipment that operates on electricity. The magnetic compass safe distance for the camera is 7.9 inches (20 cm).

Ball Up / Ball Down

In most installations, the M-Series will be mounted upright on top of the mounting surface, with the pan/tilt base below the camera (this is known as the "ball up" orientation). Optionally the unit can be hung upside down ("ball down"). Unless otherwise noted, the mounting instructions that follow assume an upright installation; refer to Mounting Upside Down section for information about ball down installations.

Once the mounting location has been selected, verify both sides of the mounting surface are accessible. With the supplied hardware, the camera



can be mounted to a platform that is up to 1.6" thick (41 mm). 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.

It is not necessary to remove the screws in the base of the camera or disassemble the camera unit. The camera unit is sealed for water tightness at the factory. Dissassembling the camera will compromise the seals and will void the warranty.

Top Down Installation Kits

Generally the M-Series camera will be secured directly to a surface using threaded studs that extend from the base through the mounting platform and are secured from below. If it is not possible to access the space below the mounting platform, it is also possible to mount the camera from above the surface with one of the "top down" mounting accessory kits. This type of installation will make use of either a mounting plate or mounting riser (these optional accessories are available from FLIR).

To install, the camera is first mounted to the accessory plate or riser, then the plate or 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. With the mounting plate, the cables pass through the plate and the connections are below the mounting surface.



Top down installation using riser

Camera Video Options

The M-Series camera provides two video outputs. One cable, labeled "IR", is for the video signal from the thermal (infrared) camera only. The other cable, labeled "VIS/IR", is for video from either the thermal camera or the low-light (visible) camera; it is switchable from the JCU.

The video from the M-Series camera can therefore be displayed on one or two video displays. If only a single display with a single video input is available, the cable labeled VIS/IR should be connected to the display. If the display has more than one video input, both video cables can be connected to the same display. In this type of installation, switching between the thermal and visible video channels is performed with the display controls, rather than the JCU.

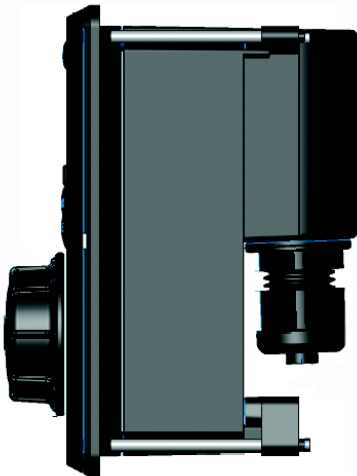
JCU Mounting Options

Mount the JCU in a convenient area that is close to the monitor that will display the M-Series video output. Make sure the area you choose will leave enough room for the cable under the JCU (refer to the M-Series ICD for



dimensions). The magnetic compass safe distance for the JCU is 21.7 inches (55 cm).

The JCU can be mounted to the dash (or other surface) in any orientation, using four (4) 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 0.063 - 1.750 inches (0.16 - 4.45 cm). A trim bezel snaps on top of the JCU to cover the mounting screws.



The JCU can be connected to the camera directly with the included 25-foot, 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; this type of configuration allows more than one JCU or camera to be used. The JCU draws its power over the Ethernet, so a Power over Ethernet (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 using one of the Top Down Installation Kits, the riser or plate itself should be used as a template for the location of the drill holes and cable access hole.

Use cables that have sufficient dimensions to ensure safety (for power cables) and adequate signal strength (for video and communications).

To ensure a proper seal between the camera unit and the vessel, an o-ring is installed in the camera base. The o-ring will seal properly with a surface that is flat to within 0.06 inches (0.15 cm) 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 5200 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 rubber grommet around the JCU may not cover the opening adequately.



Physical Installation

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



Camera Unit

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 the ball down installation. If the template is printed, be sure it is printed to scale so the dimensions are correct. If using one of the Top Down Installation Kits, the riser or plate itself should be used as a template for the location of the drill holes and cable access hole.

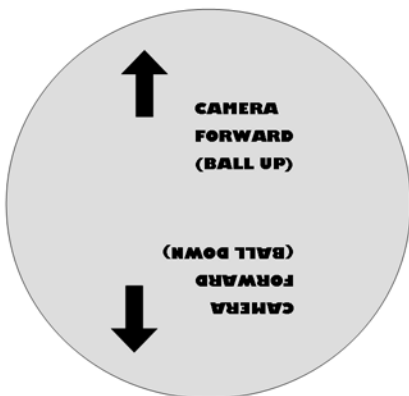
Once the holes are drilled in the mounting surface, install the six (6) threaded studs into the base of the camera with thread-locking compound. Install the rubber o-ring in the base of the camera¹. Thread the power supply, video, and ethernet cables from the camera through the center hole, and then place the camera on the mounting surface so the threaded studs extend through the drilled holes. Then 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.

As an alternative to the mounting o-ring, a marine-grade sealant such as 3M 5200 or equivalent can be used.

Mounting Upside Down

When the camera unit is mounted in an upside down orientation (with the ball down) it is necessary to mount the base rotated 180 degrees relative to the bow of the vessel, so the internal position sensors are oriented correctly. Refer to the arrow designation on the bottom of the camera base. A menu setting is used to configure the camera for the ball down position.

Note: When the camera is mounted upside down (ball down), the camera base must be rotated backwards, to point toward the stern of the vessel.

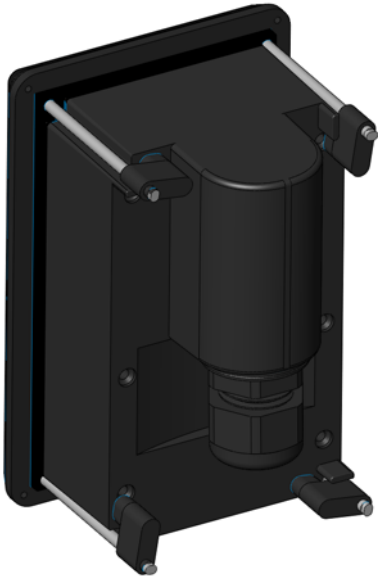


Joystick Control Unit (JCU)

Using the JCU template supplied as a guide, mark the location of the rectangular opening that will allow the JCU to be recessed in the vessel's control

¹ AS568A-427 o-ring [5.25in OD x 0.25in DIA.] 134mm OD x 7mm DIA.





console. Be sure to follow the template closely when cutting the hole. In particular, ensure the corners are marked precisely and cut square.

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 5/16 inches (0.31", 0.79 cm; see instructions below). Ensure the mounting clamps are rotated inward and are recessed so the entire JCU will fit into the hole.

It may be most convenient to connect the JCU Ethernet cable at this time, before inserting the JCU into the hole and securing the JCU to the console platform. Refer to the Ethernet Connections section for information about the JCU Ethernet connection.

Caution: Use double shielded ethernet cable only to maintain the water tight design. If the cable is connected at this time, ensure the cable gland sealing nut is tightened properly.

Secure the JCU 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 1/4-1/2 turn. Do not overtighten the screws.

As shipped from the factory, the JCU can be mounted to dash thicknesses ranging from 0.31 - 1.750 inches (0.79 - 4.45 cm). 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.



JCU Clamp reversed for mounting JCU to thin panel

If you intend to mount the JCU to a panel of 0.31 inches (0.79 cm) 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. The figure to the left shows an installation with the clamp reversed.





Electrical Connections

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

TABLE 1. Connections Quick Reference

Cable Label	Wire	Comment
Power	Red	+12VDC to +24VDC, 3.8-1.9 AMP maximum
	Black	DC Return
	Green	Chassis ground
VIS/IR	F-Style Coax	Use if only one display
IR	F-Style Coax	Thermal Camera video only
JCU	RJ45	Use shielded Ethernet cable

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. If power is supplied to it, the camera will be in one of three modes: Booting Up, Standby, and Powered On. Refer to the M-Series Operator's Manual for more information about powering up and operating the camera.

The power cable supplied by the installer must use wires that are sufficient size gauge (or diameter) for the supply voltage and length of the cable run, to ensure adequate current carrying capacity. Refer to the following table for the recommended wire size for various cable lengths:.

TABLE 2. Recommended Power Cable Wire Gauge

Length, in feet (meters)	Wire Gauge [AWG] for 12V supply	Wire Gauge (AWG) for 24V supply
25 (8)	16	18
50 (16)	14	18
75 (24)	12	18
100 (32)	10	18

Ensure the camera is properly grounded. Typical to good grounding practices, the camera chassis ground should be provided using the lowest resistance path possible. FLIR recommends using a grounding strap anchored to one of the M6 mounting bolts in the base of the camera and connected



to the nearest grounding point on the vessel for a high-conductive path to the vessel ground.

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 RG59U 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 adaptor (FLIR PN 4115330).

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).

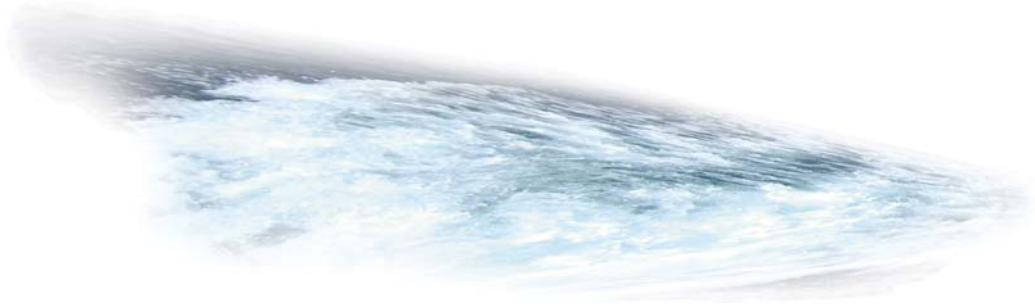
The Ethernet network cable should be rated for use with PoE devices (IEEE802.3af) and should be 8-conductor T568B, Ethernet, double-shielded for EMI considerations (FLIR PN 308-0163-25 or equivalent).

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.

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 IP66 above the JCU mounting surface/gasket and rated IP64 behind or below the gasket.





M-Series Maintenance

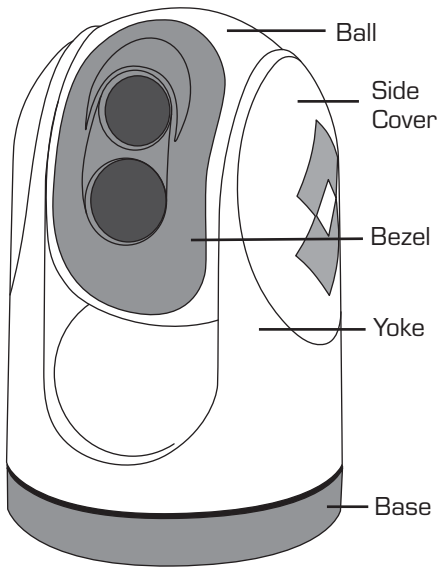
The M-Series components are designed for years of rugged, trouble-free use. When the system is not in use, keep the JCU cover in place for additional protection.



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.

Caution: Do not use alcohol based cleaners or any type of solvents as this may discolor or damage the unit.



Cleaning the camera body

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.

Caution: The M-Series is sealed at the factory against atmospheric humidity, 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.

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.

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.

Drawings

An extensive set of CAD drawings is included on the M-Series Documentation CD. Many of these drawings are .pdf files that can be viewed with Adobe Acrobat Reader. The drawings are also available from the FLIR web site:

<http://www.flir.com/cvs/americas/en/maritime/ae/>



Specifications

TABLE 1. Specifications

Physical Characteristics	
Camera Size	7" diameter by 10" tall
Camera Weight	Less than 11 lb., depending on the camera model
Joystick Size	3.6" X 5.6" X 3.2" 1.25" above platform including joystick
Joystick Weight	1 lb.
Power	
Camera Input Power	12 VDC to 24 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
Consumption	25W Nominal, 50W Max

The drawings included in this document provide more detailed dimensions and mounting information. If you have any questions, call the Applications Experts at FLIR: +1.888.747.3547 or +33 (0) 765.79.41.94.

Caution: If the installation template is printed from the .pdf file, the printout may not be to scale. Be sure to check the dimensions prior to cutting any holes.



External References

Reference
FLIR 432-0003-00-10 M-Series Operator's Guide
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 Ω 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)





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