

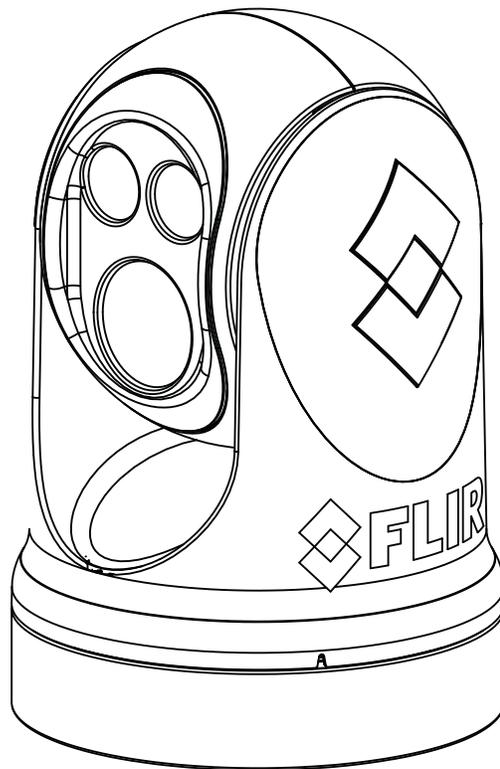


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# Installation Guide

## M400

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**Proper Disposal of Electrical and Electronic Equipment (EEE)**



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In accordance with these regulations, all EEE products labeled with the “crossed out wheeled bin” either on the product itself or in the product literature must not be disposed of in regular rubbish bins, mixed with regular household or other commercial waste, or by other regular municipal waste collection means. Instead, and in order to prevent possible harm to the environment or human health, all EEE products (including any cables that came with the product) should be responsibly discarded or recycled.

To identify a responsible disposal method where you live, please contact your local waste collection or recycling service, your original place of purchase or product supplier, or the responsible government authority in your area. Business users should contact their supplier or refer to their purchase contract.

**Document History**

Version	Date	Comment
100	December 2015	Initial release
110	July 2016	Video Tracking, Firefighter modes added.

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# Installing the M400

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## General Information

This manual describes the installation of the M400 system. If you need help or have additional questions, please call to speak with our support experts; see the phone numbers on the back cover of this manual.

The multi-sensor M400 is a stabilized maritime thermal and visible-light camera system for use on most types of vessels. Its state-of-the-art long wave infrared (LWIR) thermal camera provides excellent nighttime visibility and situational awareness, without any form of natural or artificial illumination. The HD visible-light camera with 30X optical zoom provides daytime viewing.



**M400 Pan/Tilt Camera System**

## Standard Features

- Pan/Tilt provides continuous 360° pan and +/- 90° tilt.
- Active gyro-stabilization provides steady, long-range viewing.
- Video tracking locks on and follows objects as long as they are in view (M400XR only).
- Firefighter mode provides user-adjustable colored temperature bands to aid in identifying hot spots that may be visually obscured by smoke (M400XR only).
- High intensity LED spotlight

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## General Information

The M400 should be installed by a qualified marine electronics technician; incorrect installation could void the warranty.

This manual includes information about the following topics:

- Installation overview and planning
- Mounting the camera and installing the Joystick Control Unit (JCU II)
- Connecting the electronics
- Configuration and Communication using a PC
- Maintaining the camera
- Parts list and other reference information



## Additional Installation Components

Contact FLIR Systems, Inc. for more information regarding available accessories including additional JCU IIs, PoE equipment, video distribution amplifiers, Serial to Ethernet servers, NMEA Multiplexers, etc.

The Ethernet interface to the M400 camera must support a minimum 100 Mbps communication; the camera will not communicate at 10 Mbps. This requirement is met if using the supplied PoE+ switch. In order to provide high quality streaming digital video over the Ethernet network, the network should have a minimum bandwidth of 100 Mbps. Video streams can be adjusted to use a lower bandwidth, but video quality may be affected.

## Additional References

Your M400 camera comes with a complete documentation set available from the FLIR Systems, Inc. Web site. All documents are in PDF format and can be viewed with Adobe Acrobat Reader:

- *M400 Operator's Manual* (FLIR Doc. # 432-0012-00-10) contains information about how to configure and operate the camera.
- M400 Quick Start Guide (FLIR Doc. # 432-0012-00-11) is a card used as a reference for the functions executed by the various JCU II buttons.
- M400 ICD (FLIR Doc. # 432-0012-XX-41) is an Interface Description Document providing detailed installation information.

For safety, and to achieve the highest levels of performance from the M400 system, always follow the warnings and cautions in this manual when handling and operating the M400 camera system.

**Warning notices** are used to emphasize conditions that could cause personal injury or death existing with this equipment, or that may be associated with its use.

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

**Notes** call attention to information significant to understanding and operating the equipment.

## Warnings and Cautions

**Warning:** Do not use the M400 imaging system as the primary navigation system. Use it in conjunction with other navigation aids and a primary manual navigation system.

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

**Warning:** The M400 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.

**Warning:** Use of insufficient wire gauge can result in fire.

**Warning:** The M400 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 M400 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 M400 camera optics.

**Caution:** The M400 requires a power supply of 12 Vdc to 24 Vdc nominal, 5.5 A maximum @ 24 Vdc, 11 A maximum @ 12 Vdc. Absolute voltage range: 12 Vdc to 32 Vdc. Operating the camera outside of the specified input voltage range or the specified operating temperature range can cause permanent damage.

Operating temperature range	-20 °C to +55 °C (-4 °F to +131 °F) per IEC 60945
Storage temperature range	-50 °C to +80 °C (-58 °F to +176 °F)

**Caution:** During installation, ensure the cables exiting 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.

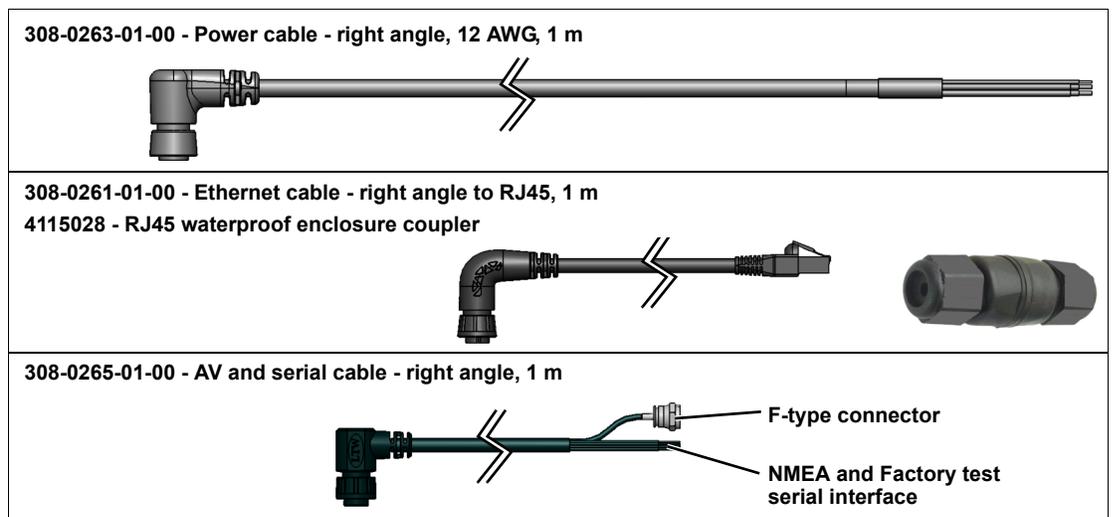
## Installation Overview

The M400 includes these standard components:



The standard cable set shipped with the M400 system is shown below in Figure 1-1. See “[M400 Interface Control Document](#)” on page 55 for the location of cable connections on the bottom of the M400 camera.

Contact FLIR Systems, Inc. for information on additional cables, shown in Table 1.1, which may be purchased.



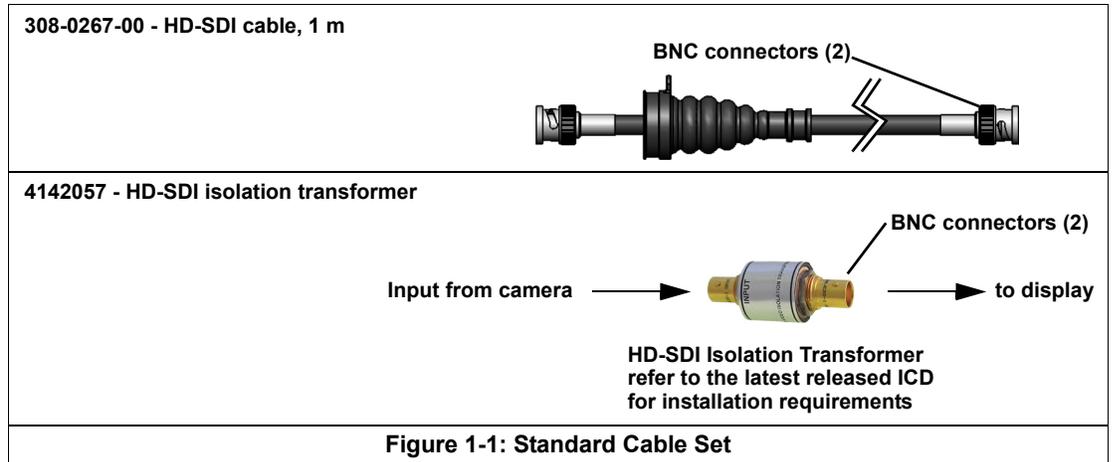


TABLE 1.1 Additional Cables Available from FLIR

Part Number	Description
308-0260-01-00	Cable - Ethernet to RJ45, 1 m
308-0262-01-00	Power Cable - 12 AWG, 1 m
308-0264-01-00	Cable - AV and serial, 1 m
4141864	Cable - HD/SDI, 100 ft
308-0251-30-00	Cable - Ethernet to RJ45, 100 ft, LSZH
308-0252-30-00	Cable - Ethernet, RA to RJ45, 100 ft, LSZH
308-0253-30-00	Cable - Power, 12 AWG, 100 ft, LSZH
308-0254-30-00	Cable - Power, right angle, 12 AWG, 100 ft, LSZH
308-0255-30-00	Cable - AV and serial, 100 ft, LSZH
308-0256-30-00	Cable - AV and serial right angle, 100 ft, LSZH

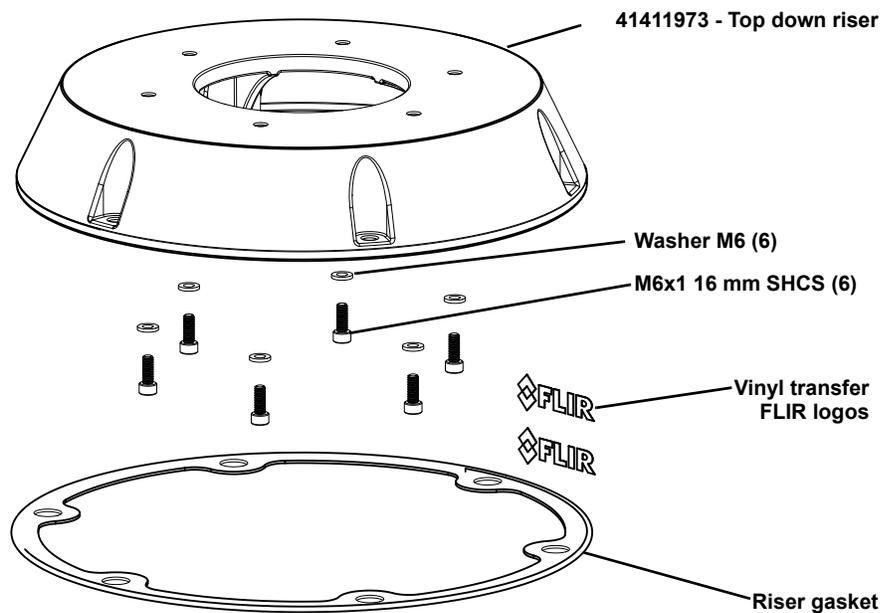


Figure 1-2: Top down riser kit

You will need to supply the following items depending on planned installation:

- For Top Down Riser—Six (6) M8 stainless steel bolts and washers to secure the top down riser after the camera is attached—bolt length depends on mounting platform thickness.  
Recommended:  
M8 socket head cap screws, or  
5/16" - 18 socket head cap screws, or  
5/16" - 18 hex head sheet metal screws type 316 stainless steel  
Apply thread locker (Loctite 262 or equivalent)
- One or more multi-function displays (MFD) or other analog or digital video display devices
- Coaxial RG6 video cable to customer-supplied analog video monitors
- Coaxial RG6 video cable to customer-supplied HD-SDI digital video monitors
- Ethernet cables to connect the M400 and the JCU II to the PoE Ethernet switch, 8-conductor T568B
- Ethernet cables to connect to the ship's Ethernet port, 8-conductor T568B
- Miscellaneous electrical hardware, connectors, and tools

### **General Location Considerations**

**Warning:** The M400 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.

First determine a good location for mounting the M400 system body, JCU II, and PoE switch. The system has four cable connections:

- Power
- Ethernet connection to the PoE switch from the M400 system body for the JCU II; the switch requires an Ethernet connection to the JCU II (customer supplied) and to a shipboard network (optional).
- HD-SDI digital video
- Composite analog video and serial data (NMEA and factory test)

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

When determining the component locations, consider how the system may be expanded in the future. For example, adding an additional monitor, or perhaps a JCU II and monitor pair.

Consider the following points when determining the camera location:

- Mount the M400 camera body as high as practical, but without interfering with any radar, navigational, or communications electronics.
- To minimize interference with video signals, the camera body must be mounted a minimum of 1 meter away from any radio frequency antenna.
- Minimize the degree to which vessel structures block the camera's 360° view. The camera's continuous-pan design lets it rotate and point in all directions.

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## System Installation

- It is a good practice to test the unit at the planned installation location with typical vessel electronics active prior to mounting the camera.
- 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 M400 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. Refer to the latest Interface Description Document for details. After installation, the forward direction of the camera must be verified and adjusted if required. Refer to *M400 Operator's Manual* (FLIR Doc. # 432-0012-00-10).



**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.

- An appropriate 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.
- When selecting a mounting location for the M400 system, 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.
- 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 1.5 mm (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 this criteria, a marine-grade sealant (3M 4200 or equivalent) must be used rather than the O-ring.
- A final location consideration is the relation between the camera and other navigation devices. If relying on a magnetic compass for navigation and direction, 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 40 cm (15.7 in).

## System Installation

In most installations, the M400 is mounted upright on top of a 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 or ball down. Once the mounting location has been selected, verify that both sides of the mounting surface are accessible. 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.

Use a thread-locking compound such as Loctite 262 or equivalent with all metal-to-metal threaded connections.

**Caution:** Use all six mounting holes to secure the camera rigidly.

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

### Mounting Upright

The cable connectors terminating the pigtail cables on the camera are waterproof, vibration tolerant, twist pin connectors designed for the marine environment. Appropriate sealing steps are needed when making connections to on-board systems.

**Caution:** If you print the template from the PDF file, ensure that it is printed to the correct scale by checking the dimensions prior to cutting any holes.

Using the template as a guide, mark the location of the holes for mounting the camera

Once the holes are drilled in the mounting surface, 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 mounting bolts extend through the drilled holes. Secure and seal the camera body to the mounting surface.

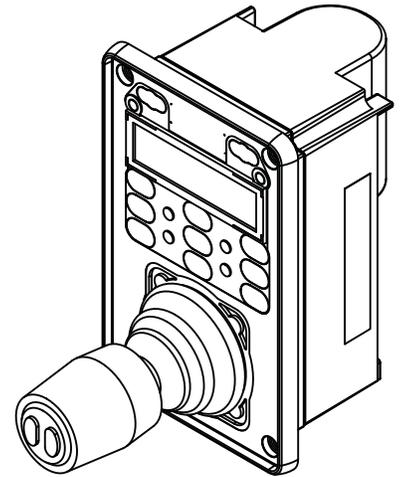
### Mounting Upside Down

When a camera is going to be mounted upside down (ball down), a menu setting is used to configure the system for ball down operation. Set the camera orientation after the camera the camera is installed. Refer to [“Configure Ball Down Installation” on page 34](#).

### Installing the Joystick Control Unit (JCU II)

Mount the JCU II in an area that is close to the monitor being used to display the M400 video output. Make sure the area you choose leaves enough room for the cable under the JCU II. The magnetic compass safe distance from the JCU II is 55 cm (21.7 in).

The JCU II can be mounted to the dash 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 II at a right angle, and come into contact with the mounting surface. The JCU II 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 II to cover the mounting screws. See [“Installing the Joystick Control Unit \(JCU II\)” on page 12](#) for detailed instructions.



**Joystick Control Unit**

**JCU II Connection to Camera**

The JCU II is a Power over Ethernet (PoE) device and can be connected to either the supplied PoE Ethernet Switch or a customer supplied PoE injector.

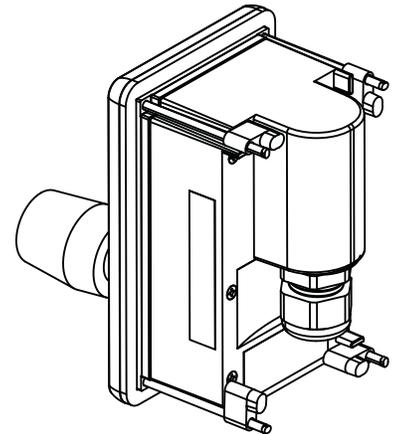
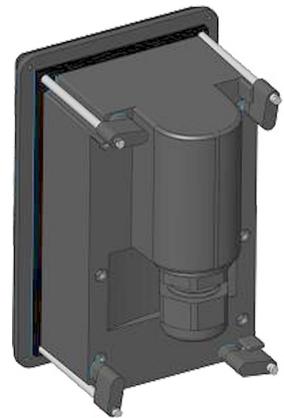
To ensure a proper seal around the JCU II, the supplied gasket must be applied to the JCU II and the cutout opening for the JCU II should precisely match the template. If the cutout opening is too large, the gasket around the JCU II may not cover the opening adequately.

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.

**Caution:** 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 II Mounting Instructions**

1. Using the JCU II template supplied as a guide, mark the location of the rectangular opening that will allow the JCU II 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 II on the surface that faces the mounting platform. The JCU II comes with 4 panel mounting clamps that can be reversed when the thickness of the panel material is less than 7.9 mm (5/16 or 0.31 in); see instructions below. Ensure the mounting clamps are rotated inward and are recessed so the entire JCU II 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 II, and insert the Ethernet cable RJ45 connector through the gland nut. Once the Ethernet cable is connected to the JCU II, replace the gland nut and turn the nut 1/4 turn beyond hand tight.
5. Insert the JCU II into the hole and secure with the 4 corner screws. Rotate each screw one full turn and ensure the mounting clamps are rotated outward from the JCU II housing. Tighten the screws to draw the mounting clamps up against the mounting surface and then tighten another quarter or half turn. Do not over tighten the screws.

**Joystick Control Unit - Back**

**Mounting the JCU II to a Thin Panel**

As shipped from the factory, the JCU II can be mounted to dash thicknesses ranging from 7.9 mm to 44.5 mm (0.31 in to 1.75 in). The clamps are set with the small foot on each clamp facing away from the panel, as shown.



**Panel thickness  
up to 44.5 mm**

If you intend to mount the JCU II to a panel of 7.9 mm (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. The foot on each clamp now faces the panel and allows the clamp to contact thinner panel surfaces while still allowing for proper compression of the JCU II mounting gasket to form a watertight seal.



**Panel thickness  
less than 7.9 mm**

**Mounting the JCU II Key Pad Front Cover**

**Note:** The JCU II is shipped without the front cover installed. The face of the JCU II has an adhesive layer, covered by a removable film, to secure the front cover after the JCU II is installed in its final location.

1. Pull up the tab to remove the adhesive protection film and expose the adhesive layer.
2. Install the key pad front cover over the joystick ensuring that the joystick boot is not caught between the cover and the JCU II.
3. Position the cover starting with the bottom corners and then press into the adhesive on all edges. The cover should snap into place flush with the JCU II bezel.



## Electrical Connections

Watertight connectors/enclosures should be used on each of the electrical connections. Table 1.2 describes the connections for the cables attached to the camera.

**Warning:** Ensure power is removed before accessing power wires during installation or removal of system components. Damage to equipment or injury to personnel may result.

**Caution:** 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.

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

**TABLE 1.2 Connections Quick Reference**

Cable Label	Connectors	Comment
Power	Red	Nominal 24 Vdc Absolute range 12 Vdc to 32 Vdc 2.5 A typical, 5.5 A max maximum @ 24 Vdc; 5 A typical, 11 A max maximum @ 12 Vdc
	Black	Vdc return
	Drain	Chassis ground
HD/SDI	BNC style Coax	Digital video with isolation
Analog Video and serial cable	F-type style Coax and pigtail for serial (NMEA/factory test)	Analog video
Ethernet	RJ45	Use shielded Ethernet cable for connection to PoE switch providing power to JCU II and optional connection to shipboard network.

### Connecting Power

The camera itself does not have an on/off switch. Generally the 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, Parked, or Powered On. The M400 *Operator's Manual* has detailed information about powering and operating the camera.

Installation of a circuit breaker (or fuse) in line with the power connection is required to protect the power wiring and camera from power surge or short circuit.

**TABLE 1.3 Fuse Recommendation**

Model	Fuse
M400	12 amp, slow blow at lowest voltage range (12 Vdc)

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.

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## Electrical Connections

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

**TABLE 1 4. Typical Power Cable Wire Gauge**

Length in Meters (Feet)	Wire Gauge (AWG) for 12V Supply	Wire Gauge (AWG) for 24V Supply
8 (25)	16	18
16 (50)	14	18
24 (75)	12	16
32 (100)	10	16

## Proper Grounding

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

Failure to provide this connection may result in electrical interference between camera and other shipboard electronic systems. Furthermore, it is recommended that a bonded grounding scheme is used 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.

## Video Connections

Video cables of various lengths with different connectors at one end are available from FLIR. The video cable used should be rated as RG6 to ensure an adequate quality video signal. For cable runs in excess of 100 ft, a video amplifier should be used.

## Ethernet Connections

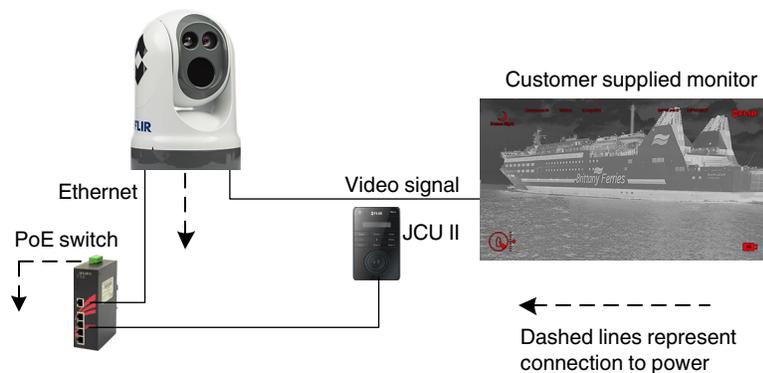
The Ethernet cable from the camera can be connected to another Ethernet cable with an RJ45 waterproof enclosure connector (FLIR PN 4115028). The Ethernet network cable should be 8-conductor T568B, Ethernet, double-shielded for EMI considerations.

# Installation Examples

This chapter describes several typical installations using standard and optional accessories.

## Basic Standard Installation

The JCU II selects which video output to view (IR or visible) on the monitor and to control the camera configuration using the OSD menus. If two JCU II are used (see Figure 2-2), typically, they are installed in different locations aboard the vessel, each with a monitor. They both can be switched on and enabled at the same time. The video to the monitor can be either the HD-SDI video signal or the composite analog video signal to match the customer supplied monitor. NMEA/ serial data connections and digital IP video connections are not shown below.



**Figure 2-1: Basic Single-Station System**

## Video Streams

The M400 system provides five configurable video outputs.

Two video streams are provided on separate connectors:

- one analog composite video
- one HD-SDI digital video

Both video streams are configurable using the camera Web Server to show video from the active camera, the secondary camera, or to always show video from one or the other.

Three digital video streams are provided over the Ethernet connector:

- VIDEO\_0 always shows the DLTV visible stream (HD res)
- VIDEO\_2 always shows the IR stream (HD res)
- VIDEO\_4 always shows Live View (low res) video on the camera Web Server page configurable to show the active camera, the secondary camera, or to always show video from one or the other.

## Digital Video and PC Interface

A computer (PC) on the network can control and configure the camera using a web browser (see “[IP Interface and PC Operations](#)” on page 20). Additionally, both IR and DLTV digital video streams are available on the Ethernet connection to a shipboard network for use by a video management system (VMS) or a network video recorder (for example, FLIR DNR400 Series) to record video streams and provide other features such as video storage and backup. Refer to the documentation for the VMS or video recorder for operation and setup details.

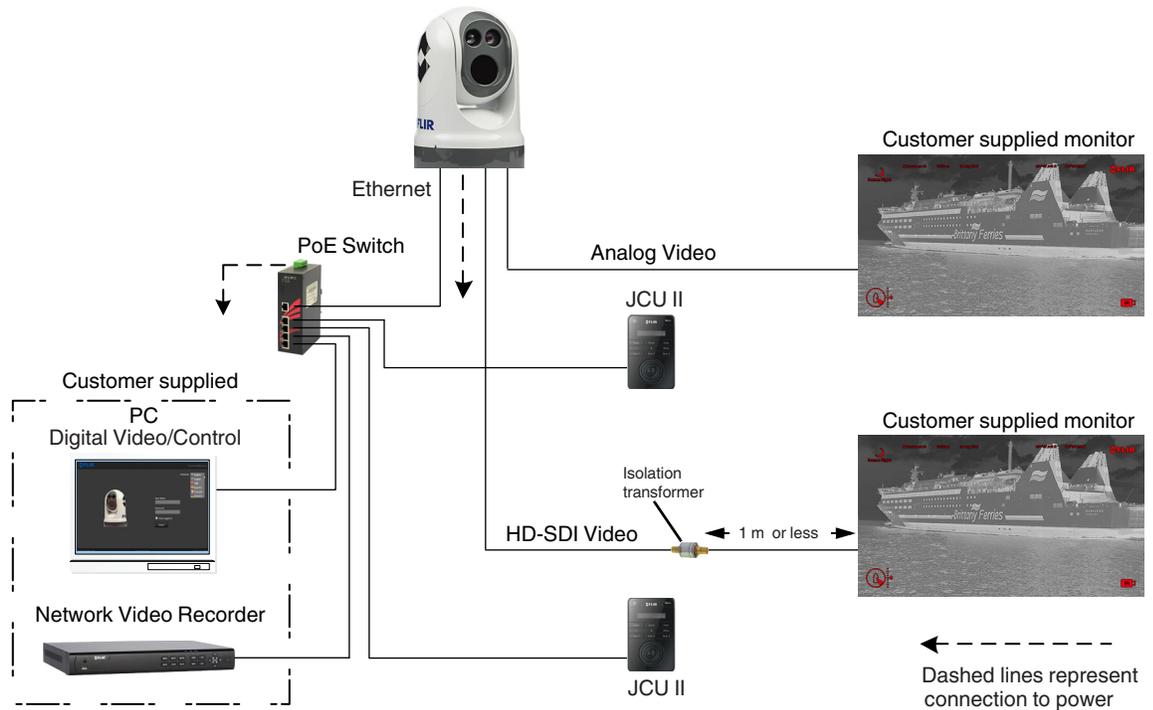


Figure 2-2: Three-Station System with Video Recorder

## FLIR DNR400-Series Connection

1. Open a web browser and enter the camera IP address to log in with the **admin** user name.
2. Ensure that the VMS Remote INTERFACE 1 driver (ONVIF v2.0) is enabled. Refer to “[Maintenance->Sensor->Communications->VMS Remote](#)” on page 33.
3. Connect the camera Ethernet to the switch, as shown in Figure 2-2.
4. Connect the video recorder on the same Ethernet network.  
The DNR400 video recorder must be connected to the Internet to utilize  services.
5. Follow the instructions in the VMS or video recorder documentation to discover the camera.

## Installation of other Shipboard Systems

### NMEA 0180 Interface

Serial NMEA 0183 interface devices (radar interface for example) can be connected via a Serial port into the M400 system. The NMEA serial interface is included as pigtail leads on the composite analog video/serial cable.

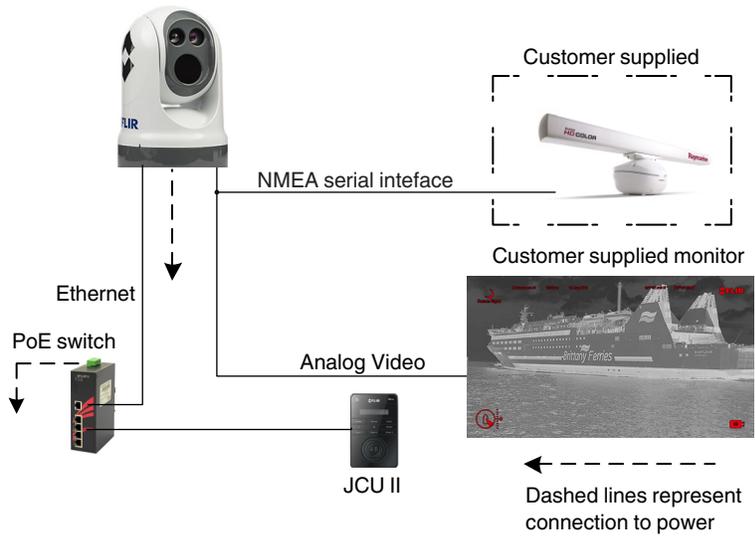


Figure 2-3: Shipboard System

# IP Interface and PC Operations

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The M400 cameras and JCU IIs are network devices that communicate over an Ethernet network using Internet Protocol (IP). In addition to using the JCU II to control and configure a camera, a user or installer can also complete similar operations and more advanced configurations using a Web browser<sup>1</sup> to view the video and control the camera.

Once the camera is connected to a network and powered on, a video management system (VMS) or a network video recorder (for example, FLIR DNR400 Series) can record video streams and provide other features such as cloud storage. Refer to the documentation of any VMS or video recorder for operation and setup details.

The M400 camera and JCU II are shipped with Dynamic Host Configuration Protocol (DHCP) enabled to assign IP addresses. During installation or at other times the system may have been set to Static addressing and these addresses may have been changed.

## M400 Web Browser Interface

This chapter describes how to use a Web browser to communicate with and configure the M400 cameras and JCU IIs:

- [“View Camera and JCU II IP Address” on page 21](#)
- [“Camera Web Server Login Accounts” on page 21](#)
- [“Log in to the Camera Web Server” on page 21](#)
- [“Setup and Configuration Menus” on page 26](#)
- [“Maintenance Menus” on page 30](#)
- [“Changing the IP Address of the Camera” on page 31](#)
- [“Enable ONVIF v2.0 Driver” on page 33](#)
- [“Configure Ball Down Installation” on page 34](#)
- [“Azimuth and Elevation Offsets” on page 35](#)
- [“Changing Video Outputs” on page 36](#)
- [“Geo-Referencing of the Sensors” on page 38](#)
- [“Firmware Update” on page 39](#)
- [“Accessing the JCU II Web Interface” on page 39](#)

**Caution:** Changes to configuration settings should only be made by someone who has expertise with M400 cameras and a thorough understanding of how the settings affect the image. Haphazard changes can lead to image problems including a complete loss of video.

---

<sup>1</sup> The web interface is supported on Microsoft Internet Explorer version 9, as well as the latest versions of Google Chrome and Mozilla Firefox.

## View Camera and JCU II IP Address

Connect the camera and JCU II together through the switch and power on both the camera and the switch. (The JCU II is a PoE device getting power from the switch.)

On the JCU II, press and hold the COLOR button while pushing the joystick forward. The IP address of the JCU II and then camera are shown for 3 seconds on the LCD display.

The PC or laptop must be on the same network as the camera and JCU II. For example: for a camera IP address of 192.168.250.116, set the network adapter to a compatible IP address such as 192.168.250.1 with a netmask of 255.255.255.0. See [“Enabling Universal Plug and Play \(UPnP\)” on page 40](#) for another method of finding the camera on the network.

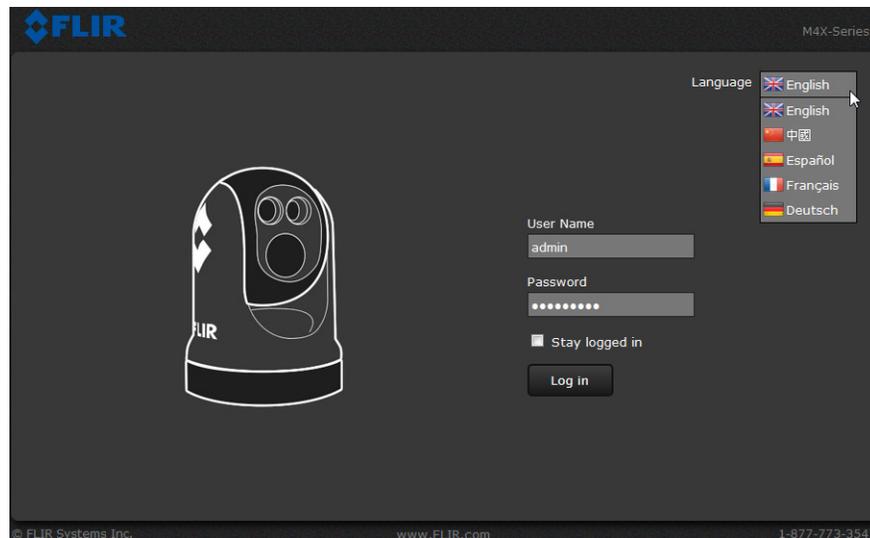
## Camera Web Server Login Accounts

It is possible to log in to the camera using one of three User Names: **user**, **expert**, or **admin**. By default, the passwords are: **user**, **expert**, and **fliradmin**, respectively. The **user** login can access the Live Video page and control the camera. The **expert** login can access the Setup menus and make configuration changes to the payloads and other components. The **admin** login can access the Maintenance menu and all the other menus as well as change the login passwords. The default login passwords should be changed to prevent unauthorized log in. Refer to [“Maintenance->Server->Security Options” on page 32](#).

**Note:** Only two web sessions can be active at once.

## Log in to the Camera Web Server

1. Open a web browser and enter the camera IP address.  
The login screen with a picture of the camera will appear.
2. Select a different language if desired.
3. Enter **admin** for User Name and **fliradmin** for Password, then click Log in.



### Live Video Page

The Live Video page will be displayed, with a live image from the camera on the left part of the page and a virtual joystick and function buttons on the right part of the page. Next to the FLIR logo along the top of the screen are some menu choices, including Live Video (the red text indicates it is selected), Setup, Maintenance, Help, and Log out.

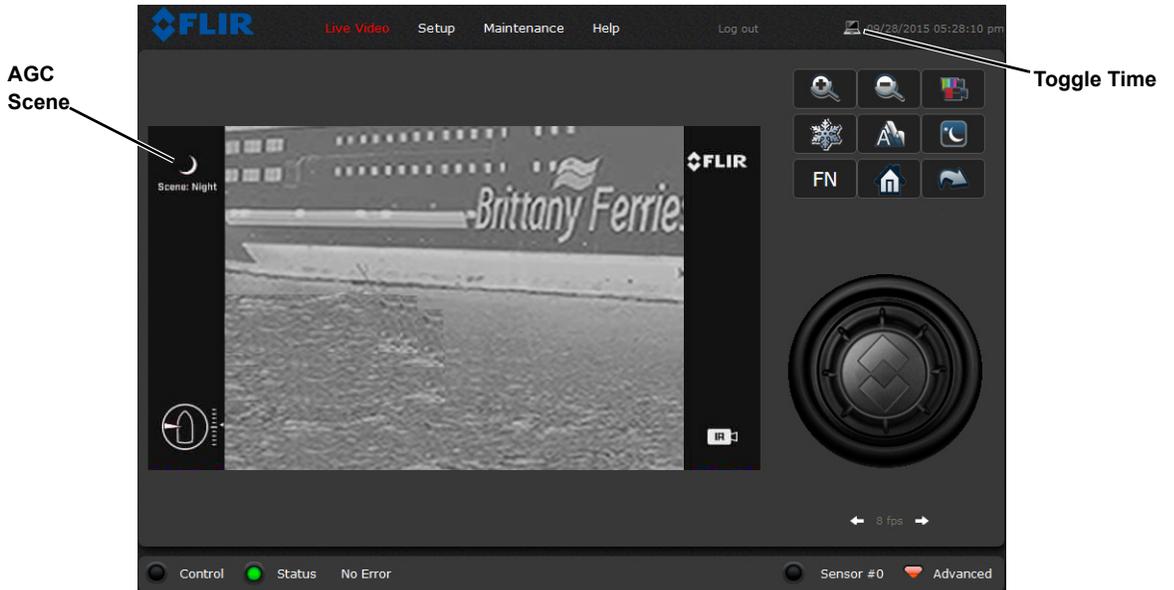


Figure 3-1: Live Video Page from admin or expert Log in

The **user** log in, shown below, can only use the Live Video page and controls and can only reset the user password if an admin or expert user has allowed the option for the user log in.

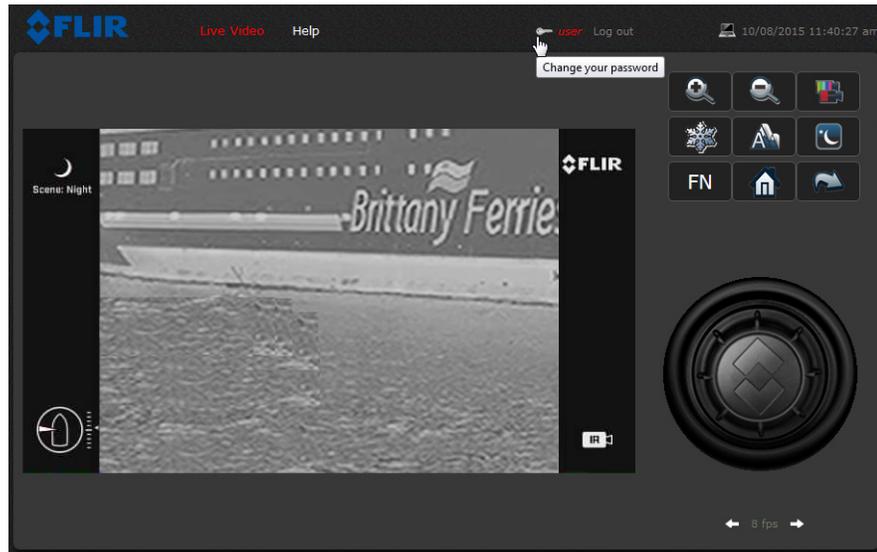


Figure 3-2: Live Video Page (user log in)

In the lower right of the web page there is a frame rate selector. This selector allows the user to change the rate at which the frames are displayed in the browser. This rate controls the user's own web browser only, and does not affect video streams to other users.

### Help

At the top of the page, the **Help** menu shows software version information. This page has information about the camera including hardware and software revision numbers, part numbers, and serial numbers. If it is necessary to contact FLIR Technical Support for assistance, it will be helpful to have the information from this page (such as Software Version) on hand.

### Log out

Use this button to disconnect from the camera and stop the display of the video stream. If a web session is inactive for 20 minutes, it will be stopped.

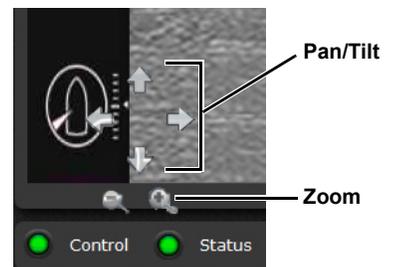
### Toggle Camera/PC time

Use this button to view either the PC time or the camera time.

### Camera Control and Status

In the lower left of the screen are two indicator lights: Control and Status. Initially the Control light is off, as in the image above, indicating the user is not able to control the camera. When multiple users are connected to a camera, only one user at a time can issue commands to the camera. If another user has control of the camera, the Control light is yellow. Request control of the camera by clicking on the yellow or black light, or simply by sending a command to the camera. The Status light may turn off temporarily while waiting for the response from the camera. Be patient, there may be a slight delay between each command while the browser waits for a response from the camera.

Mouse-over Controls

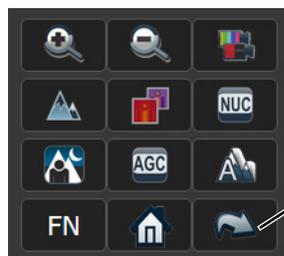


In addition, when the cursor is moved over the video, there are mouse-over pan, tilt, and zoom buttons and a mouse-over snapshot button. The zoom buttons appear in the lower left of the screen; the snapshot button appears in the upper right of the screen. After clicking the snapshot button, the video image is saved as a .jpg file and the browser will provide prompts depending on which browser is being used.

### Web Control Panel

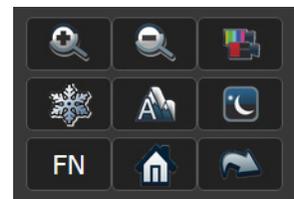
The control buttons on the right side of the page provide a way to control the camera in a limited number of ways. When the mouse cursor is positioned over a button, a tool tip is displayed.

This same web interface is used with various FLIR thermal cameras—some are fixed and some are pan/tilt cameras. As a result, different buttons in the control panel will appear for different FLIR cameras.



Go to Preset position.  
See "Setup->Surveillance->Scan List" on page 28.

IR Control Keypad



Visible Control Keypad

The functions of the buttons appearing for the M400 cameras are described below:

**Zoom In/Zoom Out**

These buttons zoom the active camera (IR or daylight). Plus zooms the camera in; minus zooms the camera out.

**Toggle Video Source**

This button changes the source of the Live Video image between the IR camera and the daylight camera. When the daylight camera is selected, only buttons that have a function on the daylight camera are shown.

**Freeze - Visible only**

This button freezes the video on the current frame. Click again to return to live video. The IR video stream is not affected.

**Toggle Polarity - IR only**

This button changes the polarity of the assigned colors to the different temperatures in a scene. In the black and white palette for example, hot objects are displayed as white and cold objects as black, or vice versa.

**Toggle Palette - IR only**

This button causes the camera to cycle through six different look up table (LUT) color palettes. Depending on the subjects viewed, one color palette may be preferable to the others. The Toggle Polarity button allows access to six more palettes.

**Perform IR NUC Calibration - IR only**

This button causes the camera to perform a Non-Uniformity Correction operation.

**Toggle Scene Preset**

This button causes the camera to cycle through four different image settings: Night, Day, Dock, and High Contrast. The Scene Presets cause the image brightness and contrast to adjust. Depending on the time of day, weather, and other conditions, one Scene Preset may be preferable to the others.

**Toggle Automatic Gain Control (AGC)**

This button causes the camera to cycle through different AGC options that use a combination of settings to produce different configurations that could improve the video image for a given set of conditions.

**AutoFocus**

This button causes the camera to perform a focus function.

**Toggle Low Light Mode - Visible only**

This button causes the camera to enter or exit low light mode.



**Home**

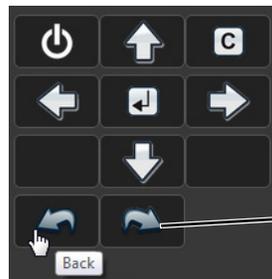
Click moves the camera to the Home position; Click and Hold sets the current pan and tilt position of the camera as the Home position.



**Function Keys**

When selected, the keypad changes to an OSD control panel. Select the back arrow to return to the main keypad.

Use the OSD menu keypad to navigate through the OSD menus and make selections. Refer to the *M400 Operator's Manual* for descriptions of the menu functions.

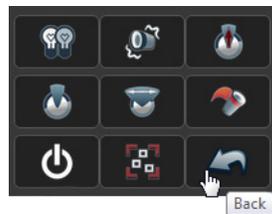


**OSD Menu Keypad**

Click to access next menu

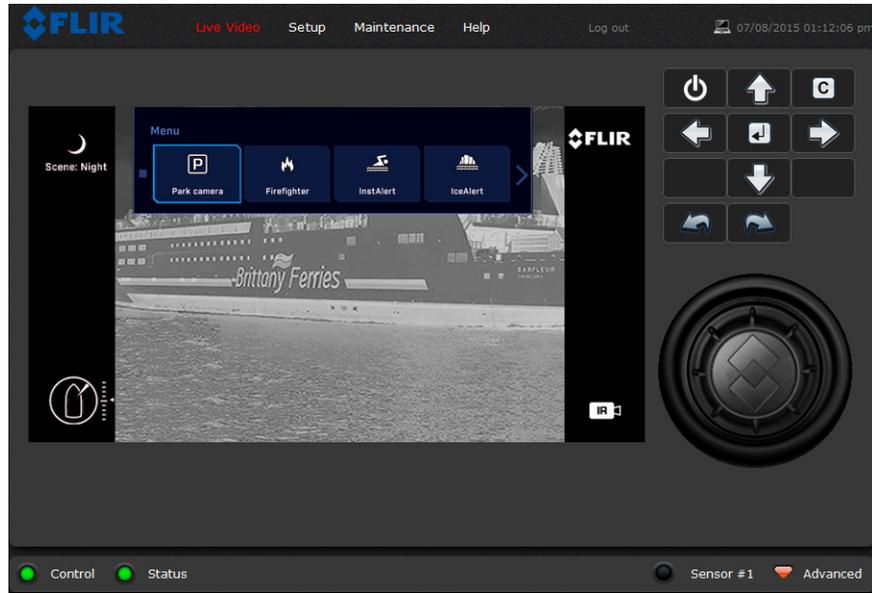
OSD Menu Keypad	
	Display OSD menu
	Move up through OSD
	Exit current OSD function
	Move left through OSD
	Enter
	Move right through OSD
	Move down through OSD

Use the shortcut keypad to access common modes. These modes are also available through the OSD, JCU II, or other web pages.



**Shortcut Keypad**

Shortcut Keypad	
	Spotlight On/Off
	Stabilization On/Off
	Vertical Stabilization On/Off
	AutoScan On/Off
	AutoScan Width toggle
	AutoScan Speed toggle
	Video Tracking On/Off (M400XR Only)
	Video Tracking Engage/Dis-engage (M400XR Only)

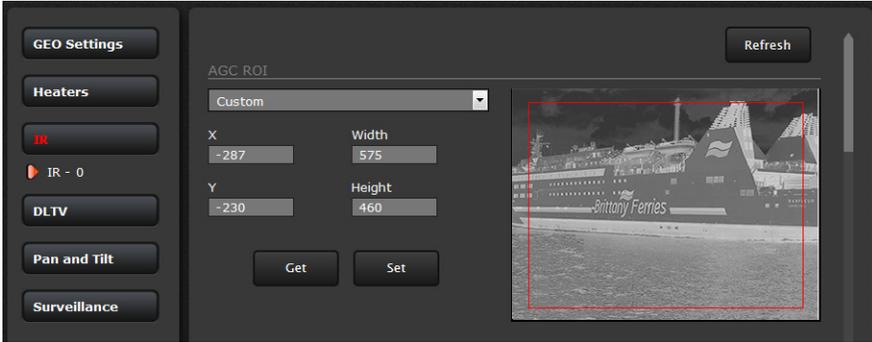


When using the OSD menu from the Web page, the virtual joystick is still enabled. Use the Web Control Panel, as shown above, to navigate through the OSD menu and make selections. Refer to the *M400 Operator's Manual* for descriptions of the menu functions.

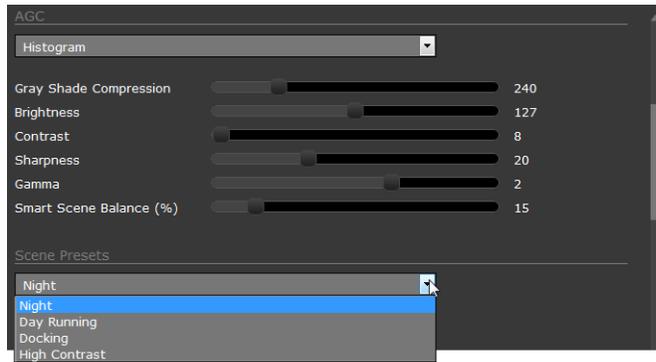
**Setup and Configuration Menus**

Additional configuration options are available that are not described in this manual. For more information on setting or changing these camera parameters refer to the *Nexus IP Camera Configuration Guide* (FLIR Doc #427-0030-00-28) or contact the local FLIR representative or FLIR Technical Support.

**Setup->IR->ROI (region of interest)**



The camera adjustments under the ROI heading allow the user to make changes to the Region Of Interest. The ROI determines what portion of the image is considered by the Automatic Gain Control (AGC) algorithm. By default all of the pixels in the image are considered; in some cases it may provide an improved image if a portion of the image is excluded. For example, the sky is generally very cold, so if the ROI excludes the sky it may add more contrast to the rest of the image. A pull-down list offers some convenient options.

**Setup->IR->AGC Scene Presets**

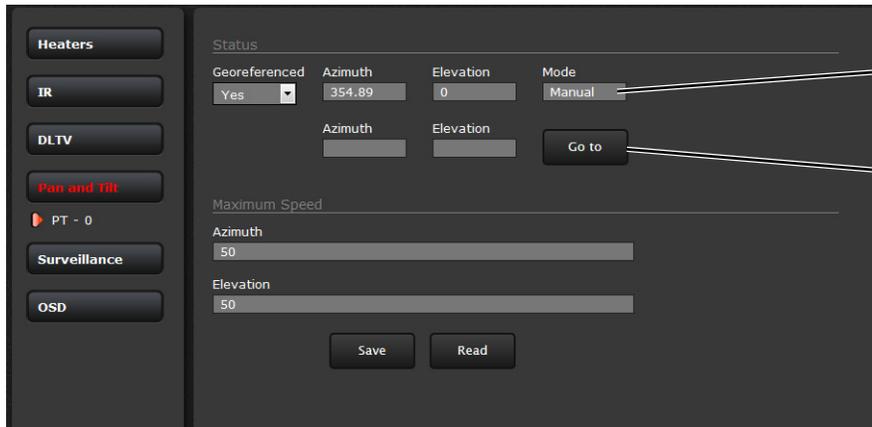
The AGC parameters affect how the overall IR video image appears. The default Histogram algorithm is suitable for most installations, but in some cases one of the other selections may provide a more appealing image, depending on personal preferences. Be aware the settings that are optimal at one time may be less optimal a short time later, since conditions such as weather and time of day affect the image and are constantly changing.

- **Gray Shade Compression** (Plateau value) when set high, the algorithm approaches the behavior of classic histogram equalization—gray shades are distributed proportionally to the cumulative histogram, and more gray shades will be devoted to large areas of similar temperature in a given scene. On the other hand, when the value is set low, the algorithm behaves more like a linear AGC algorithm—there is little compression in the resulting 8-bit histogram.
- **Brightness** (ITT Mean) setting determines the temperature that is at the middle of the 256 “shades of gray” available to the camera. Higher values allow more detail in hotter scenes, while lower values allow more detail in lower temperature scenes.
- **Contrast** (Max Gain) can generally be used to increase contrast (although it may also increase noise due to increased gain).
- **Sharpness** (DDE) is used to enhance image details and/or suppress fixed pattern noise. Higher values increase Sharpness, while lower values soften (blur) the image and filter fixed pattern noise.
- **Gamma** (ACE) provides a contrast adjustment dependent on the relative scene temperature. Gamma values greater than 0 give more contrast to the hotter scene content and decrease contrast for the colder scene content. Gamma values less than 0 do the opposite by decreasing the contrast for hotter scene content and leaving more of the “shades of gray” to represent the colder scene content.
- **Smart Scene Balance** (SSO) value defines the percentage of the scene that will be allotted a linear mapping. With SSO enabled (greater than zero), the difference in gray shades between two objects is more representative of the difference in temperature, although the optimization in local contrast can be lost.

It may be best to start with the Scene Presets selections, but experiment with different AGC settings. Select **Save Settings** button at the bottom of the page to keep the settings after a power cycle or select the **Factory Defaults** button to return the settings to default values.

Each Scene Preset provides a combination of parameters that are preferred for certain types of conditions. Select a Scene Preset that provides an image that is optimal for the situation. Recall the Scene preset can also be toggled by selecting the Toggle Scene Preset button from the **Live Video** page control panel.

Setup->Pan and Tilt->Status



Reported direction coordinates, updated in real time.

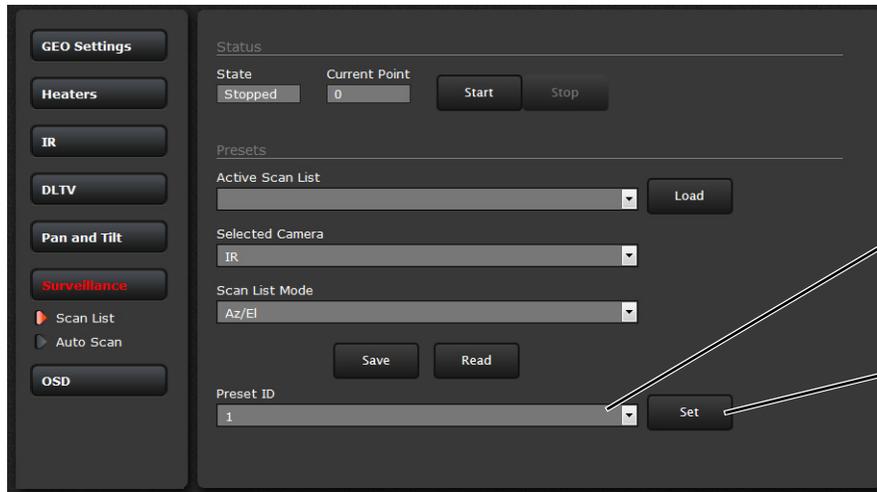
To move the camera enter coordinates, click Go to.

Icons on the video show the direction the camera is facing in relation to an outline of a ship. The Pan and Tilt status shows the azimuth and elevation of the current direction of the camera.

The azimuth angle is measured from 0 to 360 starting to starboard from the bow of the ship outline icon on the video. The elevation angle is measured from horizontal; minus values are down. positive values are up. Both the reported angles and the **Go to** angles take into consideration the Offsets. See "Azimuth and Elevation Offsets" on page 35.

The Azimuth "0" direction should be directly toward the front of the vessel; the elevation may be set to the horizon or another preferred reference. The azimuth and elevation offsets can be set using the OSD menu. Refer to the *M400 Operator's Manual*.

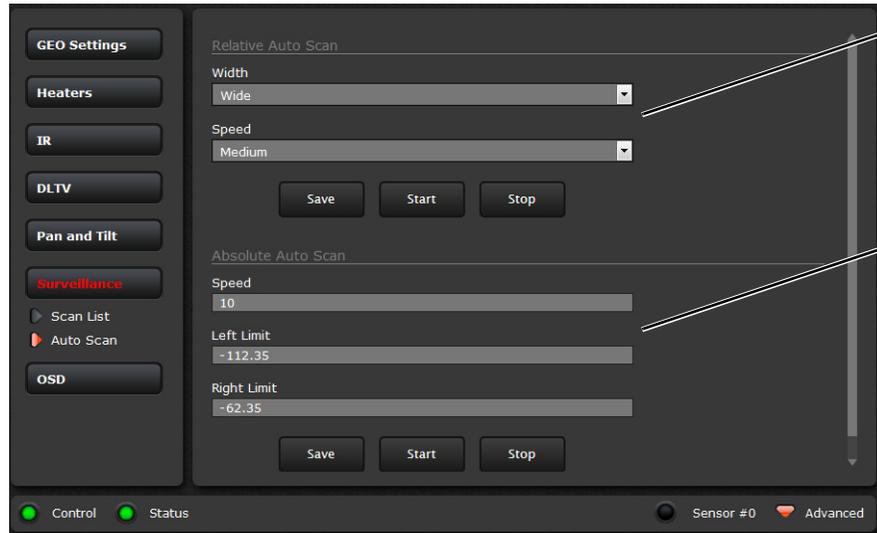
Setup->Surveillance->Scan List



To setup Presets: position camera, select Preset ID

Click Set, then Save

Setup->Surveillance->Auto Scan



**To start Auto Scan:**  
select width and speed,  
then select Start

**Set Autoscan at Startup:**  
select speed,  
select limits,  
click Save

The Relative Auto Scan (Surveillance mode) can be started and the settings changed from the OSD menu, JCU II (UPB), or the web page.

The Absolute Auto Scan can be started and the parameters set in the web page, but Absolute Auto Scan can also be started as an option in the Startup mode when the camera boots. Refer to [“Startup Mode” on page 34](#).

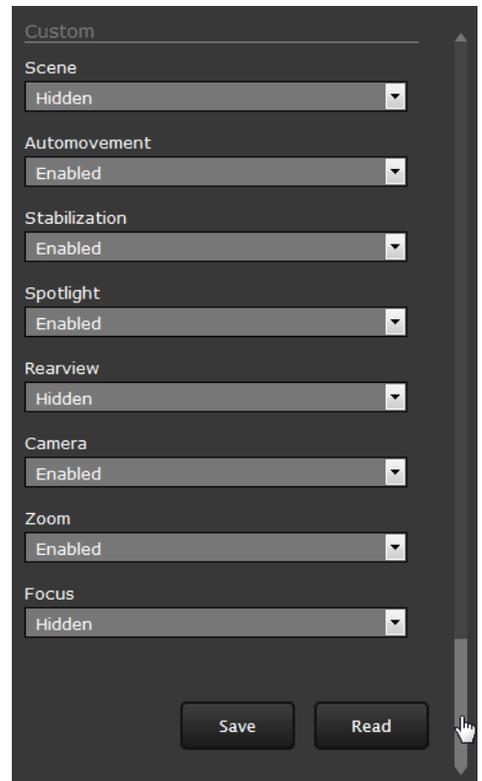
Setup->OSD

Make selections on the OSD Web page to set the content of each level of Display Icons.

Scroll down and select to enable or hide each icon for the **Full**, **Minimal**, and **Custom** icon sets.

Choose **Read** to display the current settings.

Choose **Save** to save the current selections.



### Maintenance Menu

After making configuration changes, click the Save button at the bottom of the page. After saving, it is also necessary to stop and restart the server. The server has a configuration that is active and running, and another configuration that is saved.

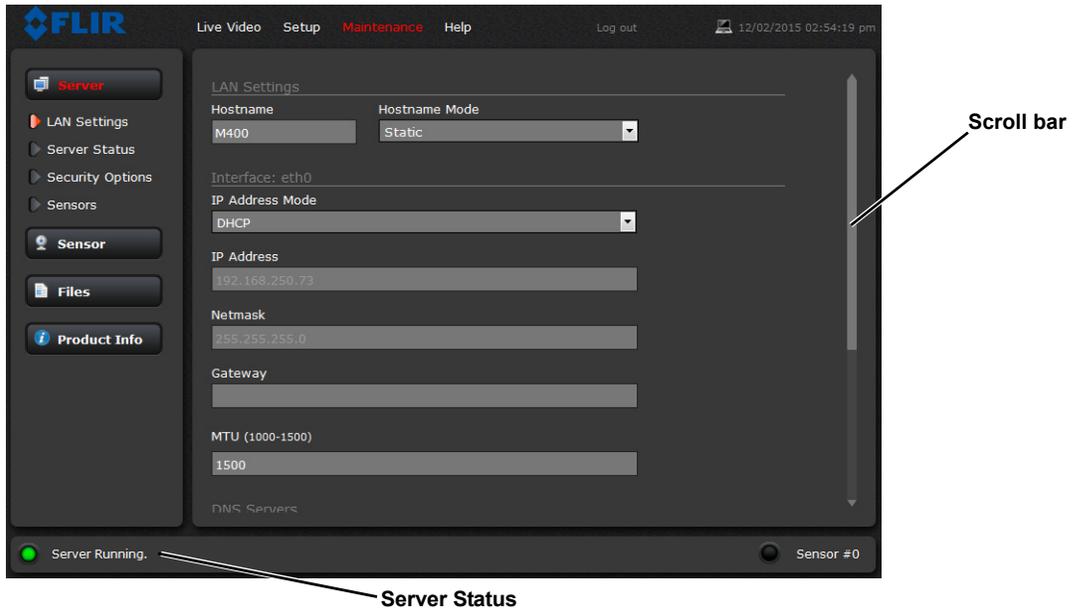
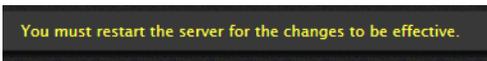


Figure 3-3: Maintenance Menu Pages

The message at the bottom of the page indicates the saved configuration is different than the active (running) configuration, and it is necessary to restart the server.



### Restarting the Server

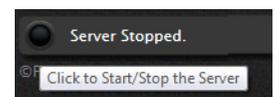
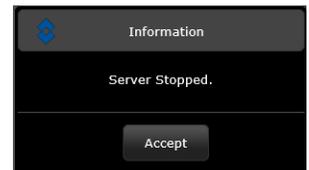
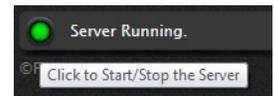
Click on the green light at the lower left next to “Server Running” to stop the server.

It may take up to 20 seconds for the server to stop, especially if multiple video streams are open. Be patient when stopping the server.

Once the server is stopped, an information message will pop up on the screen.

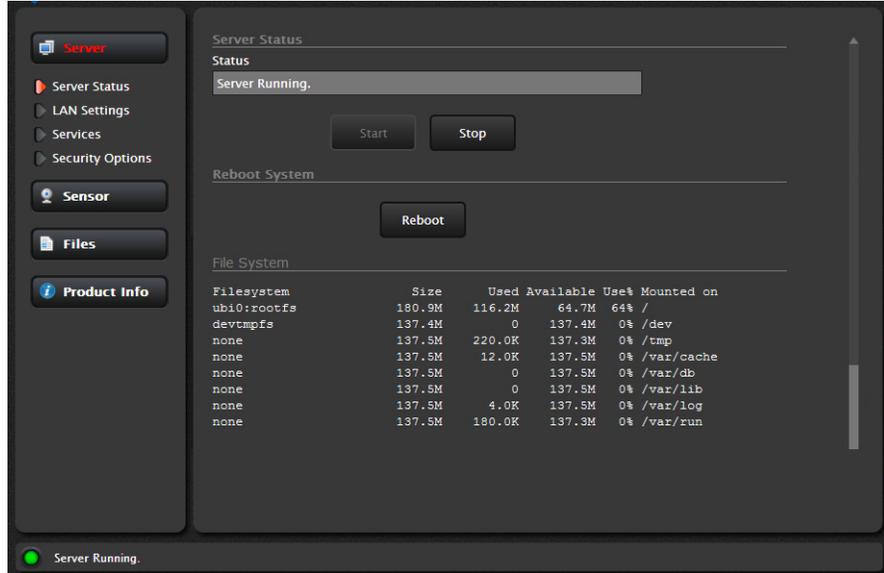
When the server is stopped and the page is refreshed, the status will show as “Server Stopped.”

Click to restart the server. When the page refreshes, the status will again show as “Server Running...”. The Start button will be replaced by a Stop button when the startup procedure has completed.



**Maintenance->Server->Server Status**

The page provides an indication of the current server status (either running or stopped) and buttons for starting or stopping the server or for rebooting the system. Scroll down to see additional status information which may be useful to FLIR technical support.

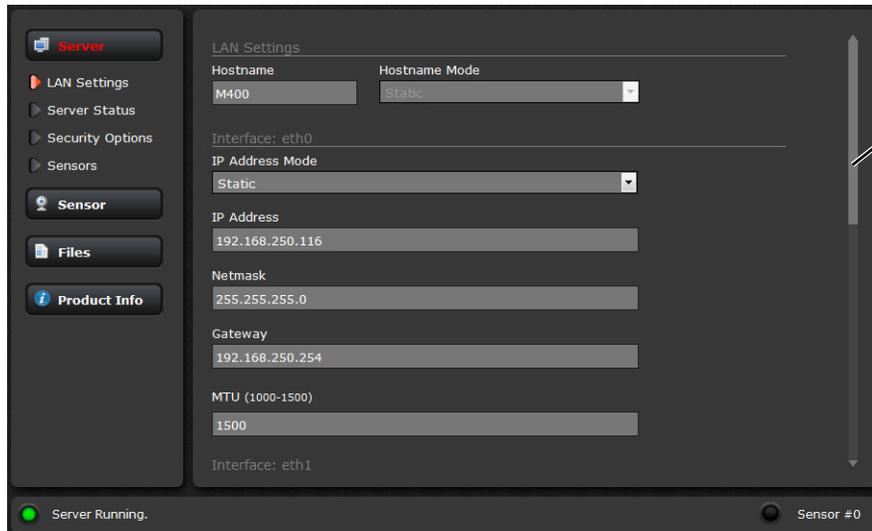


**Changing the IP Address of the Camera**

The admin and expert log in accounts can change LAN settings.

**Maintenance->Server->LAN Settings**

The M400 system is shipped with DHCP IP address mode enabled. Some networks may require that a static IP address is set. The camera IP address, mask, and gateway is shown in the figure below. A Static option is selected with an IP address of 192.168.250.116.

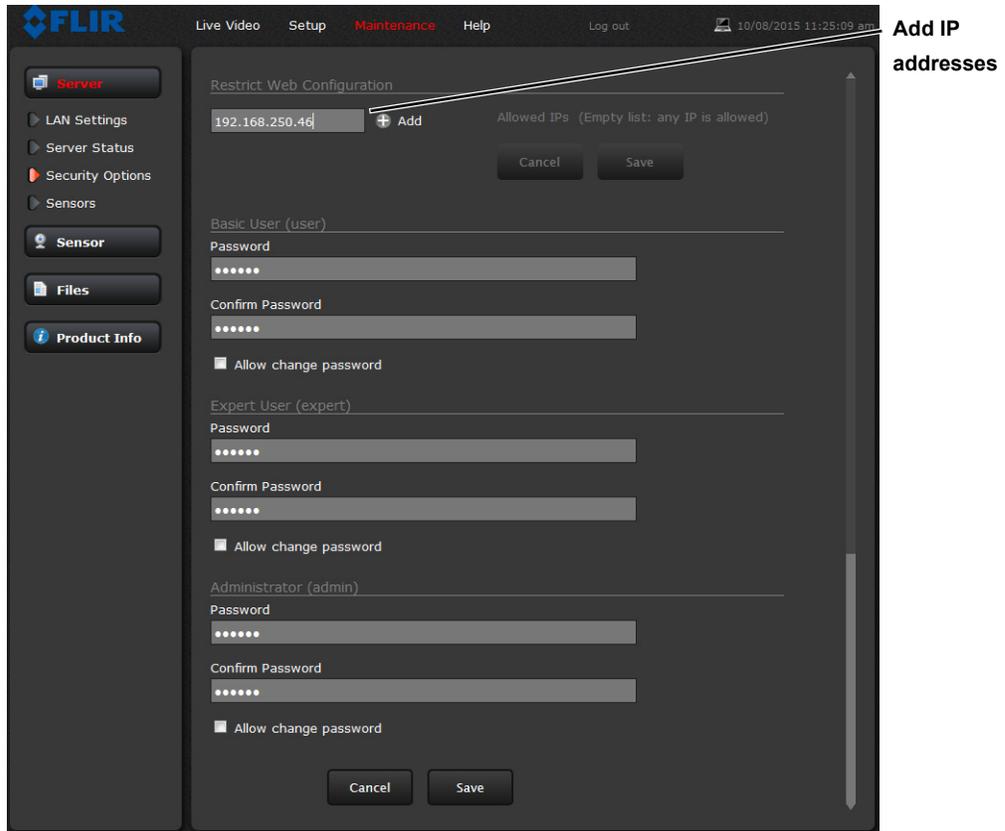


Select the Static or DHCP option. The screen will refresh, enter the appropriate information for the network, then scroll down to select the Save button at the bottom of the page.

**Maintenance->Server->Security Options**

Use the **Security Options** page to restrict access through the camera web server to specific IP addresses and to set and change passwords.

- To limit which computers have access to the web browser interface simply enter a computer's IP address and click **Add**. After all the allowed IP addresses are entered, select the Save button to save the changes.
- The **admin** log in, shown below, can use all screens and menus, reset all passwords, select to allow each of the log in accounts to change their own password, as well as restrict access to specific IP addresses.



**Figure 3-4: Security Options Page (admin log in)**

To maintain security of the system set passwords for each of the three login accounts (requires the **admin** login).

After a password is set and confirmed, select the Save button at the bottom (scroll down the page, if necessary).

- The **expert** log in, shown below, can use the Live Video page, the Setup page, the Maintenance page Server menus, and can reset the **user** password or select to allow the **user** log in account to change their own password, as well as restrict access to specific IP addresses.

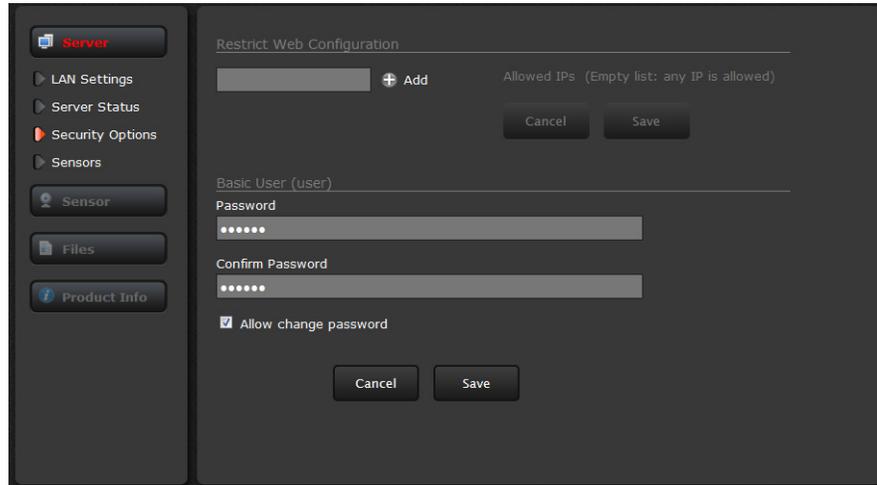


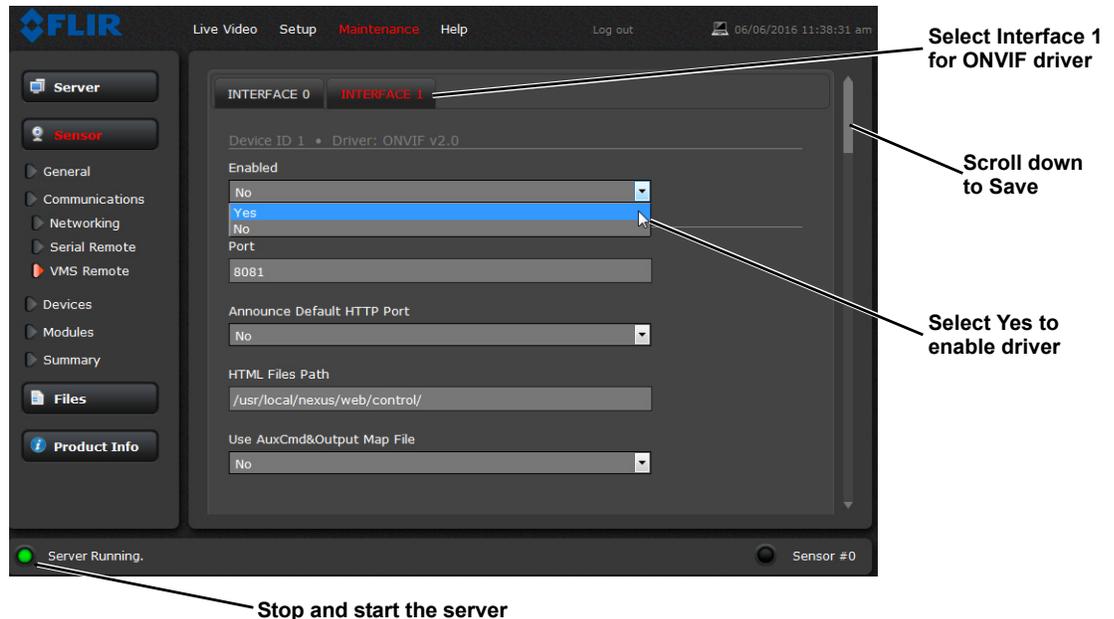
Figure 3-5: Security Options Page (expert log in)

**Maintenance->Sensor->Communications->VMS Remote**

**Enable ONVIF v2.0 Driver**

Enable the ONVIF driver to connect the camera to a VMS or a network video recorder.

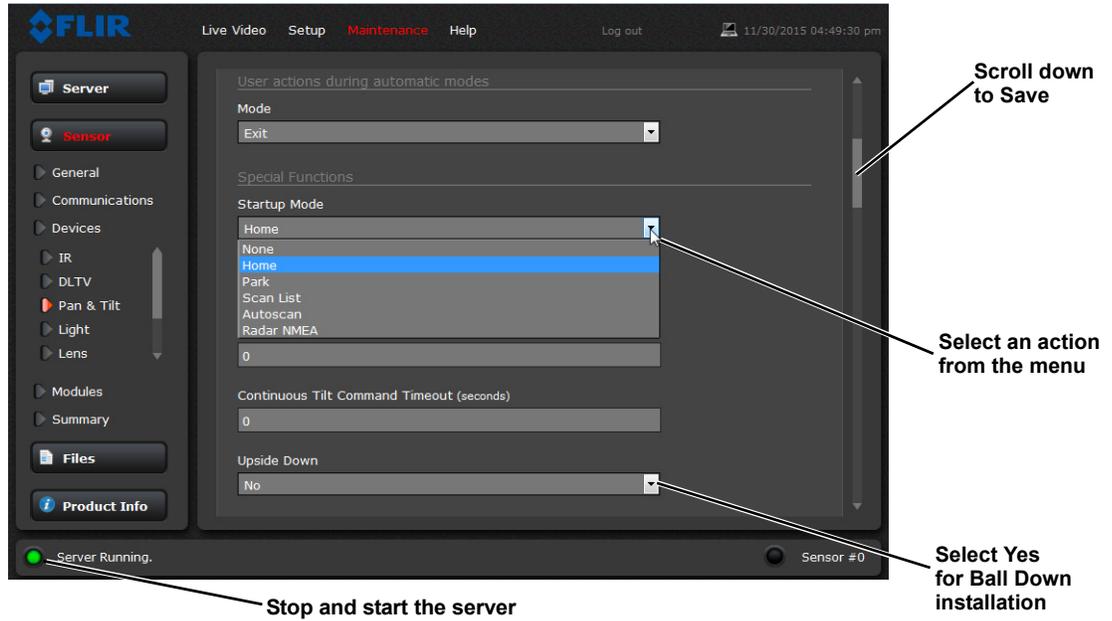
1. On the Maintenance->Sensor->Communications->VMS Remote page, select **INTERFACE 1**.
2. Select Yes to enable driver.
3. Scroll down and select **Save**.
4. Stop and start the server to make the change effective.



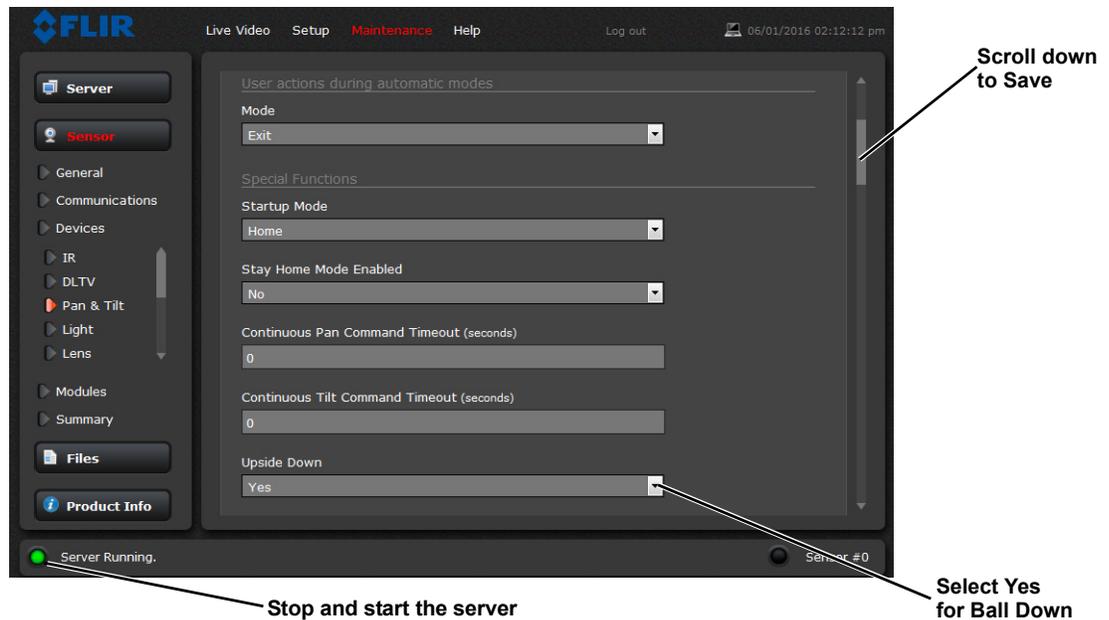
Maintenance->Sensor->Devices->Pan & Tilt

Startup Mode

Select an action the camera will perform at startup (power cycle or server reset).



Configure Ball Down Installation



The camera is configured for Ball Down or Ball Up operation with a single menu control.

1. On the Maintenance->Sensor->Devices->Pan & Tilt page, set Upside Down to **Yes**.
2. Scroll down and select **Save**.
3. Stop and start the server to make the change effective.

### Azimuth and Elevation Offsets

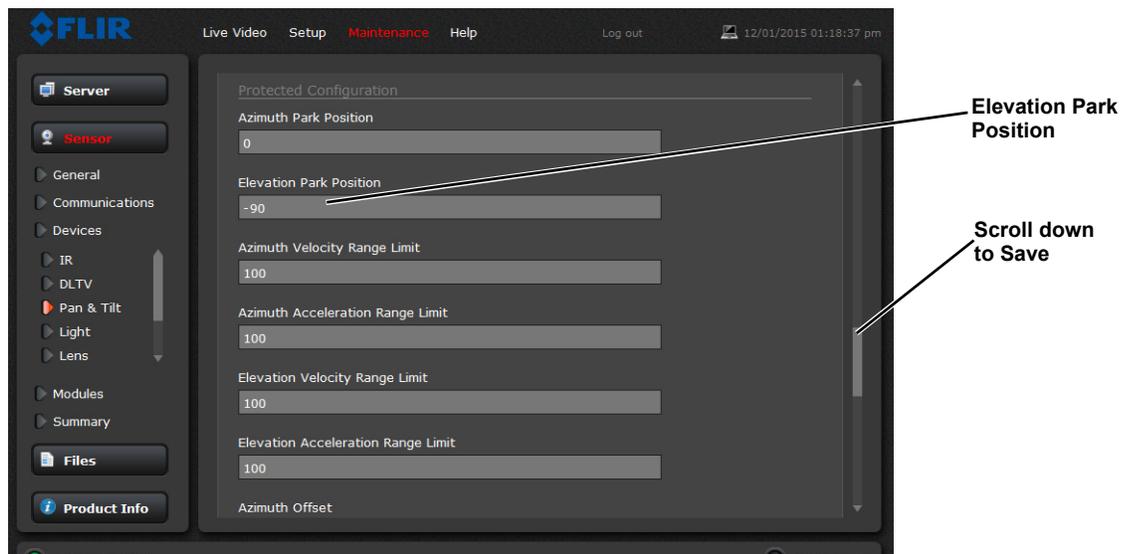
After the camera is installed, the azimuth may be set to account for variations required during installation. The azimuth direction should be directly toward the front of the vessel; the Elevation Offset should be zero. The azimuth/elevation offset can be set using the OSD menu.



### Setting Park Position

The default park position is defined as 0° azimuth and -90° elevation. If a different park position is desired, adjust the Park position as follows:

1. On the Maintenance->Sensor->Devices->Pan & Tilt page, enter the value of the new Elevation Park Position, as shown below.



### Changing Video Outputs

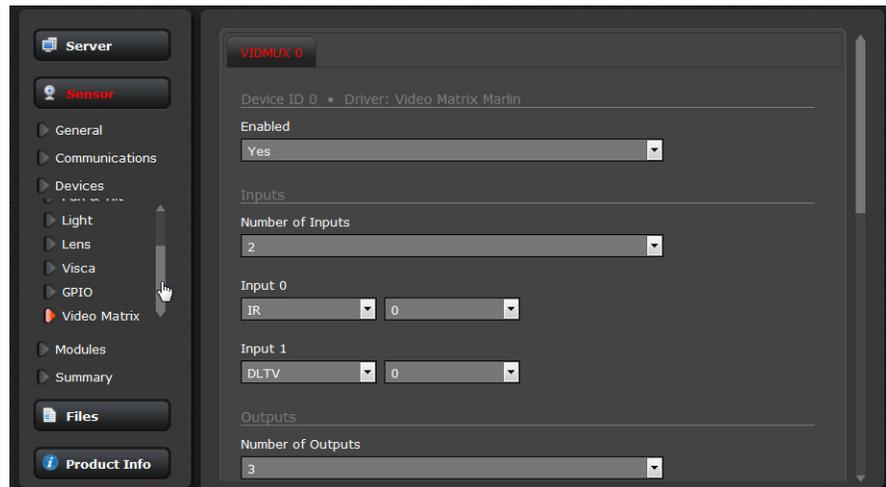
The M400 camera system has two cameras with different video streams which are then processed to provide multiple display formats and video resolutions. Use the following web pages to control these video streams and how they are affected by Active Camera selections from the JCU II.

#### Maintenance->Sensor->Devices

- **Sensor -> Devices->IR, Aspect Ratio**—select either 4:3 or 16:9 video
- **Sensor -> Devices->DLTV**—16:9 video

These video streams are provided unchanged as inputs to VIDMUX.

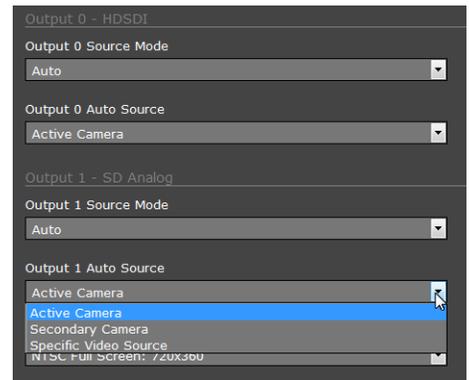
#### Maintenance->Sensor->Devices->Video Matrix



Scroll down to select how the Active Camera selection will affect each video Output (HDSDI, SD, or LiveView). Each video output stream can be set to the Active Camera, Secondary Camera, or to always display one or the other of the cameras.

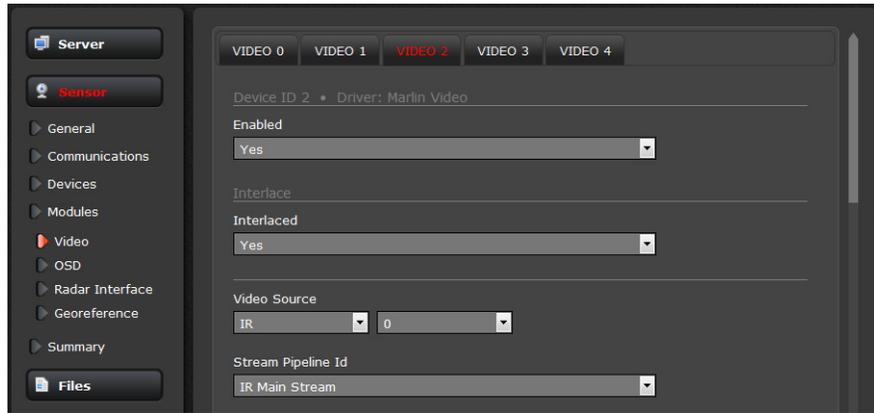
Note: The IP video output streams can not be changed except by the initial selection above in Maintenance->Sensor->Devices->IR or DLTV.

Additional display resolution settings can be made for the standard video (SD) and the LiveView video streams.



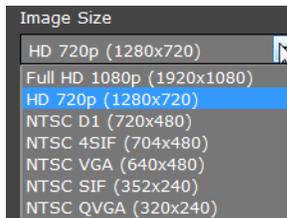
- **Sensor -> Devices->Video Matrix Output 0** - HDSDI is output unchanged.
- **Sensor -> Devices->Video Matrix Output 1** - SD Analog is processed as either NTSC Letter Box 720x360 (cropped top and bottom), NTSC Center Box 720x480 (full data), PAL Letter Box 720x432 (cropped top and bottom), or PAL Center Box 720x576 (full data).
- **Sensor -> Devices->Video Matrix Output 2** - LiveView (Live Video web page) is output unchanged.

Maintenance->Sensor->Modules->Video

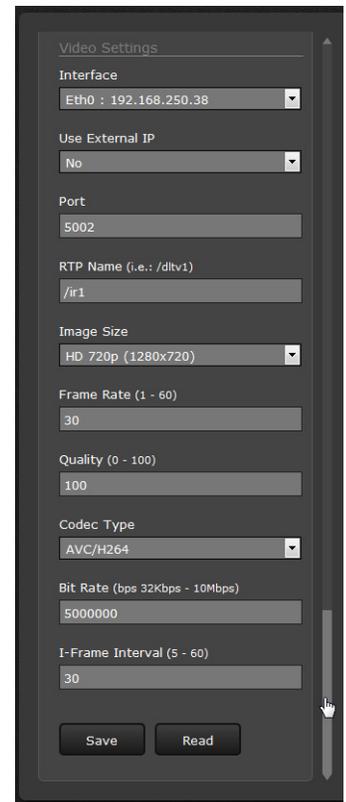


VIDEO 0 is the daylight camera (DLTV) video stream, VIDEO 2, shown above and at the right, is the infrared camera video stream, and VIDEO 4 is the video stream shown on the Live Video web page.

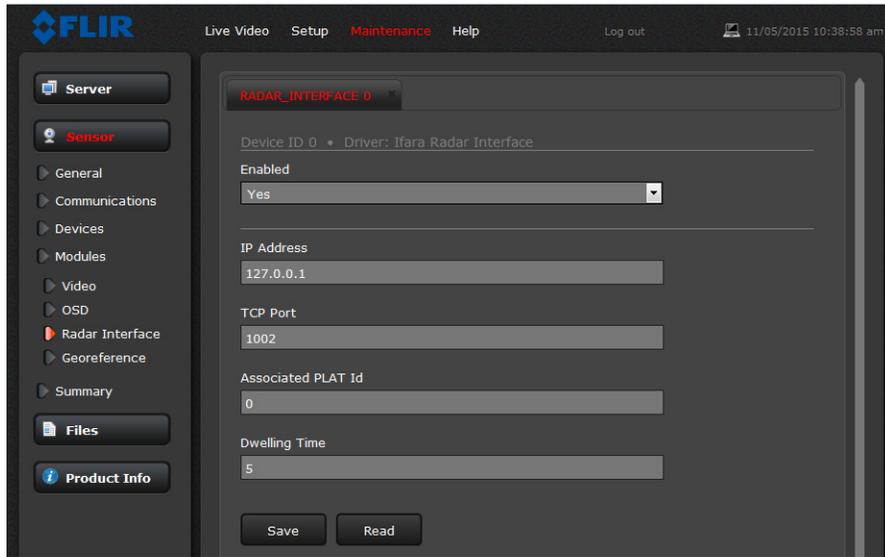
- VIDEO 0 and VIDEO 2 Video Settings Image Size



- VIDEO 4 Video Settings Image Size



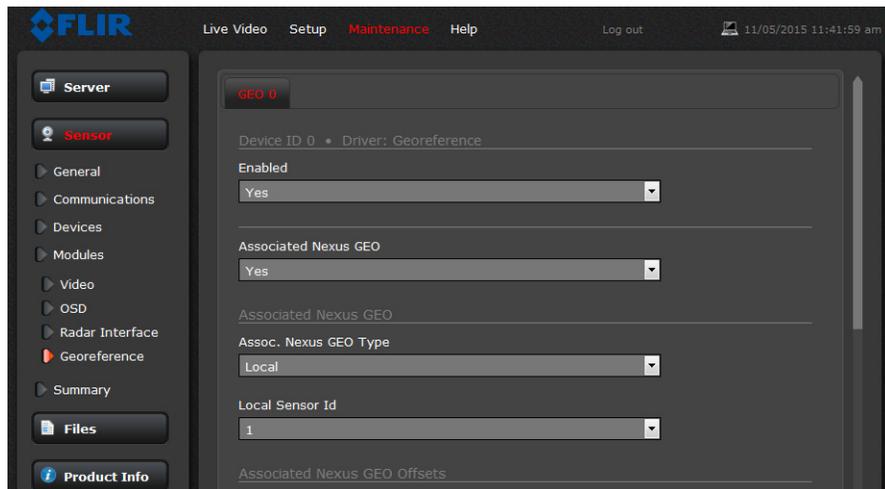
Maintenance->Sensor->Modules->Radar Interface



Geo-Referencing of the Sensors

The Camera Server and the Radar Server can each have a Georeference location. When the camera is installed on a vessel, the location information can come from a GPS and gyrocompass and the information is available as NMEA data directly from those devices or through the radar device.

Maintenance->Sensor->Modules->Georeference

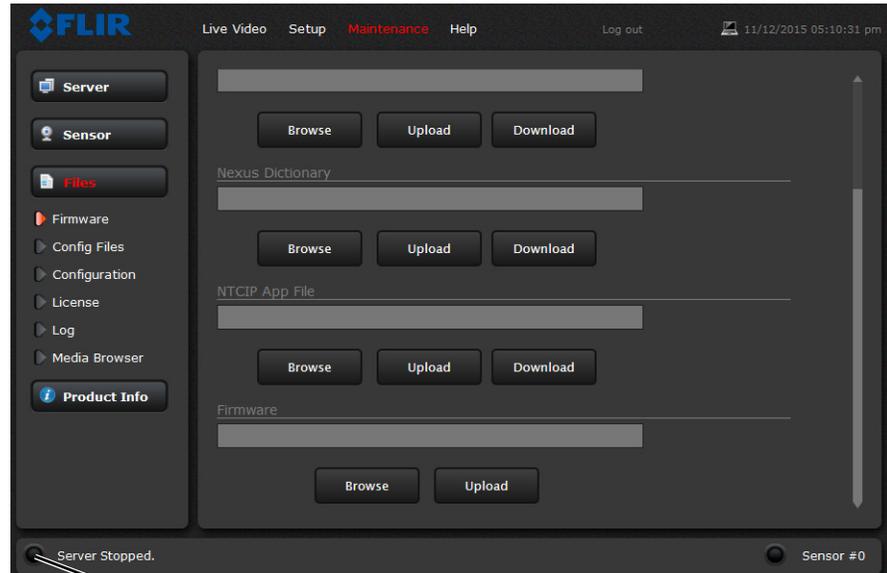


The Camera Server can have a different Georeference location and heading than the Radar Server, but typically they are associated with each other, with an offset if they are in different locations on a larger ship. It is recommended that the Radar Server is configured to receive the live location information, and the Camera Server Georeference can be associated with the Radar Server Georeference.

## Firmware Update

When software updates become available, use the Firmware Update field to load the update to the camera. Contact the FLIR dealer where you purchased the camera for additional information, or contact FLIR directly.

### Maintenance->Files->Firmware



Click to stop server. The server must be stopped to upload or download any files.

## Accessing the JCU II Web Interface

The JCU II communicates through the Ethernet IP protocol just like the M400 camera does.

### Changing the IP Address of the JCU II

On the JCU II, the IP address is displayed by pressing the COLOR button and pushing the joystick forward at the same time. The IP addresses of the JCU II and the camera are displayed for 3 seconds and then the display returns to its state before the IP request was made.

On networks with specific requirements, you may need to assign the JCU II a static IP address. Do this using steps similar to the way you changed the camera IP address:

1. Determine the JCU II IP address by pressing the COLOR button and pushing the joystick forward at the same time. The IP address is shown on the JCU II screen.
2. Type the JCU II IP address into the address bar of the browser adding /index.html. for example: `http://192.168.250.110/index.html`  
The JCU II Web page is shown, with a picture of the JCU II.



FLIR  
1-888-747-3547  
[www.FLIR.com](http://www.FLIR.com)

### M-Series JCU Web Interface

The screenshot shows two sections of the web interface. The top section is titled "Firmware Update" and contains the text "Please specify a bin file:" followed by a "Choose File" button and the text "No file chosen". Below this is an "Upload" button. The bottom section is titled "Network Addressing" and has two radio buttons: "Dynamic" (which is selected) and "Static". Below the radio buttons are two input fields: "IP:" with the value "192.168.250.110" and a question mark icon, and "Mask:" with the value "255.255.255.0" and a question mark icon. At the bottom of this section is a "Save" button.



3. For Network Addressing, select Static.
4. Enter the new value in the IP field. The Network Mask should fill in automatically (255.255.255.0).
5. Click Save to save the changes and exit the Web page.

## Enabling Universal Plug and Play (UPnP)

In order to use the Web interface, the PC may need to be set up to use Universal Plug and Play (UPnP), which may not be active.

UPnP is typically not active on older computers using Windows XP but can be activated by following the steps outlined here.

**Note:** The JCU II will display on the PC network only when the PC is on the same network as the camera. If the PC is not configured with a static IP address, the UPnP icons will not display.

### UPnP Overview

UPnP is a set of networking protocols that allows devices on a network to connect automatically, without the need for configuration by a network expert, thus simplifying the implementation of networks and the installation of computer components. A UPnP compatible device from any vendor can dynamically join a network, obtain an IP address, announce its name, convey its capabilities upon request, and learn about the presence and capabilities of other devices.

UPnP devices are plug-and-play in that when connected to a network they automatically announce information about themselves and supported device and services types, enabling clients that recognize those types to immediately begin using the device.

M400 cameras and JCU IIs are UPnP devices so they broadcast their presence on the network. A PC configured to accept UPnP broadcasts will show all UPnP devices discovered under My Network Places.

### Enabling the UPnP User Interface

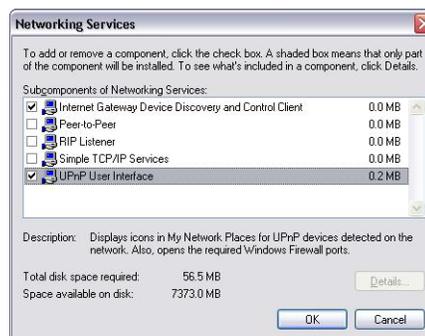
In some cases, Windows will discover UPnP devices and provide its own user interface to control them. Windows Vista and Windows 7 automatically detect network devices in the Network page. If UPnP devices are hidden, a prompt at the top of the screen will ask to display hidden devices.

With Windows XP, install the optional user interface (UI) component using the steps below. This UI component Web page a balloon tip for newly discovered devices and places an icon for each device in the My Network Places folder. To enable the UPnP UI, follow these steps:

1. Click Start, click Control Panel, and then click Add or Remove Programs.
2. In the Add or Remove Programs dialog box, click Add/Remove Windows Components on the left side.
3. In the Windows Components Wizard, click Networking Services and then click Details.



4. Select the Universal Plug and Play check box.



5. Click OK, and then click Next in the Windows Components Wizard. The Windows XP installation CD may be required.

See if any UPnP-enabled devices exist on your network by opening My Network Places. If there are UPnP devices on the local network, they will appear here with a generic icon based on the device type. In the future when a UPnP device is installed on the network, a notifying icon will appear briefly in the System Tray. When you see this icon, go to My Network Places to view the new device. Double-click on the icon to bring up the Web page.

# M400 Reference

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## M400 Maintenance

The M400 components are designed for years of rugged, trouble-free use.

### Cleaning the JCU II

To clean the JCU II, 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

**Warning:** The M400 camera body is a remotely and automatically controlled device. Ensure camera motion has been disabled before cleaning surfaces that can cause pinch hazards.

Great care should be used with your camera's optics. They are delicate and can be damaged by improper cleaning. The M400 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.

### Cleaning the Camera Body

**Warning:** The M400 camera body is a remotely and automatically controlled device. Ensure camera motion has been disabled before cleaning surfaces that can cause pinch hazards.

**Caution:** The M400 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 M400 camera will void the manufacturer's warranty.

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 M400 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 4.1 lists details about physical characteristics, power usage, and environmental features of your M400 camera.

**TABLE 4.1 Specifications**

<b>Thermal Imaging Specifications</b>	<b>M400</b>
Sensor Type	640 x 480 VOx Microbolometer
Field of View	18° to 6° HFOV / 1.5° HFOV with e-zoom
Focal Length	35 mm (Wide) to 105 mm (Narrow)
E-Zoom	4X Optical Zoom
Imaging Processing	FLIR DDE
<b>Daylight Imaging Specifications</b>	
Detector Type	Long range color daylight and low light viewing
Resolution	High Definition up to 1080/30p
Minimum Illumination	>0.5 lux at 50 IRE / .05 Lux in ICR Mode (B/W)
Zoom	30X Optical Zoom
Focal Length	129 mm to 4.3 mm
Field of View	64° to 2.3° Optical HFOV / 0.2 NFOV e-zoom
<b>Spotlight Specifications</b>	
Type	LED
Lumens	580
Beam	5° Divergence Angle
<b>Physical Characteristics</b>	
Camera Size	32.4 cm (12.75 in) diameter by 46 cm (18.1 in) tall
Camera Weight	12.25 kg (27 lb), depending on the camera model
Joystick Size	9.1 X 14.2 X 8.13 cm (3.6 X 5.6 X 3.2 in) 7.4 cm (3 in) above platform including joystick
Joystick Weight	0.45 kg (1 lb)
<b>Power</b>	
Camera Input Power	24 Vdc, 2.5 A typical, 5.5 A max 12 Vdc, 5 A typical, 11 A max Absolute range 12 Vdc to 32 Vdc
JCU II Input Power	Power over Ethernet (PoE) per IEEE 802.3af
Consumption	50 W Nominal, 132 W maximum
<b>Network Specifications</b>	
JCU II	10/100/1000 Mbps
M400 Pan/Tilt Camera	100/1000 Mbps
Ethernet Switch	10/100/1000 Mbps

**TABLE 4.1 Specifications (Continued)**

<b>Environmental</b>	
Operating temperature range	-20 °C to +55 °C (-4 °F to +131 °F) per IEC 60945
Storage temperature range	-50 °C to +80 °C (-58 °F to +176 °F)
Automatic Window defrost	Standard
Sand/dust	IEC 60945
Water Ingress	IP X6
Shock	15 G vertical, 9 G horizontal
Vibration	IEC 60945
Lightening Protection	IEC 60945
Salt Mist	IEC 60945
Wind	100 knot (115 mph)
EMI	IEC 60945

## External Standards

Table 4.2 lists other sources of information and standards definitions that may be useful during the installation of your M400 camera.

**TABLE 4.2 External References**

<b>Standard</b>	<b>Description</b>
IEC 60169-24	Radio-frequency coaxial connectors with screw coupling, typically for use in 75 Ohm cable distribution systems (Type F)
IEC 60754-1	Testing of cable materials indicating content of acidic gases evolved during combustion.
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 (48 V/400 mA/15.4 W)
ANSI/SMPTE 170M - 1994	Composite Analog Video Signal (Supersedes RS-170A)
Directive 96/98/EC	Marine Electronics Directive (MED)

## Acronyms

<b>Acronym/Term</b>	<b>Definition</b>
AGC	Automatic Gain Control
ANSI	American National Standards Institute
API	Application Programming Interface
B/W	Black and white
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 II	Joystick Control Unit
LCD	Liquid Crystal Display
LWIR	Long-wave infrared
LSZH	Low Smoke Zero Halogen
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)



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# Mechanical ICD Reference

The following Mechanical Interface Control Documents detail the outline and mounting for the M400 systems. These documents are provided for reference only. You should consult your local sales representative or application engineer to obtain current ICD information. Also, the Thermal Imaging Camera Data Sheet available from the website contains important mechanical interface data as well.

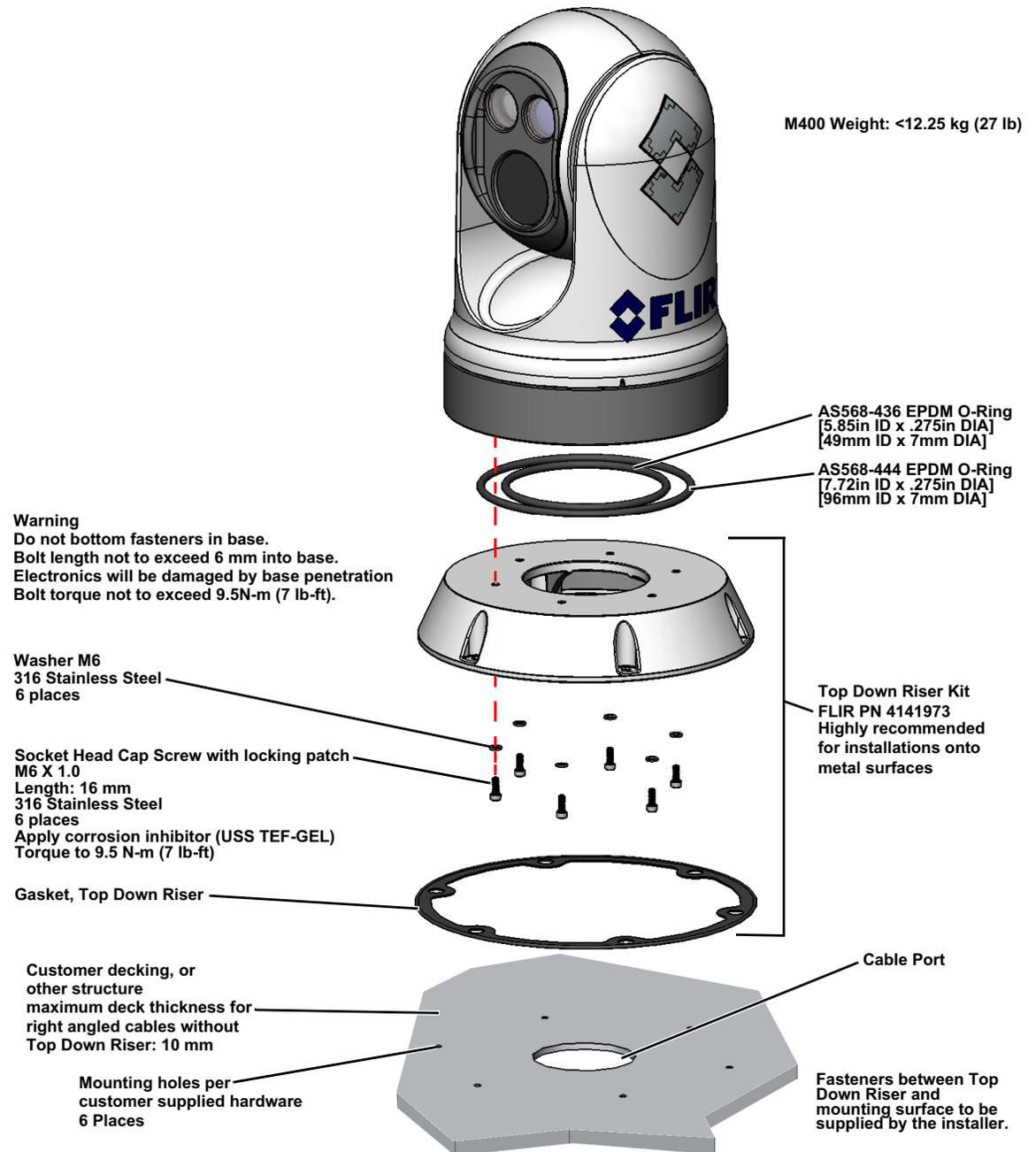


Figure A-1: M400 Top Down Riser Installation—Ball up

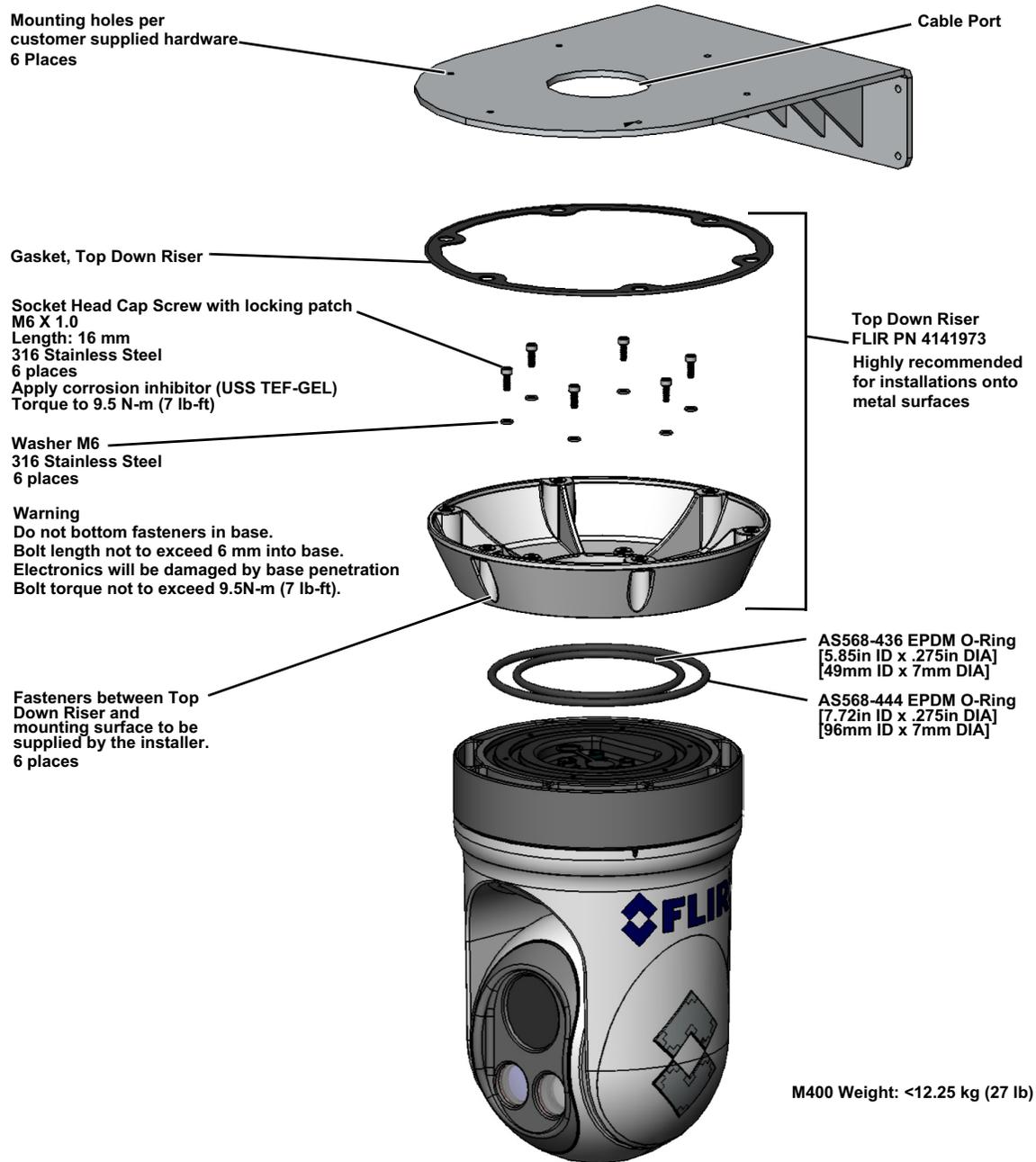


Figure A-2: M400 Top Down Riser Installation—Ball down

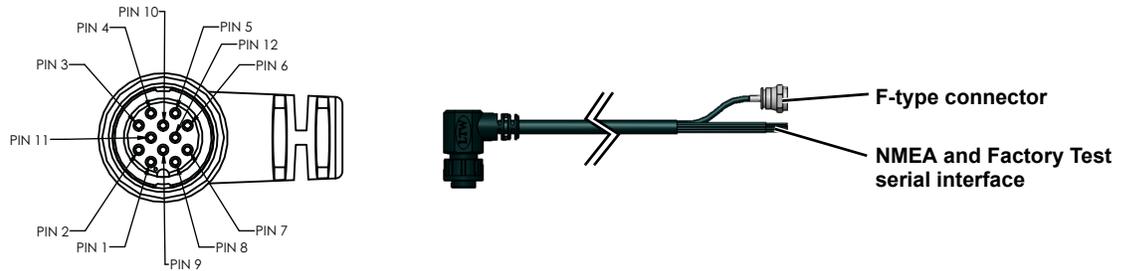


Figure A-3: Analog Video and Serial Cable

TABLE A.1 Analog Video and Serial Cable Pinout

Pin #	Signal Name	Wire Color
1	Factory TX-P	GREEN
2	Factory TX-N	GREEN/WHITE
3	ANALOG VIDEO OUT	RG179
4	ANALOG VIDEO RETURN	NATURAL
5	NMEA RX-N	BROWN/WHITE
6	NMEA RX-P	BROWN
7	NMEA TX-P	BLUE
8	Factory RX-N	ORANGE/WHITE
9	Factory RX-P	ORANGE
10	NMEA SHIELD	DRAIN
11	Factory SHIELD	DRAIN
12	NMEA TX-N	BLUE/WHITE

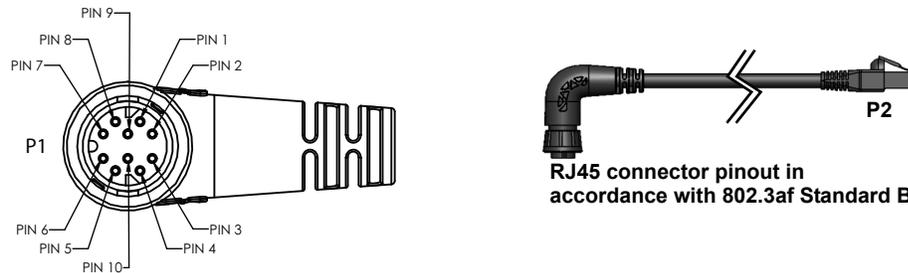


Figure A-4: Ethernet Cable

TABLE A.2 Ethernet Cable Pinout

P1 Pin #	Signal Name	Wire Color	P2 Pin #
1	TXRX A+	ORANGE/WHITE	1
2	TXRX A-	ORANGE	2
3	TXRX C+ DC+	BLUE	4
4	TXRX C- DC+	BLUE/WHITE	5
5	TXRX B+	GREEN/WHITE	3
6	TXRX B-	GREEN	6
7	TXRX D+ DC-	BROWN/WHITE	7
8	TXRX D- DC-	BROWN	8
9		NA	NA
10	DRAIN	DRAIN	SHELL

TABLE A.3 Power Cable Pinout

Signal Name	Wire Color
BATT +	RED
BATT -	BLACK
CHASSIS GROUND	DRAIN

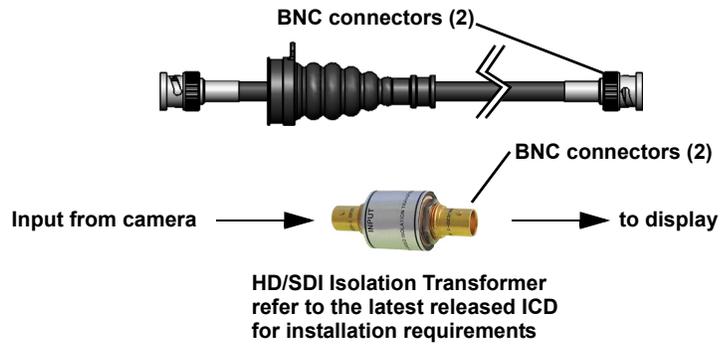
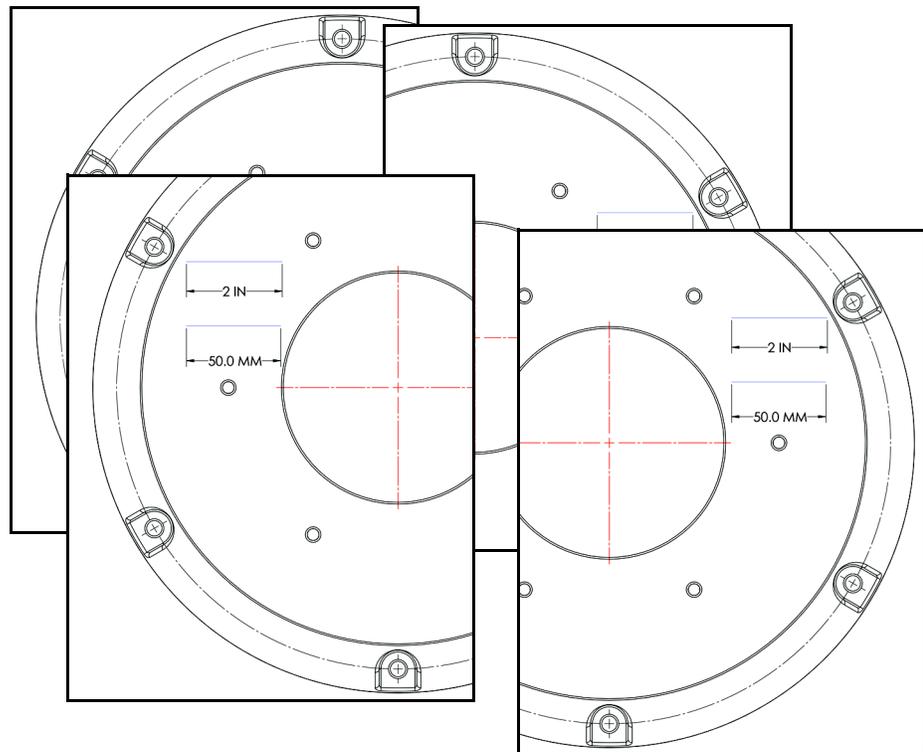


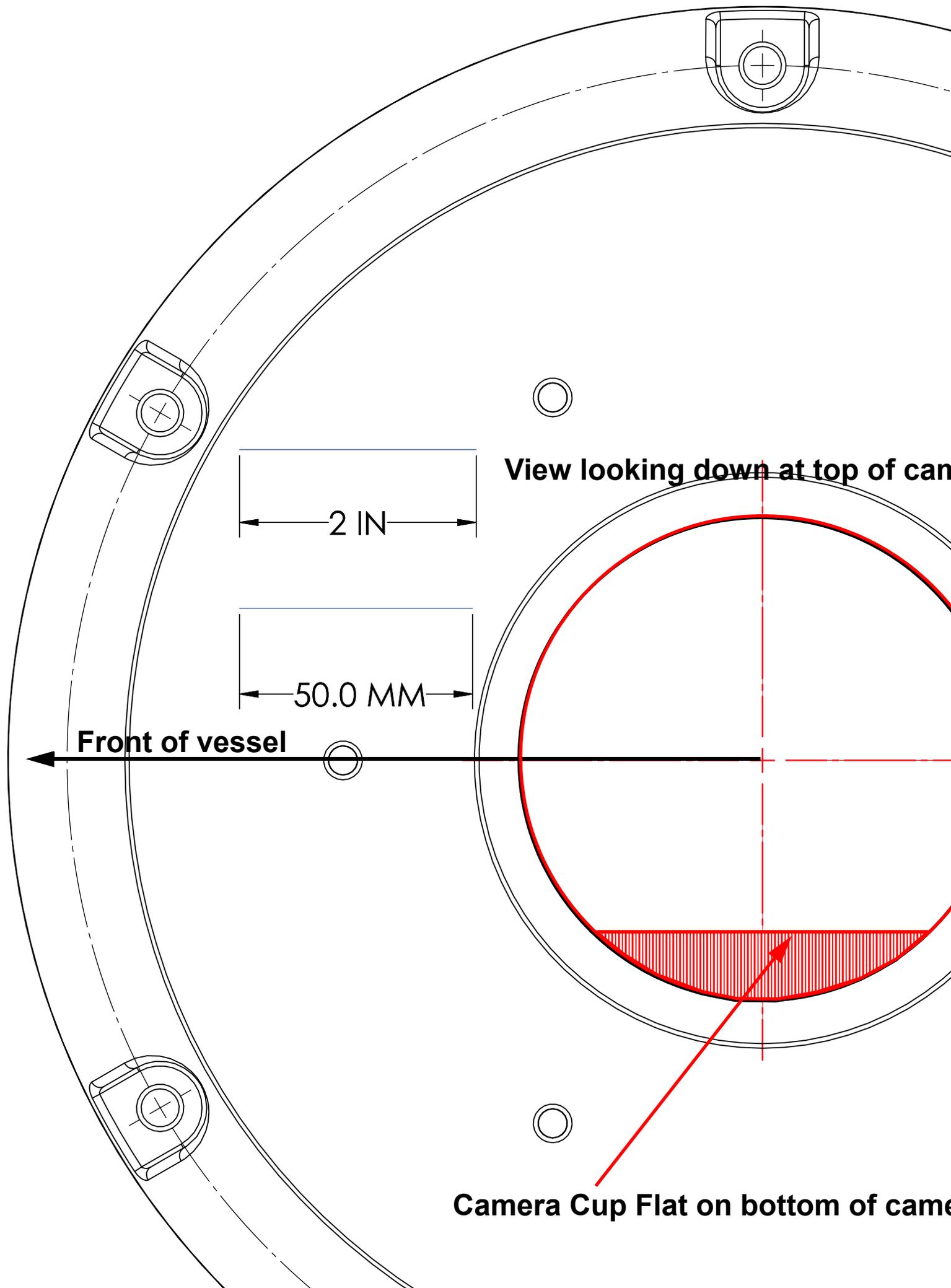
Figure A-5: HD-SDI Cable

## M400 Top Down Riser Installation Template

The following four pages provide a mounting template for the M400 camera using the top down riser which can be printed on a standard printer using either 8.5x11 or A4 paper. See “M400 Riser Installation Document” on page 58. for dimensions.

1. Ensure printer margins are set to zero and scale is 100%.
2. After printing verify the scale dimensions of the key on each page.
3. Align the center cross on the sheets to get a full 13 in. by 13 in. template.





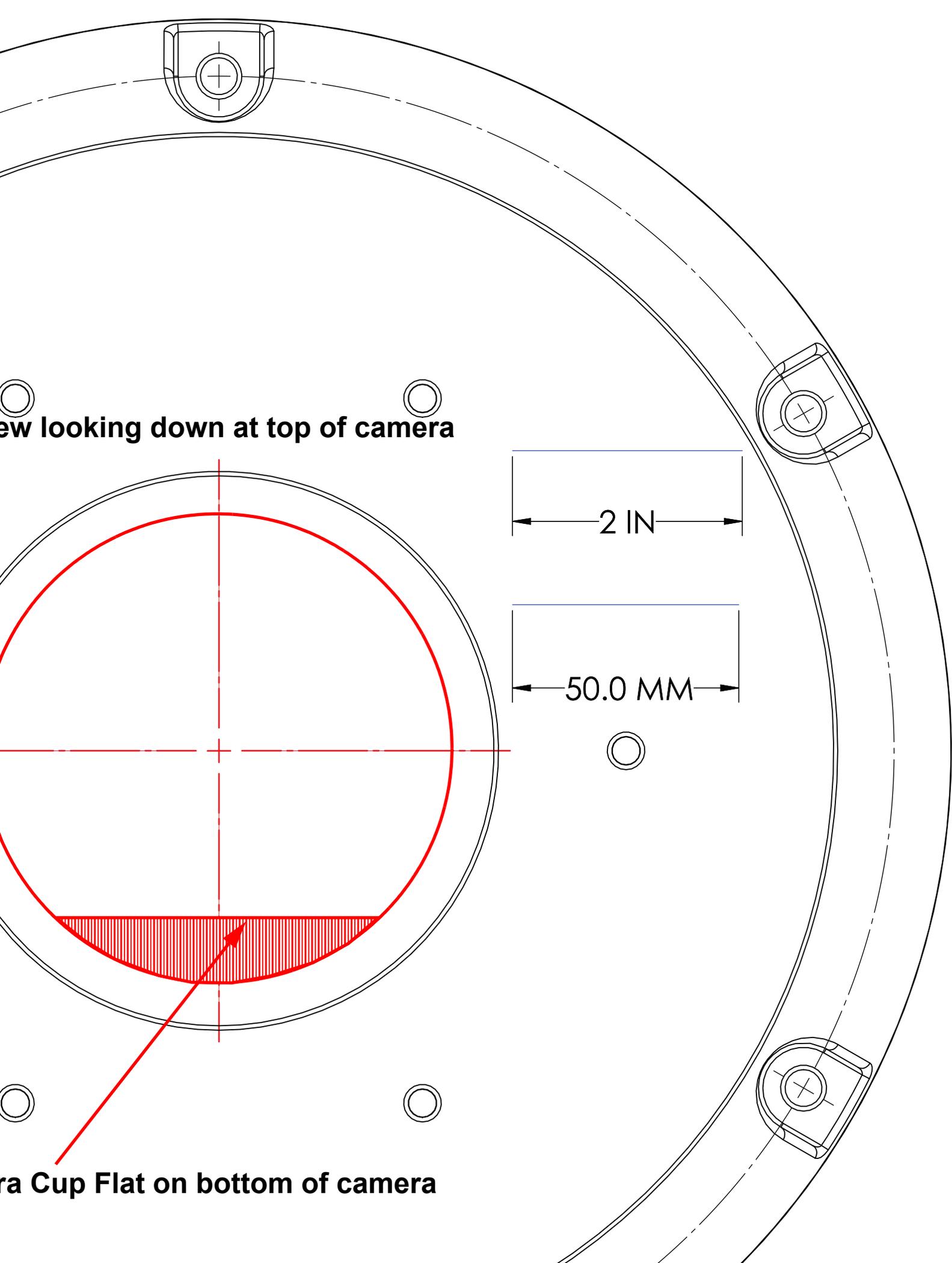
**View looking down at top of camera**

2 IN

50.0 MM

**Front of vessel**

**Camera Cup Flat on bottom of camera**

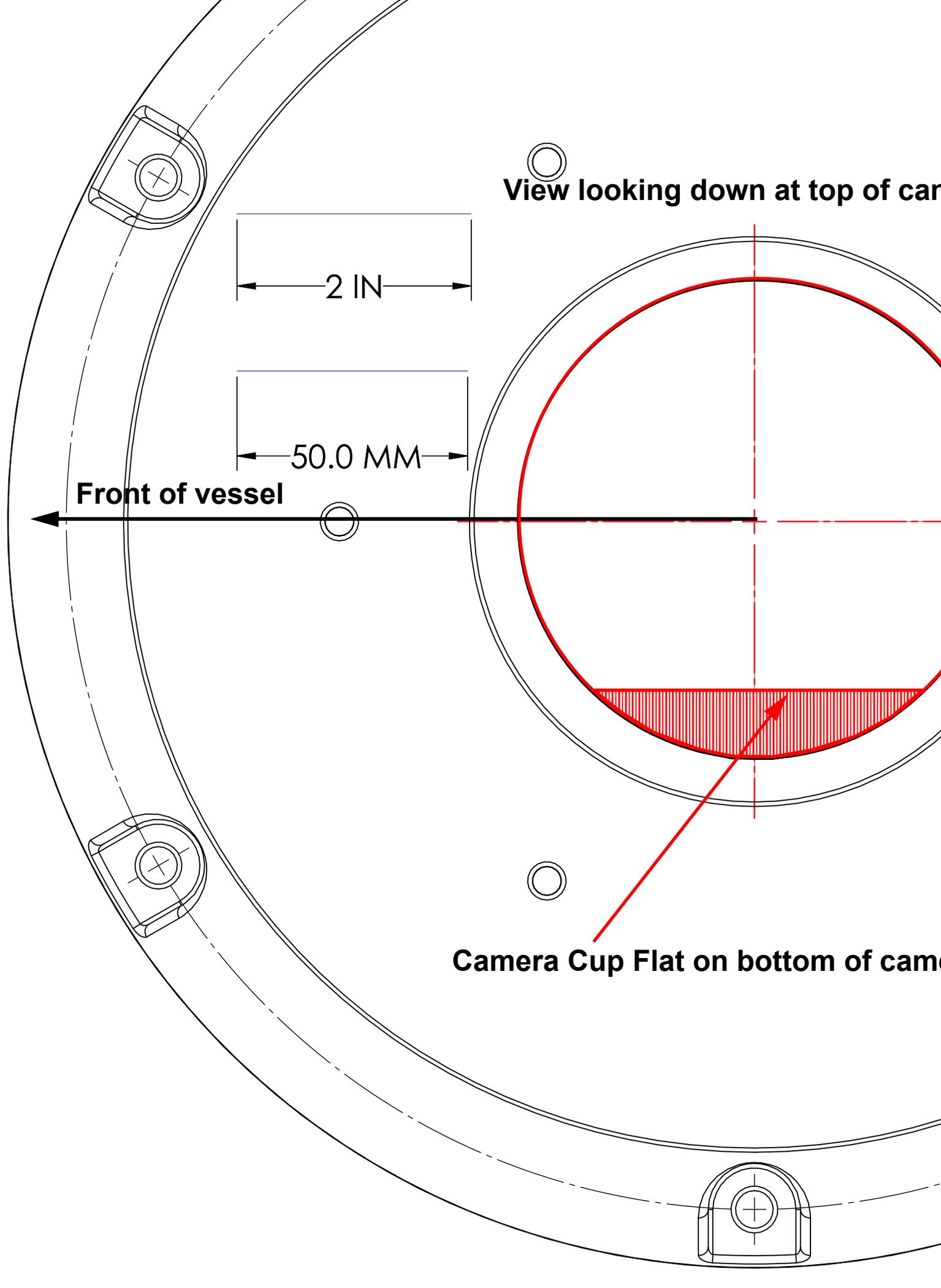


View looking down at top of camera

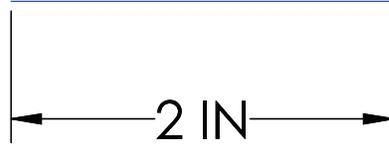
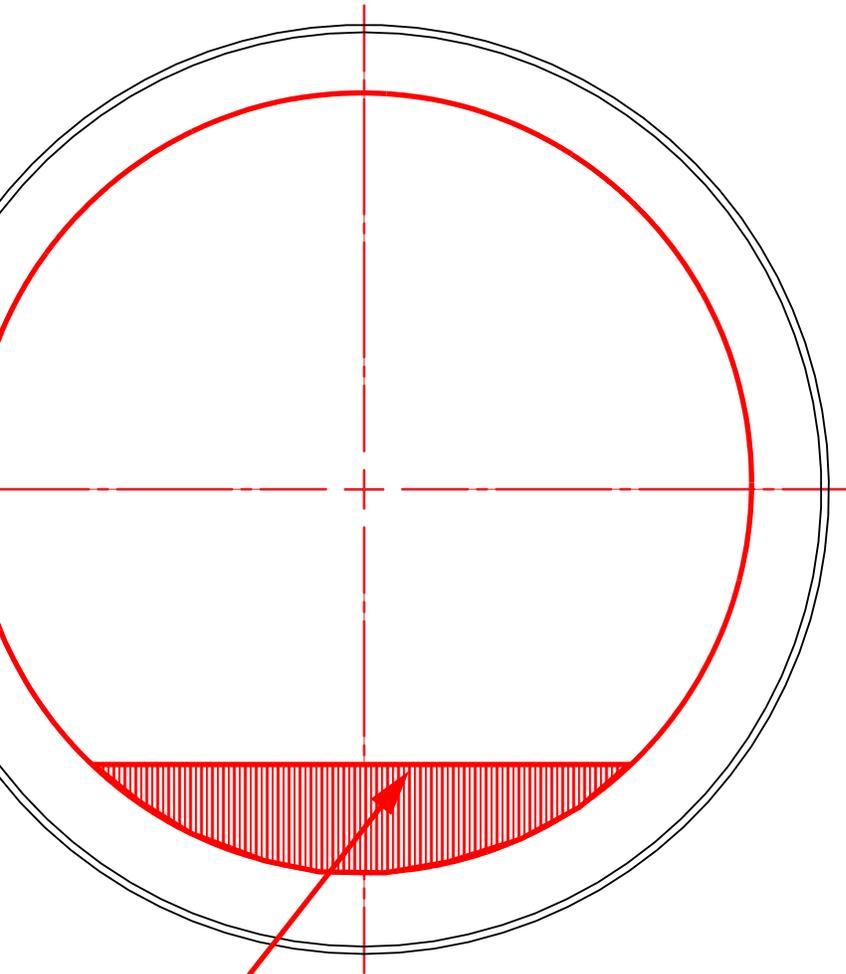
2 IN

50.0 MM

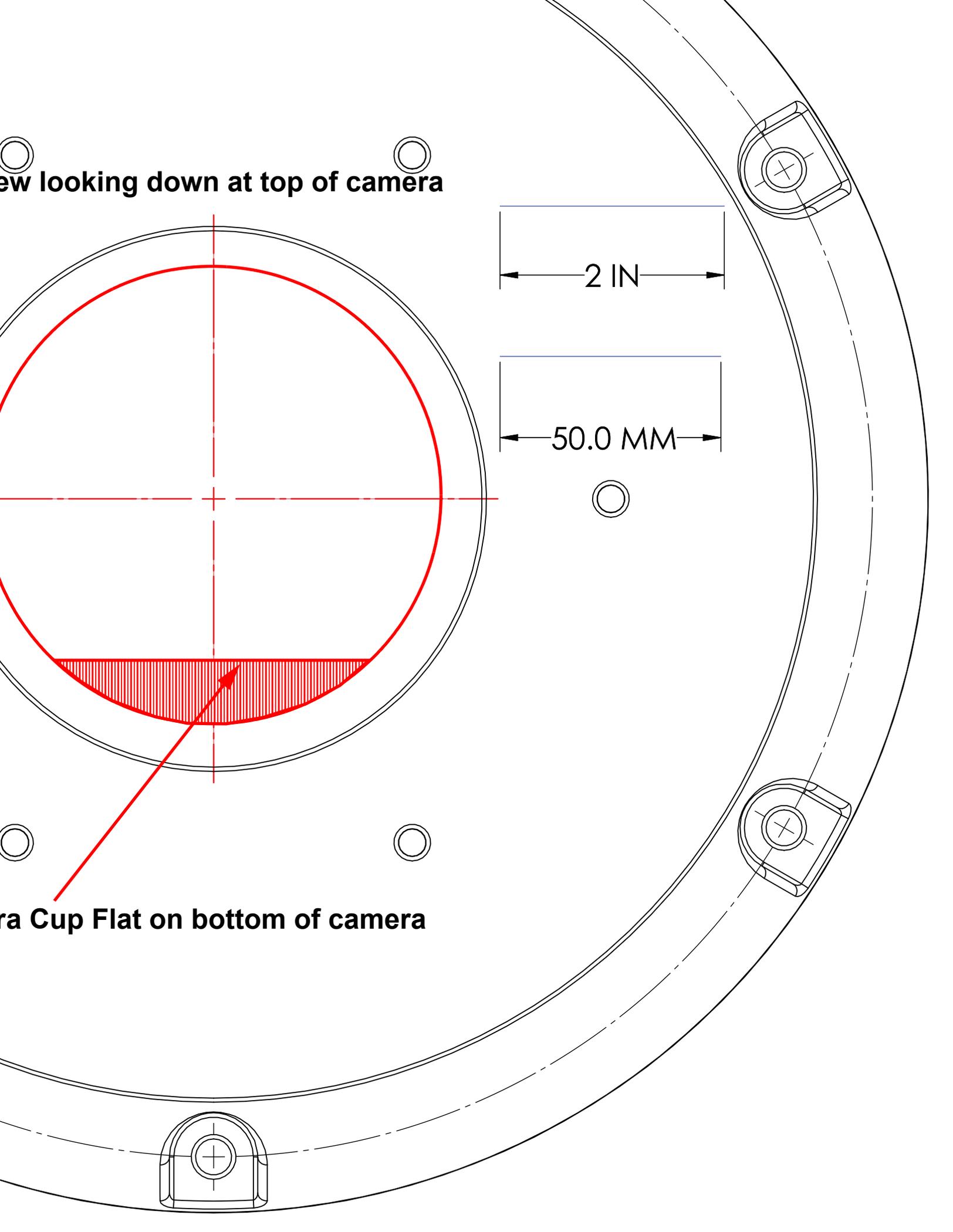
Camera Cup Flat on bottom of camera

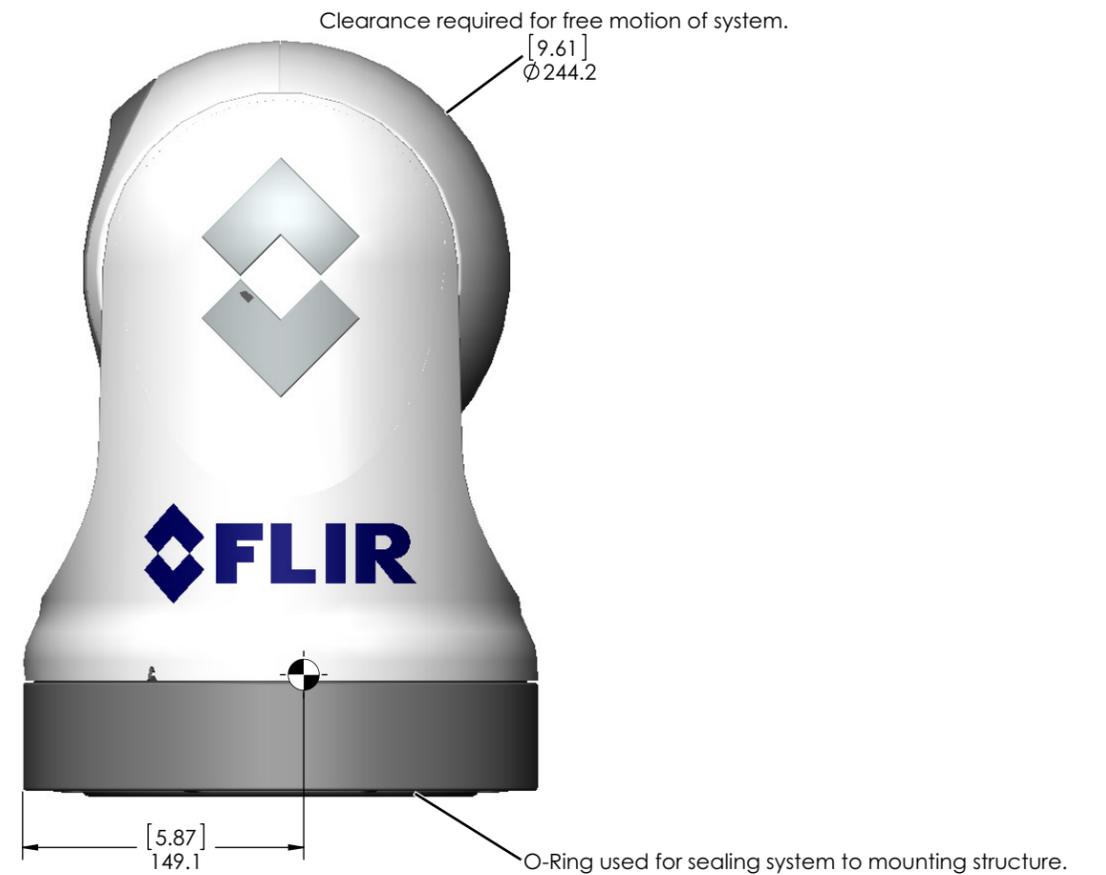
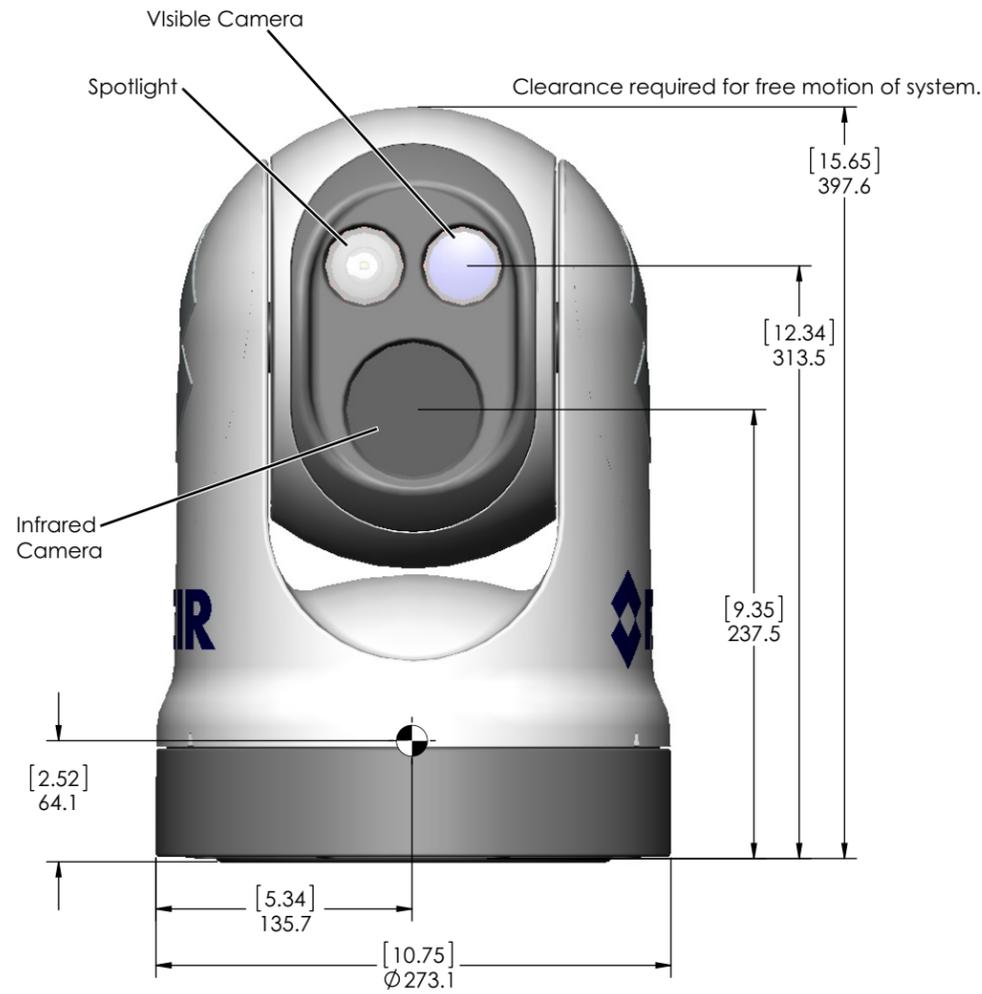


View looking down at top of camera

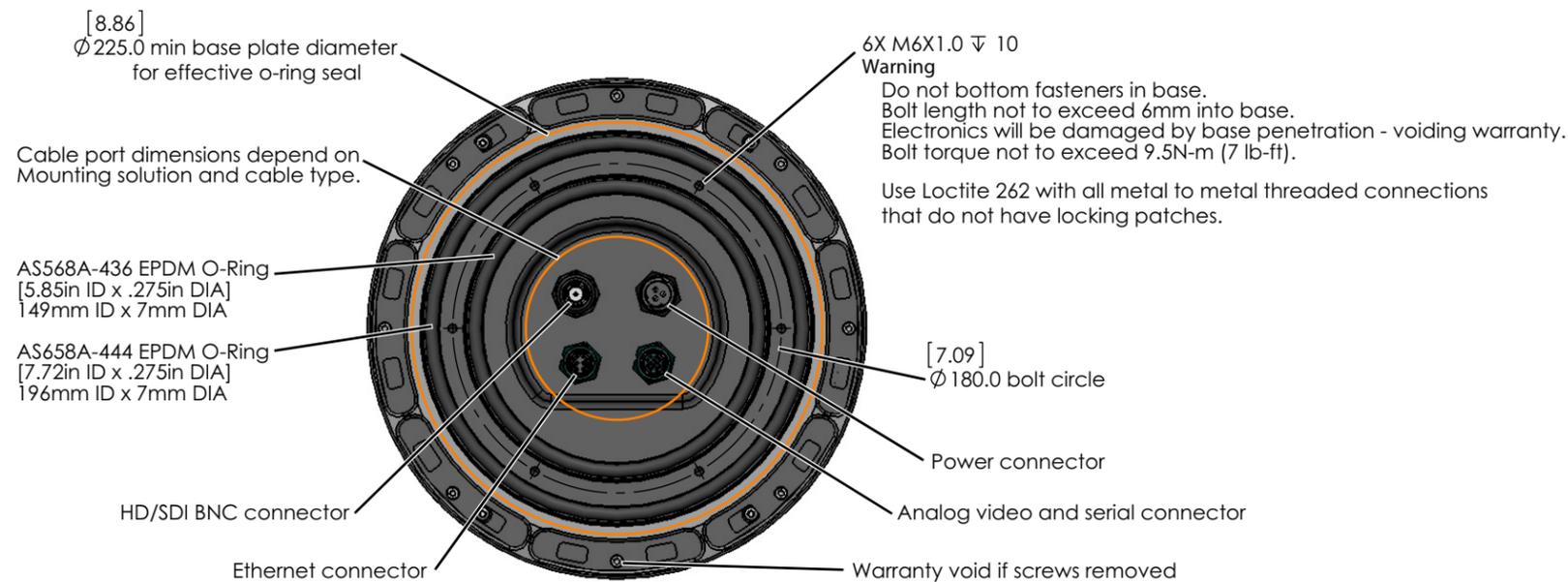


Camera Cup Flat on bottom of camera

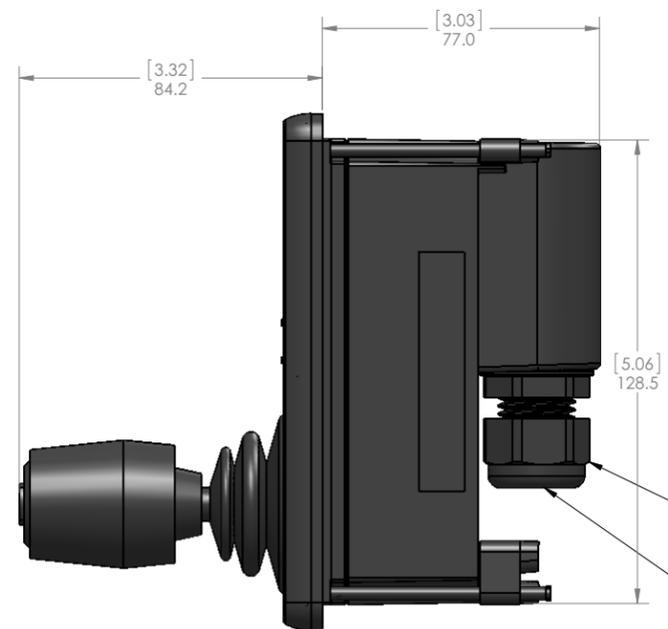
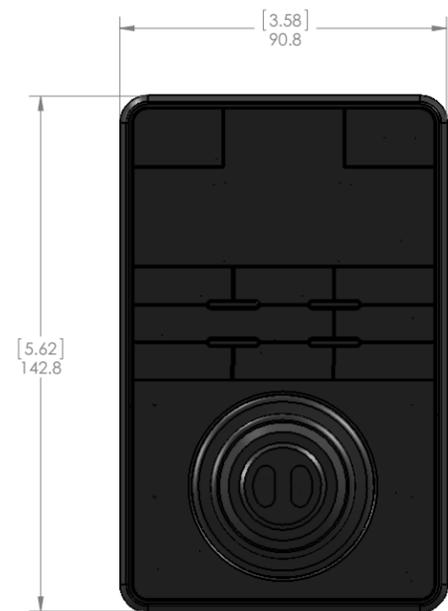




O-Ring used for sealing system to mounting structure. Stand alone unit meets IPx6 sealing specification. Minimum mounting surface flatness of 1.5mm [0.060in] over system diameter required for o-ring use. When mounting to irregular surfaces, use of bedding compound is recommended.



All dimensions are in mm and (inches)



WITH CABLE INSTALLED, TURN NUT 1/4 TURN BEYOND HAND TIGHT.

GLAND SEAL DESIGNED FOR USE WITH DOUBLE SHIELDED CAT 5 ETHERNET CABLE. USE OF SINGL SHIELDED CABLE MAY REQUIRE THE USE OF ADDITIONAL SEALANT SUCH AS SILICON OR RTV TO ENSURE SEALING OF ENCLOSURE

INSERT NETWORK CABLE RJ45 THROUGH GLAND NUT AND SEAL BEFORE INSTALLING

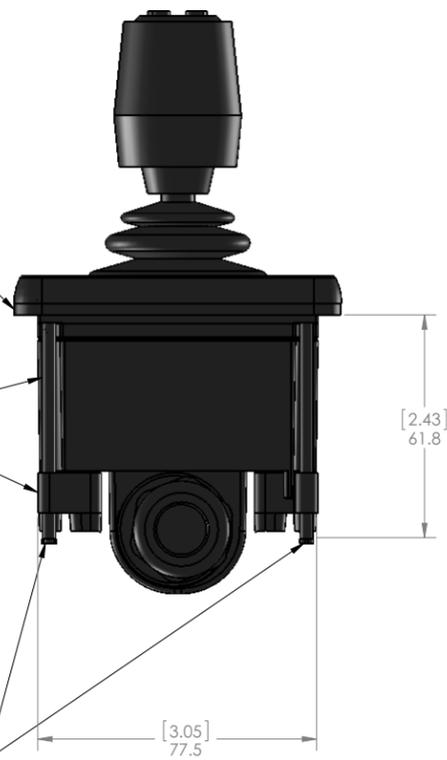
IP66 RATED ABOVE GASKET.

IP64 RATED BEHIND GASKET.

APPLY ADHESIVE SIDE OF GASKET TO JCU BODY.

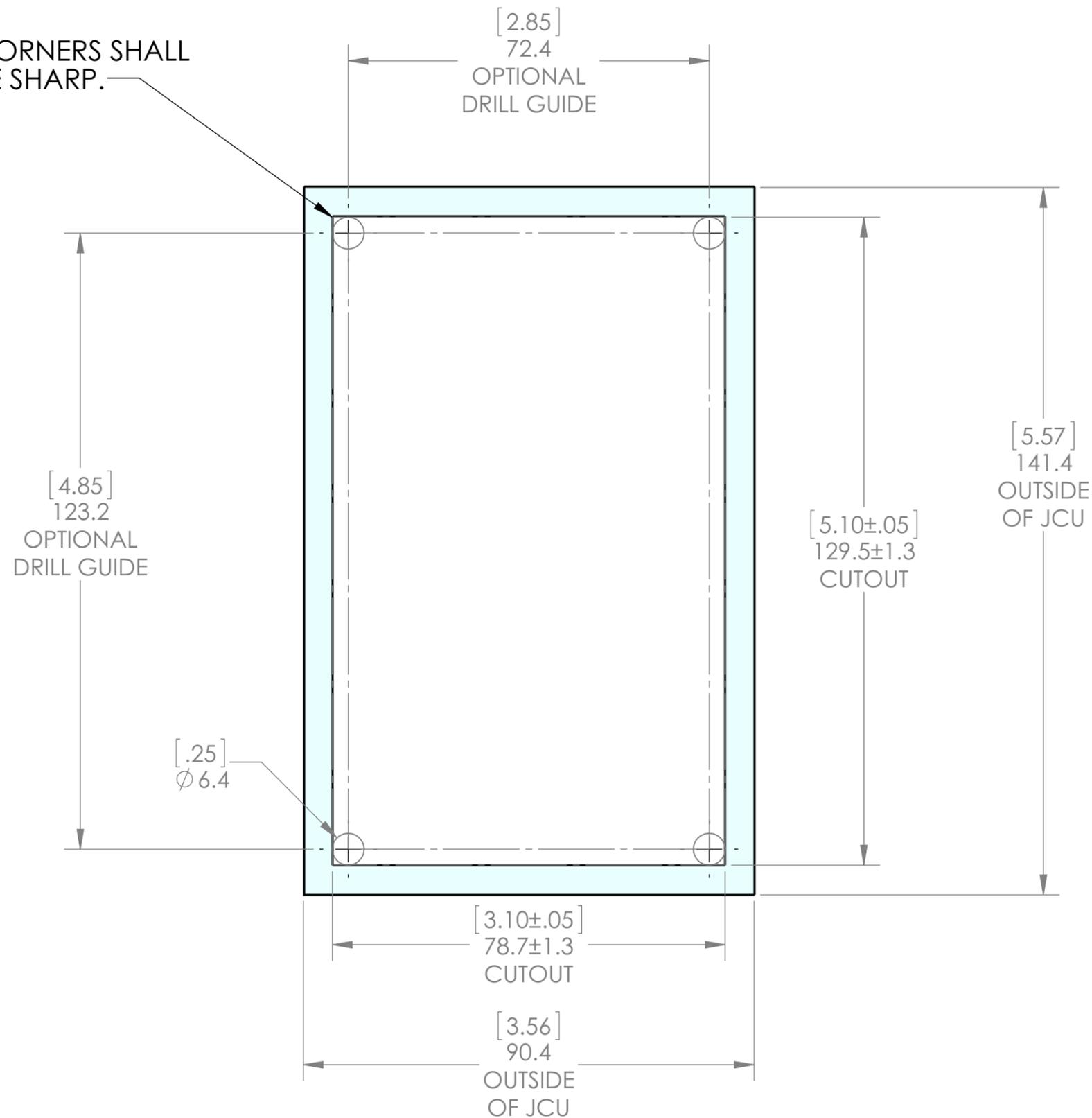
MOUNTING PANEL THICKNESS RANGE 1.6-45 [0.036-1.750]. WHEN MOUNTING TO PANEL LESS THAN 6.3 [0.25] REVERSE PADDLES.

DURING INITIAL TIGHTENING, ENSURE MOUNTING TABS ON SCREWS SWING FREE OF REAR HOUSING. WITH TABS RUN UP AGAINST REAR OF INSTRUMENT PANEL, TIGHTNE 1/4 - 1/2 TURN BEYOND HAND TIGHT.



**All dimensions are in mm and (inches)**

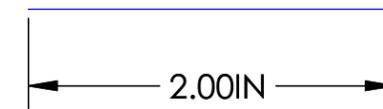
CORNERS SHALL BE SHARP.



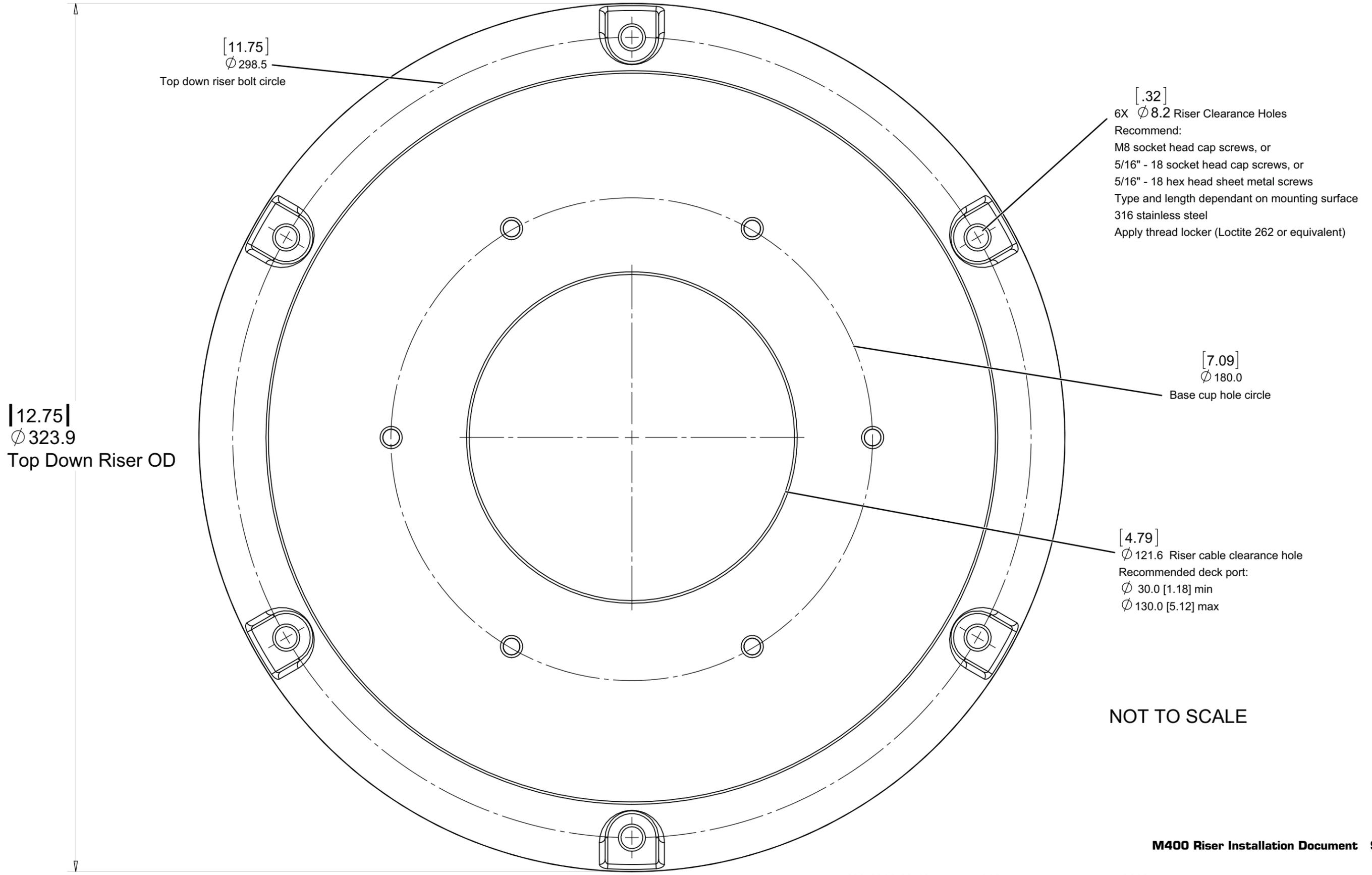
IMPORTANT NOTE:

PAPER SIZE: 11x17in  
TEMPLATE SHOULD PRINT 1:1

DUE TO VARIATION IN SOFTWARE AND PRINTER, PLEASE VERIFY SCALE BELOW BEFORE MODIFYING MOUNTING SURFACE.



All dimensions are in mm and (inches)



[11.75]  
 Ø 298.5  
 Top down riser bolt circle

[.32]  
 6X Ø 8.2 Riser Clearance Holes  
 Recommend:  
 M8 socket head cap screws, or  
 5/16" - 18 socket head cap screws, or  
 5/16" - 18 hex head sheet metal screws  
 Type and length dependant on mounting surface  
 316 stainless steel  
 Apply thread locker (Loctite 262 or equivalent)

[7.09]  
 Ø 180.0  
 Base cup hole circle

[12.75]  
 Ø 323.9  
 Top Down Riser OD

[4.79]  
 Ø 121.6 Riser cable clearance hole  
 Recommended deck port:  
 Ø 30.0 [1.18] min  
 Ø 130.0 [5.12] max

NOT TO SCALE

