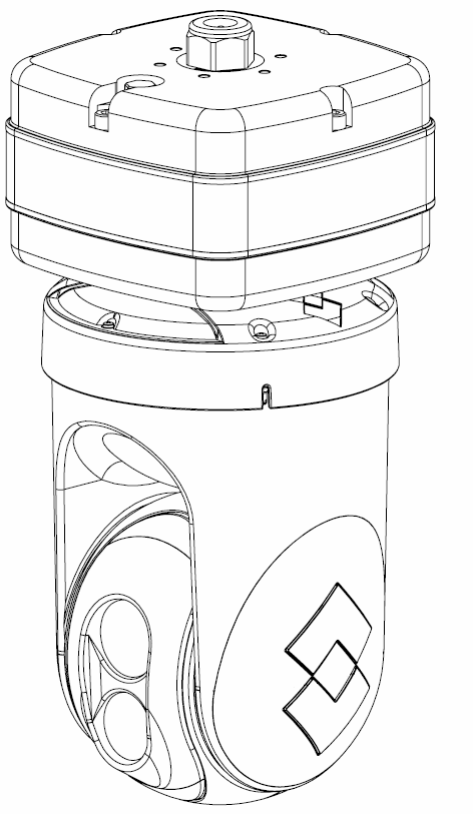
Installation Manual

D-Series C



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Important Instructions and Notices to the User:

Modification of this device without the express authorization of FLIR Commercial Systems, Inc. may void the user's authority under FCC rules to operate this device.

Note 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna;
- Increase the separation between the equipment and receiver;
- Connect the equipment into an outlet on a circuit different from that of the receiver; and/or
- Consult the dealer or an experienced radio/television technician for help.

Note 2: This equipment was tested for compliance with the FCC limits for a Class B digital device using a shielded cable for connecting the equipment to an analog video output to a monitor and using a shielded USB cable for connecting the equipment to a personal computer. When making such connections, shielded cables must be used with this equipment.

Industry Canada Notice:
This Class B digital apparatus complies with Canadian ICES-003.

Avis d'Industrie Canada:
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Proper Disposal of Electrical and Electronic Equipment (EEE)

The European Union (EU) has enacted Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE), which aims to prevent EEE waste from arising; to encourage reuse, recycling, and recovery of EEE waste; and to promote environmental responsibility.

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.

D-Series C Camera Installation

Basic Operation and Configuration

Advanced Configuration

1 D-Series C Camera Installation

The D-Series Camera is a multi-sensor camera system on a pan/tilt platform. The system combines an infrared thermal imaging camera and a visible-light video camera, and is intended for outdoor installations. This manual describes the installation of the D-Series C camera. If you need help during the installation process, contact your local FLIR service representative or, call 888-747-3547 inside the US. Online help is available through the support web site: http://support.flir.com/

All installers and integrators are encouraged to take advantage of the training offered by FLIR; visit http://www.flir.com/training for more information.

This manual includes the following topics:

- Installation overview
- Mounting the camera and its components
- Connecting the electronics
- Bench testing the camera
- Basic configuration and operation of the camera
- Camera Specifications

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

1.1 Warnings and Cautions

Warning!

If mounting the D-Series C camera on a pole, tower or any elevated location, use industry standard safe practices to avoid injuries.

Caution!

Except as described in this manual, do not open the D-Series C camera for any reason. Damage to the camera can occur as the result of careless handling or electrostatic discharge (ESD). Always handle the camera with care to avoid damage to electrostatic-sensitive components.

Prior to making any connections, ensure the power supply or circuit breaker is switched off.

Be careful not to leave fingerprints on the D-Series C camera's infrared optics.

Operating the camera outside of the specified input voltage range or the specified operating temperature range can cause permanent damage.

Be sure to use a water-tight enclosure for the pigtail connections (rated IP 67 or higher).

1.2 References

D-SERIES C Interface Control Document (ICD) (FLIR Doc # 427-9XXX-XX-19)

- Available on the documentation CD or from the FLIR website, provides further details regarding mechanical dimensions and mounting for the D-Series C camera.

Nexus IP Camera Configuration Guide (FLIR Doc # 427-0030-00-28)

- Available on the documentation CD or from the FLIR website, provides further details on using a web browser to operate and configure the D-Series C camera.

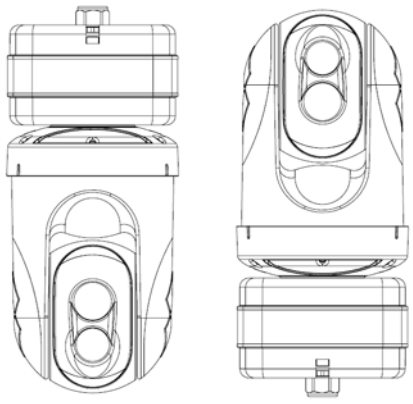
1.3 Camera Overview

The D-Series C camera is both an analog and an IP camera. The video from the camera can be viewed over a traditional analog video network or it can be viewed by streaming it over an IP network using MPEG-4, M-JPEG and H.264 encoding. Analog video will require a connection to a video monitor or an analog matrix/switch. The IP video will require a connection to an Ethernet network switch and a computer with the appropriate software for viewing the video stream.

1.4 Installation Overview

The D-Series C Camera is a multi-sensor thermal imaging camera system intended for outdoor security applications. The system has a pan/tilt gimbal assembly (dome) with a dual payload that includes:

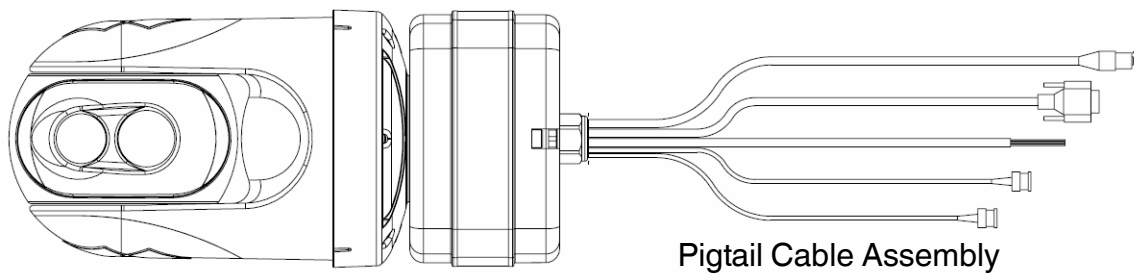
- An uncooled thermal imaging camera with fixed Field of View (FOV)
- A daylight camera with continuous zoom



It is shipped from the factory in one of two configurations, either dome up[1] or dome down, depending on the model number ordered. The D-Series C camera is intended to be mounted on a heavy-duty fixed pedestal or wall mount commonly used in the security industry. The camera mount must support at least 11.4 kg (25 lbs).

The camera can be attached to the mount with a single 1.5” NPT stainless steel threaded coupler which is supplied with the camera. Optionally the camera can also be mounted to a surface with M5 fasteners (quantity 6).

The electrical connections can be made with a short pigtail cable assembly which exits the base of the camera. The camera will typically be mounted (either directly or via a short coupler) to a water-tight enclosure for the pigtail connections. In order to install the camera, it is not necessary to open the camera’s electronics enclosure.



Pigtail Cable Assembly

The pigtail connectors range in length from 300 mm (11.8 in) minimum to 450 mm (17.7 in) maximum.

1. A camera mounted in the dome up position has a limited range of downward tilt. The range of tilt motion is 25° to -90° when dome down, -25° to 90° when dome up.

1.5 Camera Connection Options

The camera can be powered with a conventional power supply, using 21 - 30 VAC or 21 - 30 VDC.

The D-Series C Camera can produce analog or digital (IP) video output (or both). Analog video will require at least one connection to a video monitor or an analog video matrix switch. In most analog installations, two video connections will be used - one for the thermal camera video, and one for the daylight camera video. The camera pigtail provides two BNC connectors for these video channels.

An Ethernet connection is provided for IP video streaming and for command and control communications (pan/tilt/zoom/etc.). A web browser can be used for camera configuration and maintenance (software/firmware updates). On some models, a web browser can also be used for IP video streaming and for command and control.

For analog installations that are not using Ethernet/IP, a serial cable (RS232 or RS422) can optionally be connected and used for command and control communications, supporting either Pelco D or Bosch protocols. In installations using analog video and serial communications, it is recommended an Ethernet cable should also be installed for camera configuration, operation and troubleshooting.

For installations where the camera is mounted on a tower or pole or other location that may be difficult to access, it is recommended the Ethernet connection should be installed from the camera down to ground level at a minimum, to allow easier access.

1.5.1 Supplied Components

The D-Series C camera package includes these standard components:

- Multi-sensor Pan/Tilt Camera Gimbal Assembly
- Stainless Steel threaded coupler (1.5” OD)
- Power connectors (qty 3)
- Ethernet coupler (RJ-45 jacks at each end)
- D-Series C Camera Documentation Package

1.5.2 Camera Accessories

The following accessories are available for purchase from FLIR Systems, Inc.

- Power supply (PN 4124857)

Additional accessories may be available subsequent to the printing of this document. Contact your FLIR Dealer or integrator for up-to-date information.

1.5.3 Required Supplies

The installer will supply the following items, as needed (specific to the installation).

- Water-tight enclosure for the connections
- Power cable for system power; 3-conductor, shielded, gauge determined by cable length and supply voltage
- Cat5e Ethernet cable for digital video and/or communications
- Coaxial RG59U cables for analog video (up to 2, with BNC male connector at the camera end to connect to the supplied pigtail)
- Serial cable for serial communications
- Camera grounding strap, camera mount, miscellaneous connectors and tools

1.6 Location Considerations

The camera will require connections for power, video and communications. Ensure that cable distances do not exceed the specifications and that cables adhere to all local and industry standards, codes, and best practices. The D-Series C camera should be mounted upright (dome up) or upside down (dome down), depending on the model ordered. The camera should be mounted such that the FLIR logo on the side of the camera is right-side up and readable.

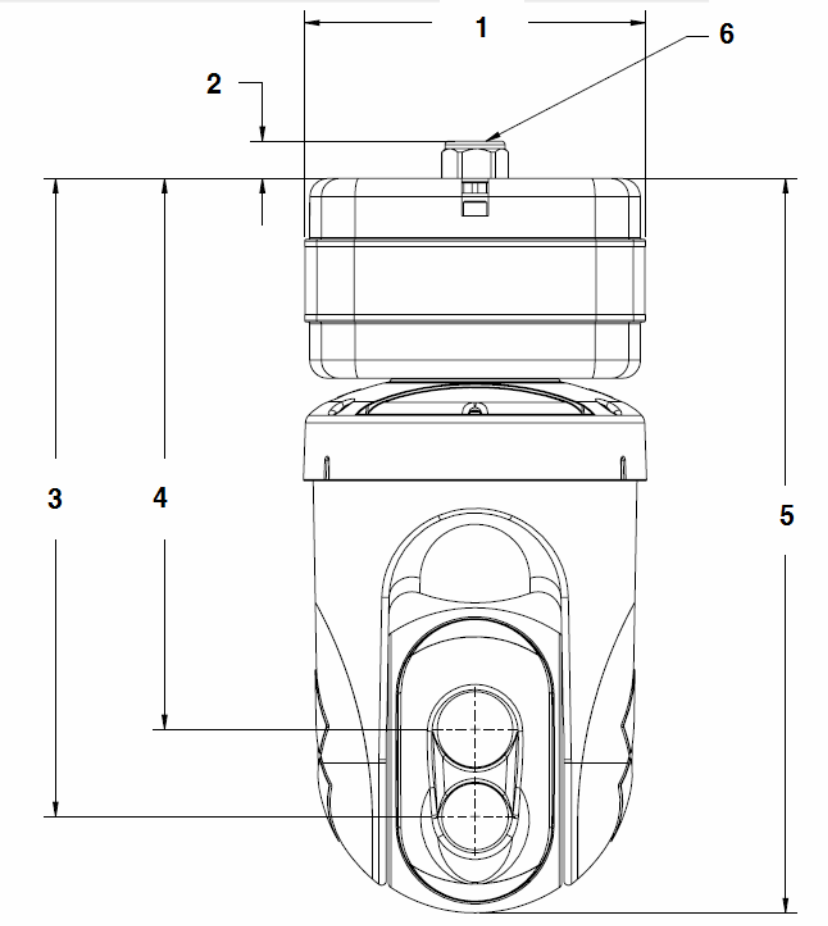


Table 1-1: Camera Dimensions

1	187.5 mm (7.38 in) square
2	20.6 mm (0.87 in) - Cable Gland, do not loosen or remove
3	351.4 mm (13.83 in)
4	303.4 mm (11.94 in)
5	404.4 mm (15.92 in) - Overall camera height from base
6	Cables (not shown) exit through the center of the base

A dome-up camera model can be mounted on top of the mounting surface. A dome-down camera model can be mounted under an overhanging mounting arm, or underneath an overhanging mounting surface such as eaves or an awning.

Note

If the camera is to be mounted on a pole or tower or other hard-to-reach location, it may be a good idea to connect and operate the camera as a bench test at ground level prior to mounting the camera in its final location.

1.6.1 Bench Testing

Connect the power, video, serial and Ethernet connections and confirm that the video is displayed on a monitor when the power is turned on. Confirm the camera can be controlled by moving it (pan/tilt). For configuration and basic setup information using the onboard web server, refer to the following chapter.

1.6.2 Prior to Cutting/Drilling Holes

When selecting a mounting location for the D-Series C camera, 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 cables that have sufficient dimensions to ensure safety (for power cables) and adequate signal strength (for video and communications).

Caution!

There is no need to open the electronics enclosure. All settings and adjustments are done through software. There are no user-serviceable parts inside the camera enclosure.

1.6.3 Camera Mounting

The camera mount must nominally be rated to support at least 11.4 kg (25 lbs). For some installations, the mount must support even greater weights. Use a mount which will provide adequate support in adverse weather and environmental conditions. The D-Series C camera can be secured to the mount two ways:

- 1.5” npt threaded coupler
  Intended for rigid mounting with the supplied NPT stainless steel coupler, or equivalent.
  Important: Use PTFE pipe seal tape or equivalent on the coupler.
- M5 x 0.8 fasteners (quantity 6)
  If using four M5 x 0.8 fasteners, the maximum depth of the fastener should not exceed 10.0 mm (0.4 in). Use Loctite 222 low strength threadlocker for the M5 fasteners.

Refer to the ICD for additional information (FLIR Doc. # 427-9XXX-XX-19).

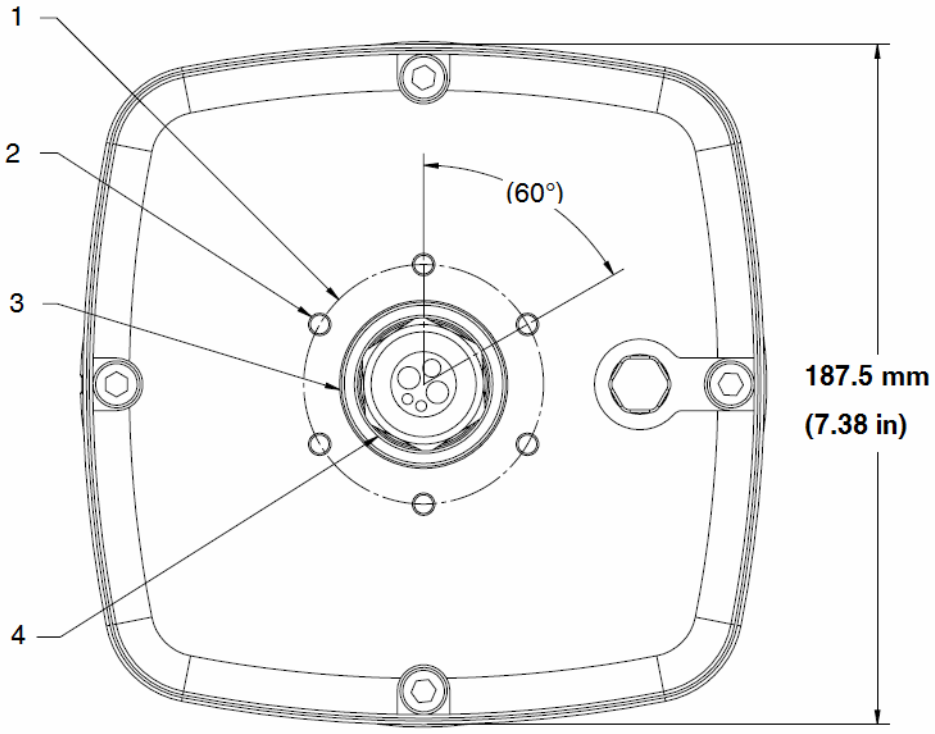


Figure 1-1: D-Series C Camera Bottom Mounting Holes

Table 1-2:

1	M5 bolt circle diameter 66 mm (2.598 in)
2	6X M5 X 0.8 fasteners, equally spaced at 60°; maximum fastener engagement 10 mm (.394 in)
3	1-1/2 in NPT threaded opening
4	Do not loosen or remove the cable gland nut; doing so could result in damage to the camera unit

Be sure to select a water-tight enclosure for the connections that allows adequate space for the cable connections. This requirement may vary, depending on the installation. Do not exceed the minimum bend radius per the recommendation of the cable manufacturer. The typical cable bend radius is 50-75mm (2-3 in).

1.7 Camera Connections

Do not disassemble the camera, as it will void the camera warranty and could lead to damage if the camera is not resealed properly.

1.7.1 Connecting Power

The camera can be powered with a conventional AC or DC power supply. Prior to making any connections, ensure the power supply or circuit breaker is switched off.

Table 1-3: Power Connections

Wire Color	VAC	VDC
Red	Line	DC +
Black	Neutral	DC -
Clear	Chassis	Chassis

The power cable supplied by the installer must use wires that are sufficient size gauge for the supply voltage and length of the cable run, to ensure adequate current carrying capacity (for most installations 18 AWG is recommended). Always follow local building/safety codes.

Note

The supplied connectors for the power connections will accept 16 AWG to 24 AWG wire size.

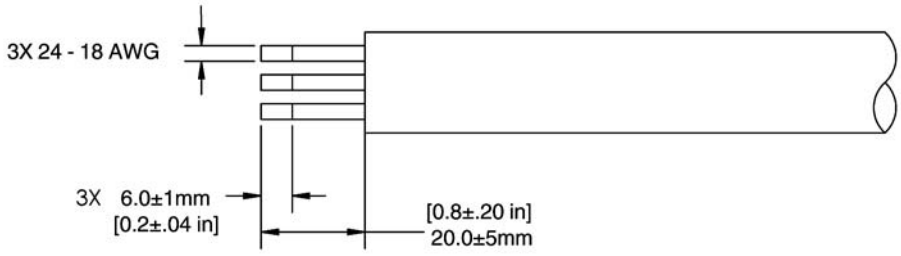


Figure 1-2: Power Cable (3 conductor)

The camera itself does not have an on/off switch. Generally the D-Series C camera may 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 powered on and operating.

1.7.2 Camera Grounding

Ensure the camera is properly grounded. Failure to properly ground the camera can lead to permanent damage to the camera. Typical to good grounding practices, the camera chassis ground should be connected to the lowest resistance path possible.

Grounding of the camera is accomplished by terminating the ground wire (clear wire of the power cable pigtail). Additional grounding can be accomplished by connecting a grounding strap to one of the 6x bolt locations on the unit's mounting surface, with the other end connected to the nearest earth-grounding point.

1.7.3 Analog Video Connections

The analog video connections from the camera use female BNC connectors. The video cable supplied by the installer should be rated as RG-59/U or better to ensure a quality video signal and should be terminated with male BNC connectors.

1.7.4 Ethernet

The Ethernet pigtail cable is terminated with an RJ-45 plug. Connect the supplied Ethernet coupler to the pigtail cable, then connect a shielded cat5e/6 Ethernet cable to the other end of the Ethernet coupler. Connect the far end of the Ethernet cable to a network switch.

1.7.5 Serial Connection

By default, the serial interface uses the Pelco D protocol, RS-422 standard, 9600 baud rate (8/none/1), and address 1. The pigtail serial connection provides a female DB9 connector. The pinouts are as follows:

Table 1-4: Serial Connector

Signal	DB9F Pin	Color wire
TxA	2	Green
TXB	7	White
RxA	8	Black
RxB	3	Red
Ground	4	Brown

1.8 Camera Specifications

Camera Model	D-Series C
Camera Platform Type	Pan/Tilt (Pan: 360° continuous; Tilt: 25° to -90° when dome down, -25° to 90° when dome up)
Composite Video	NTSC or PAL
Thermal Camera	
Array Format	324x256 (25 µm pixel pitch) 640x480 (17 µm pixel pitch)
Detector Type	Long-Life, Uncooled VOx Microbolometer
Effective Resolution	76,800
Field Of View (Focal Length)	D-348 C = 48° × 39° (9 mm) D-334 C = 34° × 28° (13 mm) D-324 C = 24° × 19° (19 mm) D-313 C = 13° × 10° (35 mm) D-645 C = 45° × 37° (13 mm) D-625 C = 25° × 20° (25 mm) D-618 C = 18° × 14° (35 mm)
Spectral Range	7.5 to 13.5 µm
Lens	Athermalized, focus-free
General	
Weight	18.2 lb (8.3 kg)
Dimensions (L,W,H)	8” x 8” x 17" (Nominal) (203mm x 203mm x 432mm)
Input Voltage	24 VDC (21 to 30 VDC) or 24 VAC (21 to 30 VAC)
Power Consumption	Maximum power at 24VDC = 75 Watts Maximum power at 24VAC = 85VA
Shipping weight	21 lbs (9.5 kg)
Shipping Dimensions	12" x 12" x 19.5"
Environmental	
IP rating (dust and water ingress)	IP56
Operating temperature range	-25°C to 70°C (-13° F to 158° F)
Storage Temperature range	-55°C to 85°C (-67° F to 185° F)
Humidity	0-95% relative
Shock	MIL-STD-810F
Vibration	IEC 60068-2-27
Approvals	FCC Part15, Subpart B, Class A, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, EN 50130-4

2 Basic Operation and Configuration

This chapter provides basic information on how to operate a new camera that has not yet been configured. A bench test can be used to verify camera operation before the camera is configured for the local network. This chapter also provides basic configuration information.

2.1 Nexus IP Camera

TheD-Series C camera is an IP camera with Nexus capabilities, which means there is a microprocessor inside that runs the Nexus Server software. The Nexus Server provides a number of services, including camera control, video streaming, and geo-referencing capabilities. The Nexus communications protocol is an open, standards-based protocol that allows the server to communicate with a video management client, such as FLIR Sensors Manager or with a third-party ONVIF-compatible VMS client.

There are two main components to the Nexus Server software. One is a web server known as the web tool or web interface that listens on the network for web browser requests, and is used for the initial (and perhaps ongoing or occasional) configuration changes to the server. The latest release of the web tool also allows the user to view video and to operate the camera.

The other process, known as the Nexus Server, listens on the network for connections from clients such as FSM or other VMS clients. These clients are used to control the camera and stream video during day-to-day operations of the camera.

2.1.1 Nexus Server Configuration

In general, it may be necessary for the installer to make a limited number of configuration changes for each server, such as setting the serial and/or IP communication parameters. For example, each camera comes from the factory with the same default IP address, so adding more than one camera to an IP network requires each camera to be configured with a different IP address, at a minimum. On the other hand, many of the configuration parameters will remain unchanged from the factory default settings.

In order to control the camera, it is necessary to communicate with it either using serial communications (RS-232 or RS-422), or over Ethernet using Internet Protocol (IP). In either case, it is likely there are some communication parameters that are specific to each installation.

2.1.2 Serial and/or IP Communications

For a camera that is installed in a legacy-type CCTV network using analog video, the camera may commonly be controlled with serial communications. The serial cable from the camera will be connected to a keyboard/joystick device, or to a video switch, encoder, or DVR that has a serial communication port. In this case the installer may want to configure parameters such as the address of the camera, the baud rate, and so on. On Nexus IP cameras that support serial communications, these parameters can be set through software using a web browser. The parameters can also be set using DIP switches when IP communications are not used.

For a camera installed in an IP network, the camera will commonly be controlled over Ethernet by a PC or laptop running FLIR Sensors Manager (FSM) or a third-party Video Management System (VMS) software. FSM is an integral part of the Nexus architecture—it is a client program that communicates with the Nexus Server on the camera. It allows control of the camera and video streaming and many other sophisticated functions.

In many cases, a camera will be installed with both serial and Ethernet communications. As such, the camera can be controlled by means of a serial device or through software. When someone tries to

control the camera with a serial device at the same time as someone does through the software IP interface, the serial device takes priority.

Not all parameter settings are described in this manual. If you need help during the configuration process, contact your local FLIR representative or, call 888-747-3547 inside the US.

2.1.3 Serial Communications

Cameras that have a serial interface support a limited set of pan/tilt/zoom and focus commands over RS-422 or RS-232 serial communications using common protocols (Pelco D or Bosch). By default, the camera is configured for RS-422 standard, 9600 Baud, 8 bits, no parity, 1 stop bit, using the Pelco D protocol, and address 1.

2.1.4 Ethernet Communications

The camera has an Ethernet connection that allows streaming video over an IP network as well as configuration and control of the camera[1]. It is possible to stream video and control the camera as it is from the factory, without making any configuration changes. However in most cases the camera will have at least some configuration changes to allow it to connect with other devices on the existing network.

Once the camera is connected to a network and powered on, the user can choose to use either a web browser[2] or the FLIR Sensors Manager (FSM) software to view the video and control the camera. The FSM software is included with the camera and can be run under Microsoft Windows. Refer to the ***FSM User Manual*** for details about using the software; the manual is available from the Windows Start menu once the software is installed.

With the latest version of camera firmware, a web browser can be used to operate the camera (view video, pan/tilt/zoom, and so on) and it can be used to make configuration changes. This manual has basic configuration information; refer to the ***Nexus IP Camera Configuration Guide*** (FLIR Doc. 427-0030-00-28) for more details about camera configuration.

If the camera will be controlled only through serial communications, it may still be necessary to connect it to an IP network, at least temporarily, to adjust any of the serial communications settings. By default, the serial interface uses the Pelco D protocol, RS-422 standard, 9600 baud rate (8/none/1), and address set to 1. Refer to the ***Nexus IP Camera Configuration Guide*** for information on changing these parameters.

Getting the camera IP interface set up and working may require a level of familiarity with managing IP networks that is new to many security professionals. Prior to configuring the IP interface and streaming video parameters, make sure you know how to manage and configure the other equipment in the network (for example, any PC or device that will connect to the camera, any router or firewall that will carry the IP traffic, and so on). FLIR technical support can only provide limited support in this regard.

1. For this chapter, it is assumed the camera will be connected to a network via Ethernet. For installations that use only analog video output, it is not possible to make configuration changes unless an Ethernet connection is also used.
2. The web interface is supported on Microsoft Internet Explorer version 9, as well as the latest versions of Google Chrome and Mozilla Firefox®.

2.2 Bench Test and Basic Configuration Steps

Assuming the existing network uses IP addresses that are unique and different than the default address on the camera, configuring the camera for IP communications generally involves the following steps:

Step 1 Connect the Ethernet port to an IP network that is isolated from the existing camera network (for example, a standalone switch)

Step 2 Connect a PC or laptop to the same network

Step 3 Temporarily set the IP address of the PC or laptop to be compatible with the factory network address of the camera (for example, 192.168.250.1)

If you are unsure how to set the IP address on the PC or laptop, refer to section 2.9 “Setting the IP address on a Windows PC” on page 2-24.

Step 4 Perform a bench test of the camera using a web browser and/or FSM, prior to making any parameter changes (this step is optional but recommended)

Step 5 Using a web browser, configure the camera settings, such as IP address, camera date/time, and other parameters, so the camera is compatible with the existing network equipment

Step 6 Save the configuration changes and restart the server

Step 7 Connect the camera to the existing network and test the camera

Step 8 Make a backup of the new configuration

2.3 Camera Bench Test

Since the camera offers both analog video and IP video, there are several ways to bench test the camera. It is recommended the installer should test the camera using the same type of connections as the final installation.

Even if using analog video and serial communications in the final installation, it is a good idea to test the IP communications when performing the bench test. If any image adjustments are necessary, they can be done using a web browser over the IP connection, and saved as power-on default settings.

With the camera powered up, analog video can be tested at the BNC connectors. Connect the camera video output to a video monitor and confirm the live video is displayed on the monitor.

Connect the camera and a PC or laptop to the same Ethernet switch (or back-to-back with an Ethernet crossover cable[3]). The D-Series C camera is shipped with an IP address set to 192.168.250.116 with a netmask of 255.255.255.0. Set the PC or laptop network adapter to a compatible IP address (for example: 192.168.250.1).

If using serial communications, connect the serial cable from the camera to a serial device such as a keyboard, and confirm that the camera is responding to serial commands. Before using serial communications, it may be necessary to configure the serial device interface to operate with the camera. When the camera is turned on, the video temporarily displays system information including the serial number, IP address, Pelco address, and the Baud rate. For example:
S/N: 1234567
IP Addr: 192.168.250.116
PelcoD (Addr:1): 9600 SW

3. In most cases, a straight Ethernet cable can be used, because many PCs have auto-detect Ethernet interfaces.

2.4 Web Browser Interface

Use a web browser to connect to the camera as described below, and confirm it is streaming video. Once the bench test is complete, use the web browser to make configuration changes as needed (for example, set the IP address to an address that is compatible with the existing network). It is also a good idea to run the FSM software and confirm it is working with the camera as expected.

It is possible to log into the camera using one of three User Names: **user**, **expert**, and **admin** (the corresponding passwords by default are **user**, **expert**, and **fliradmin** respectively). The **user** login can be used to do the initial bench test of the camera. The **admin** login must be used to make configuration changes such as setting the IP address. The login passwords can (and should) be changed by the system administrator to prevent unauthorized logins. For information on how to change the passwords, refer to section 2.6 “Basic Camera Configuration” on page 2-11.

Log into the Camera Web Page

Step 1 Open a web browser and enter: http:\\192.168.250.116. The login screen with a picture of the camera will appear. Enter **user** for the User Name and **user** for the Password, and click the Log in button.

Figure 2-1: Camera Web Page Login Screen

The **Live Video** page will be displayed, with a live image from the camera on the left part of the screen. 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), **Help** and **Log Off**.

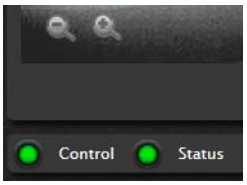
On the right side are some control buttons and an image of a joystick.

Figure 2-2: Camera Web Page Login Screen

If the live video is not displayed, refer to section 2.8 “Troubleshooting Tips” on page 2-19. 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 the video streams to other users or to an NVR.

2.4.1 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 immediately. 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.



A user is able to request control of the camera by clicking on the yellow or black “light”, or simply by sending a command to the camera. For example, move the cursor over the video and select the “Zoom In” control (magnifying glass with “+”) that appears in the lower left of the screen. The Status light may turn off temporarily while waiting for the response from the camera. After a short pause, the Control light should turn green. Observe what happens to the image when the “Zoom In” control is clicked several times. Be patient, there may be a slight delay between each command while the browser waits for a response from the camera.

If a command is sent to the camera when the user does not have control, the command will not be executed, and it is necessary to send the command again once the light is green.

2.4.2 Web Control Panel

The control buttons on the right side of the page provide a way to control the camera. When the mouse cursor is positioned over a button, a screen tip is displayed which explains the function of the button.

This same web interface is used with various FLIR thermal cameras; some are fixed mount cameras, such as the F-Series and FC-Series S cameras, and some have pan/tilt capabilities, such as the PT-Series and D-Series. As a result, some buttons appearing in the control panel may be disabled if they do not apply to the camera in use.

When the web interface is used with a pan/tilt camera, an image of a joystick appears below the control panel buttons. When the mouse is positioned over the joystick, the camera can be moved (up-down and/or left-right) by clicking and dragging the joystick in the appropriate direction.

For a fixed camera, the following buttons are enabled:

Save Snapshot

This button allows the user to save an image as a .jpg file. The destination folder for the image is determined by the web browser that is used.

Perform IR NUC Calibration

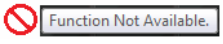
This button causes the camera to perform a Non-Uniformity Correction operation (refer to the section 2.8.1 “Image freezes momentarily” on page 2-19).

Toggle Scene Preset

This button causes the camera to cycle through 5 different image settings. 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 Polarity

This button changes the way various objects are displayed in the image, with hot objects displayed as white and cold objects as black, or vice versa.



The other buttons on the control panel will be disabled for a fixed camera. In the control panel, a disabled button is indicated with a grey color and when the cursor is positioned over a disabled button, the screen tip indicates the function is not available. The disabled buttons correspond to commands that are not used with a fixed camera, but might be used to control a pan/tilt camera with multiple sensors.

For a pan/tilt camera, when the mouse is positioned over the video window, some controls appear in the lower left of the video image which allow the camera to be panned left or right, or to be tilted up or down. To move the camera, click on one of the arrows.

As with a fixed camera, the zoom in and out controls also appear. To zoom in, click on the Zoom In control (+); to zoom out, click the Zoom Out control (-).

The following control panel buttons are enabled for pan/tilt cameras:

Start Scan List

This button will cause the camera to start the current scan list, which is a set of preset locations (each preset has a specific azimuth, elevation and zoom setting). The presets are programmed on the camera using the web interface or the FSM software.

Stop Scan List

This button causes the camera to stop (discontinue) the scan list.

Toggle Video Source

For a multi-sensor system with more than one video source (for example, a PT-Series camera with a thermal IR camera and a daylight camera), this button causes the “active” video source to be switched from one camera to the next. If the thermal IR camera is active and the button is selected, it causes the daylight camera to become active, and vice versa. This also causes the new active video source to be displayed in the Live Video window.

Initialize Pan/Tilt

For a long-range multi-sensor system with a pan/tilt platform, this button causes the pan/tilt to go through its startup initialization. For most pan/tilt security cameras, this button is not needed since the pan/tilt will initialize automatically. For safety reasons, long-rage systems with large camera lenses do not initialize automatically, so this button is used.

Pan/Tilt Home

This button causes the camera to go to the Home position. The Home position can be set using the FSM software.

Autofocus

This button causes the active video source to perform an autofocus operation. If the active source is a thermal camera with a fixed-focus lens, selecting this button causes an error message to be displayed below the video window (“Function not available for this driver.”).

Function

Some cameras have additional features or functions which can be accessed using an extra numeric function keypad. It is possible to create customized camera functions through a “macro” interface which can be programmed through XML commands. For additional information contact FLIR Technical Support for information about the Nexus XML-Based Control Interfaces.

When the Function button is selected, the keypad changes to a numeric keypad. As digits are selected, they are displayed below the keypad. To execute the function, select the FN Function button again.

If an invalid function is entered, an error message appears below the video window (“Function is not available in current mode.”). To return to the Control Panel, select the Back button (left arrow).

Goto Preset

A camera can have a set of predetermined pan/tilt locations, each of which is known as a “preset”. For example, a preset may be configured for each of the locations where security surveillance is most needed, such as a gate, doorway, and other point of access.

When the Goto Preset button is selected, the keypad changes to a numeric keypad. As digits are selected, they are displayed below the keypad. To cause the camera to go to the entered preset, select the Goto Preset button again.

To return to the Control Panel, select the Back button (left arrow).

2.4.3 Help

At the top of the web page, the **Help** menu displays 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.

2.4.4 Log Off

Use the **Log Off** menu entry to disconnect from the camera and stop the display of the video stream.

2.5 Bench Test Using FSM

IF FSM is to be used in the final installation, it is a good idea to perform a bench test with it, as described below, prior to making configuration changes. The FSM software is included with the camera; the software installation will begin automatically when the CD is inserted into the PC. Once the bench test is complete, use a web browser to make configuration changes as needed (for example, set the IP address to an address that is compatible with the existing network).

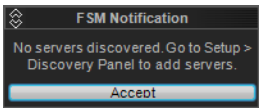
The following provides a brief description of how to use FSM to control a camera and stream video from the camera. For more detailed information on how to use FSM, refer to the ***FLIR Sensors Manager User Manual***. Once the software is installed, the manual is available from the Windows Start Menu. If the FSM software has not been installed yet, locate the CD that came with the camera and install it on the PC. The latest version of the software is also available from http://support.flir.com/ in the Downloads page.

2.5.1 Running FSM

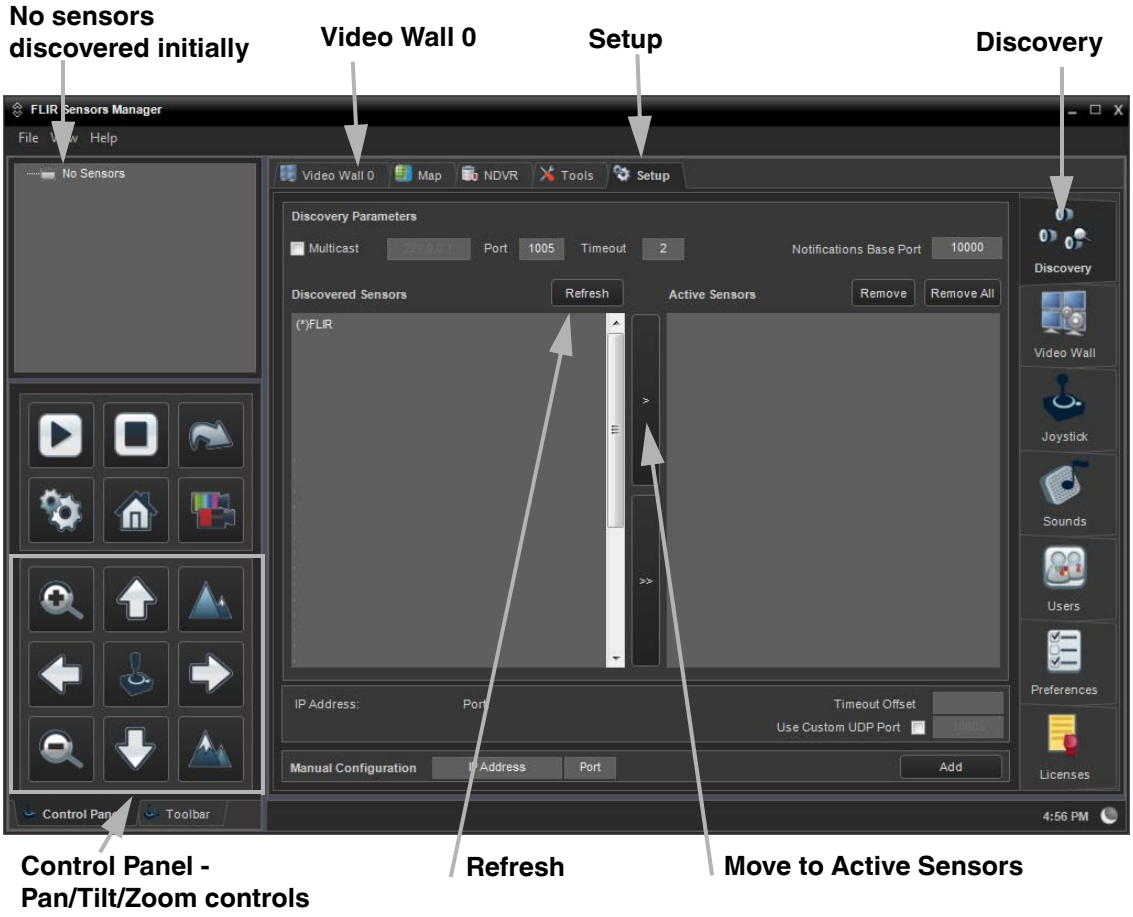
Run the FSM software by double clicking the FLIR Sensors Manager icon on the desktop, or click on the Windows Start button and select Programs > FLIR Sensors Manager > FLIR Sensors Manager.

Initially the FLIR Sensors Manager splash screen will be displayed. After a brief while, the FSM main window will appear. A popup FSM Notification window will appear in the lower right of the screen indicating that no cameras (servers) have been discovered yet.

Click on the Accept button to acknowledge the notification.



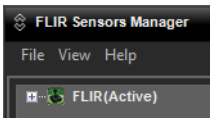
The FLIR Sensors Manager uses a “client/server” architecture. The FSM software is considered a client, and the cameras are considered servers or sensors. The Sensors Panel in the upper left of the window indicates no sensors have been discovered and added to the list of Active Sensors.



Click on **Setup**, if required, then the **Discovery** button on the side panel to bring up the Discovery Panel. The FSM software can automatically discover FLIR cameras on the network.

When the Discovery Panel is displayed, click **Refresh**. The FLIR camera will appear in the list of Discovered Sensors. The camera will be called “FLIR”, and the asterisk in parenthesis “(*)” indicates the camera has not been added to the list of Active Sensors on the right.

Click on the center bar “**>**” to move the camera over to the list of Active Servers. The name of the camera should appear in the Sensors Panel, with a green joystick icon.



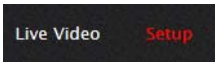
By default, the FSM software will automatically discover sensors in the network, connect to the first camera it finds, take control of the camera, and display the video from the camera in Video Wall 0.

Click on **Video Wall 0** and confirm that video is streamed to the monitor and it is possible to control the camera using the pan/tilt/zoom controls in the **Control Panel**. For example, click on the zoom button (magnifying glass with +), and the video will zoom to 2X. Once operation of the camera has been confirmed, the camera can be configured to an IP address that matches the installation network.

2.6 Basic Camera Configuration

The following procedures describe how to do the most common basic camera configuration steps, such as setting the camera IP address and hostname and changing the user passwords. To make these changes, it is necessary to login using the **admin** user account. Additional configuration options are described after the basic steps are given (refer to section "Advanced Configuration" on page 3-1).

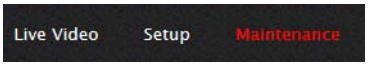
2.6.1 Expert and Admin Logins



When a user logs in as **expert**, an additional menu called **Setup** is available. The **Setup** menu can be used to make advanced adjustments to the thermal camera. For a pan/tilt camera, it can also be used to make configuration changes to the daylight camera and the pan/tilt platform. These adjustments should only be made by someone who has expertise with thermal cameras and a thorough understanding of how the various settings affect the image. Haphazard changes can lead to image problems including a complete loss of video. Additional information is provided in section 3.1 "Thermal Image Setup" on page 3-1.

Note

In most installations, the only camera settings needed are available from the Live Video page (using Scene Presets or Polarity). Use caution when modifying the camera settings described in this section. Some settings may adversely affect the thermal image over time or may completely disable the camera or the network interface.



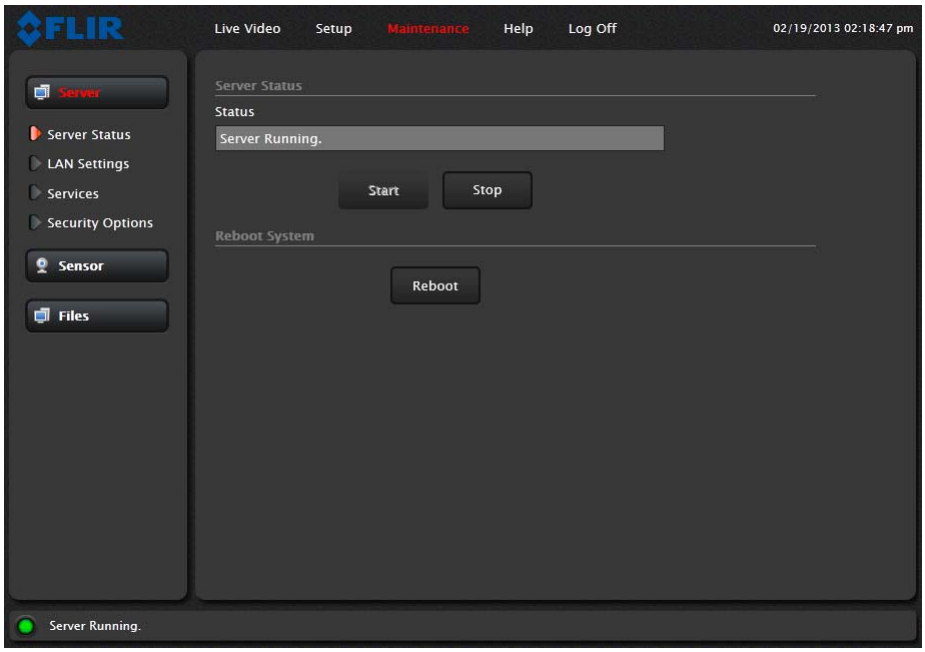
When a user logs in as **admin**, a third menu called **Maintenance** is available. It is possible to use settings on the **Maintenance** menu to modify the network settings, including the IP address of the camera. It is also possible to use the **Maintenance** menu to change the login passwords. The **Maintenance** menu also provides access to many other configuration options.

2.6.2 Maintenance Menu

Initially, when the **Maintenance** page is selected, the **Server Status** page is displayed. 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. In order to make some configuration changes through the **Maintenance** menu, it is necessary to save the changes, then stop and restart the server to make the changes take effect.

The basic camera configuration steps are accessed through the **Maintenance** menu, using the **Server** submenu on the left side of the page.The **LAN Settings**, **Services**, and **Security Options** selections are described below. Generally with these settings it is necessary to save the changes to make them effective, but it is not necessary to stop and restart the server.

When the **Maintenance** menu is selected, the following **Server Status** page appears.

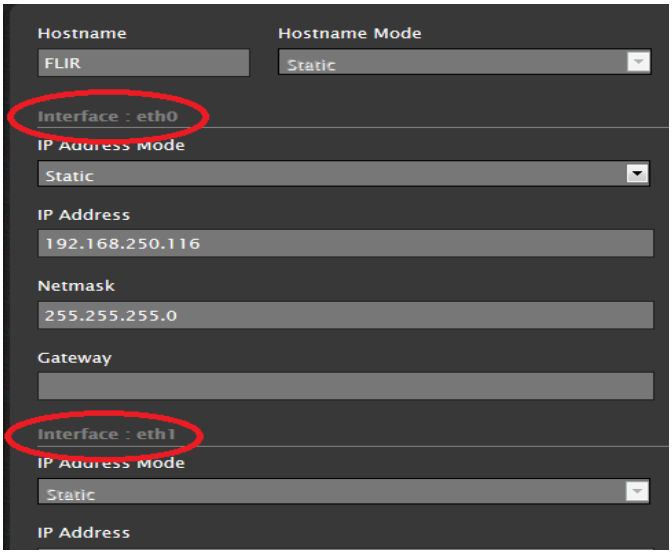


LAN Settings

LAN Settings

The **LAN Settings** page can be used to set the hostname, default gateway, and IP address for the camera. The default IP Address mode is static; the mode can also be set to DHCP. When the IP address of the camera is changed, the PC may no longer be on the same network and therefore may not be able to access the camera until the IP address on the PC is changed also. For that reason, it may a good idea to change the IP address after making other configuration changes.

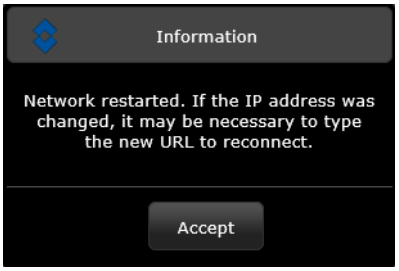
On the LAN Settings page for the D-Series camera there are two IP Interfaces. The network address for the camera is interface eth0, and internally the camera communicates using interface eth1.



Note

It is not possible to change the settings for Interface: **eth1** with the web tool. Do not use an IP address for the **eth0** interface that is in the same network range as the **eth1** IP address (192.168.2.x). Contact FLIR Technical Support if it is necessary to use an address in that range for the **eth0** network interface.

When the LAN settings are changed and the Save button is clicked, a pop-up message will appear to indicate the network interface should be restarted.



Once all the changes have been made and saved, scroll to the bottom of the page and click on the **Restart Network** button.

If the Hostname is changed, the new name may not show up in FSM until the camera is rebooted. To reboot the camera, save any configuration changes, then select Server Status and click the Reboot button.

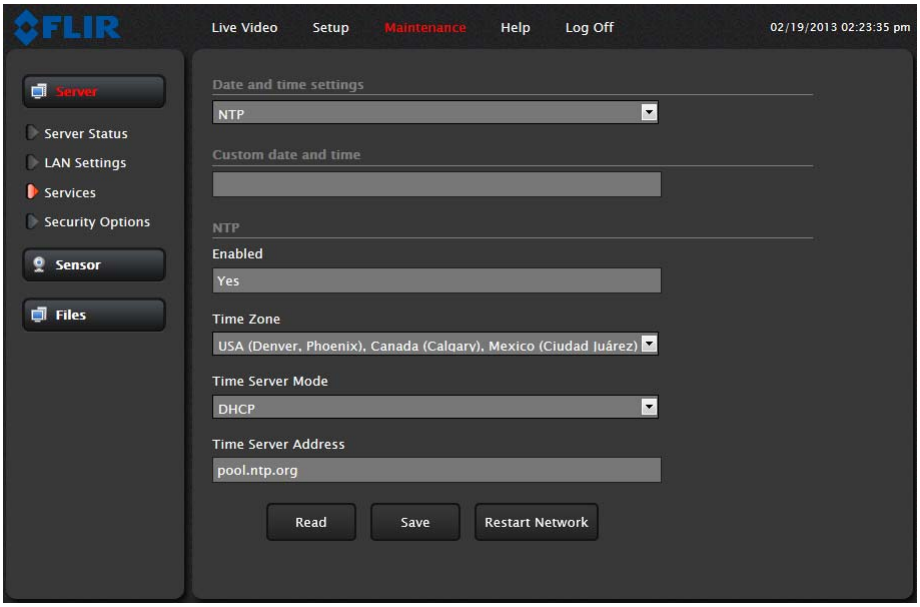
Note

The IP address is temporarily displayed on the video for a short while after the camera boots up. If you are unsure what the camera IP address is set to, it may useful to reboot the camera and watch for the IP Address information after the camera boots up.

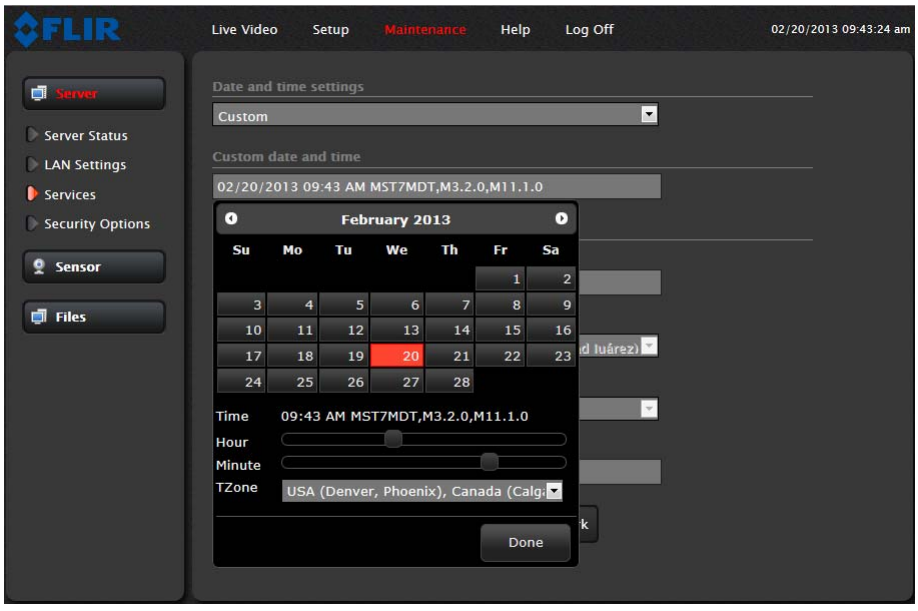
To reset the IP address (and other configuration settings and login passwords) to the factory default, refer to section 3.8 “Restoring the Factory Settings” on page 3-17.

Services (Date and Time settings)

The **Services** page is used to configure the date and time settings. The date, time, and time zone can be obtained from an NTP server, or can be entered manually. If the NTP mode is selected, the NTP server information can be entered. The NTP server address can be entered as a static address or can be obtained via DHCP.



If the Custom mode is selected, a pop-up window allows the information to be entered manually.

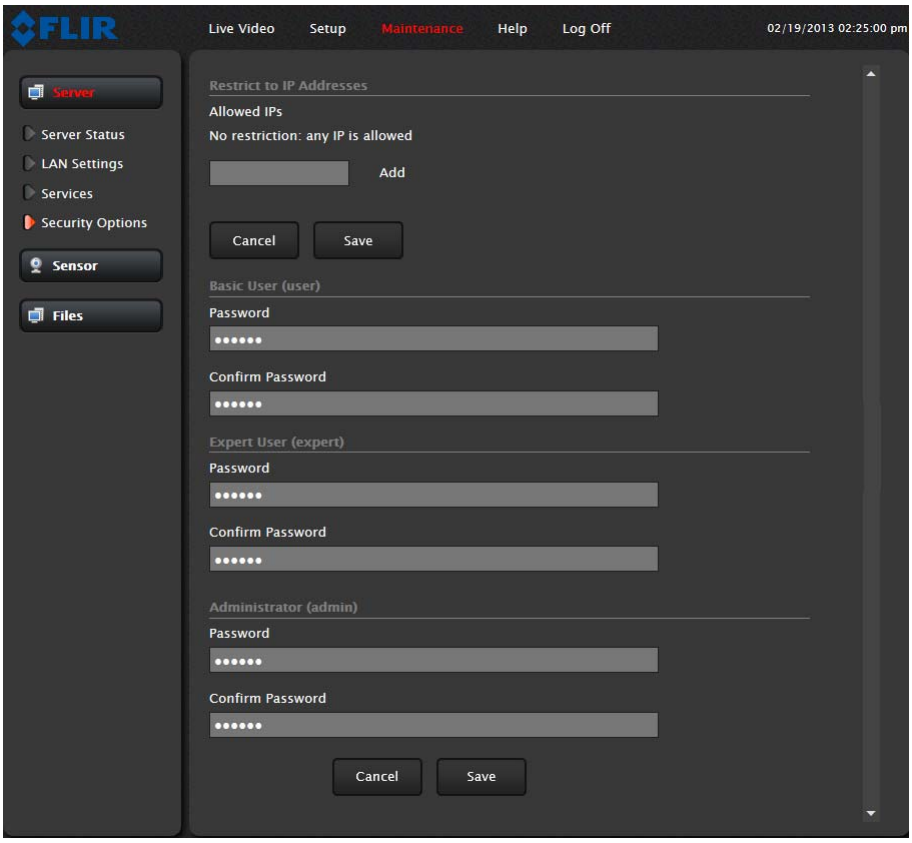


Set the date and time parameters, then select the Save button at the bottom.

Security Options

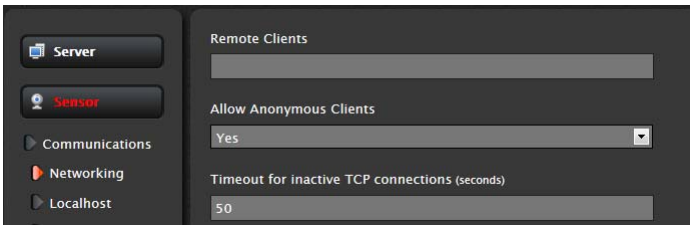
To maintain security of your systems set passwords for each of the three login accounts.
user —The user account can only use the **Live Video** screen and controls.
expert —The expert account can use the **Live Video** screen and the camera **Setup** screen.
admin —The admin account can use all screens

After each password is set and confirmed, select the Save button at the bottom (it may be necessary to scroll down the page)..



Note, as an additional security measure, it is possible to limit which computers have access to the web browser interface. At the top of the page under “Restrict Web Configuration”, add a computer’s IP address and click “Add”. After all the allowed IP addresses are entered, select the Save button to save the changes. Note, once one or more addresses has been added to this list, **only** these computers will be able to log in to the web interface. Be sure to remember which addresses are allowed.

It is also possible to limit access to the camera from a client program (such as FSM) by IP address. To do so, in the **Maintenance** menu select Sensor, then Networking. Set the “Allow anonymous clients” parameter to No, and then add in the allowed addresses in the Remote Clients list and click Save.



Note, once one or more addresses has been added to this list, **only** these computers will be able to access the camera as a client. Be sure to remember which addresses are allowed.

2.7 Thermal Imaging Overview

When power is applied to the D-Series C camera, a FLIR splash screen is displayed for less than two seconds, and then the camera outputs the live video image. No operator action or intervention is required and no configuration of the camera is necessary.

Figure 2-3: Splash Screen

The thermal camera makes an image based on temperature differences. In the thermal image, by default the hottest item in the scene appears as white and the coldest item is black, and all other items are represented as a grey scale value between white and black.

It may take some time to get used to the thermal imagery from the camera, especially for someone who only has experience with normal daylight cameras. Having a basic understanding of the differences between thermal and daylight cameras can help with getting the best performance from the thermal camera.

Both thermal and daylight cameras have detectors (pixels) that detect energy. One difference between thermal and daylight cameras has to do with where the energy comes from to create an image. When viewing an image with an ordinary camera, there has to be some source of visible light (something hot, such as the sun or lights) that reflects off the objects in the scene to the camera. The same is true with human eyesight; the vast majority of what people see is based on **reflected** light energy.

On the other hand, the thermal camera detects energy that is **directly radiated** from objects in the scene. Most objects in typical surroundings are not hot enough to radiate visible light, but they easily radiate the type of infrared energy that the thermal camera can detect. Even very cold objects, like ice and snow, radiate this type of energy.

The camera is capable of sensing very small temperature differences, and produces a video image that typically has dramatic contrast in comparison to daylight cameras. This high contrast level from the thermal video enables intelligent video analytic software to perform more reliably.

The performance of the camera will likely vary throughout the day. Right after sunset, objects warmed by the sun will appear warmest. Early in the morning, many of these objects will appear cooler than their surroundings, so be sure to look for subtle differences in the scene, as opposed to just hot targets.

Originally developed for the military, thermal imaging cameras are now deployed in numerous commercial applications where it is impractical or too expensive to use active illumination (lights).

They are perfect for a wide variety of applications including transportation, maritime, security, fire fighting, and medical applications. The cameras often provide improved daytime viewing in environments where traditional video camera performance suffers, such as in shadows or backlit scenes.

The D-Series C camera is a state-of-the-art thermal imaging system that will provide excellent night visibility and situational awareness, without any form of natural or artificial illumination. The system is easy to use, but it is useful to understand how to interpret what is displayed on the monitor.

While the imagery on the monitor may at first look similar to ordinary black and white daylight video, experience with the camera in varying conditions and seasons will lead to an appreciation of the characteristics that make thermal imaging distinct. A few tips on how to interpret some of the imagery may help you to make the most of your system.

The thermal camera does not sense light like conventional cameras; it senses heat or temperature differences. The camera senses small “differences” in apparent radiation from the objects in view, and displays them as either white (or lighter shades of grey) for warmer objects, and black (or darker shades of grey) for colder objects.

The thermal imaging camera relies on the fact that all objects, even very cold objects like ice, emit thermal energy in the portion of the infrared spectrum that this camera can “see”, the long wave infrared (LWIR). Therefore, unlike an illuminated infrared camera, a thermal camera does not need an additional active illumination source, and creates video based on directly radiated rather than reflected energy.

This is why hot objects such as parts on an engines and exhaust pipes appear white, while the sky, puddles of water and other cold objects appear dark (or cool)[4]. Scenes with familiar objects will be easy to interpret with some experience. The camera automatically optimizes the image to provide you with the best contrast in most conditions.

4. By default, the camera represents hot objects as white and cold objects as black. The camera can be set to use the Black Hot polarity setting, which displays hot objects as black and cold objects as white and is effectively the negative of White Hot polarity.

2.8 Troubleshooting Tips

If you need help during the installation process, contact your local FLIR representative or, call 877-773-3547 inside the US. FLIR Systems, Inc. offers a comprehensive selection of training courses to help you to get the best performance and value from your thermal imaging camera. Find out more at the FLIR training web page: http://www.flir.com/training.

2.8.1 Image freezes momentarily

By design, the camera image will freeze momentarily on a periodic basis during the Flat Field Correction (FFC) cycle (also known as Non-Uniformity Correction or NUC). Every few minutes, the image will momentarily freeze for a fraction of a second while the camera performs a flat field correction. A shutter activates inside the camera and provides a target of uniform temperature, allowing the camera to correct for ambient temperature changes and provide the best possible image. Just prior to the FFC, a small green square will appear in the corner of the screen.

Using FSM, it is possible to adjust the frequency of how often the FFC operation occurs. Using the Advanced Sensor Control, it is possible to change the FFC interval or to disable the automatic FFC entirely by setting it to Manual mode. For the best possible image, it is recommended the factory settings are used.

2.8.2 No video

If the camera will not produce an image, check the video connection at the camera and at your display. If the connectors appear to be properly connected but the camera still does not produce an image, ensure that power has been properly applied to the camera and the circuit breaker is set properly. If a fuse was used, be sure the fuse is not blown. If the video cabling is suspected as a possible source of the problem, plug a monitor into the RCA connection inside the camera and determine if it produces an image.

When the camera is powered on, it will do a NUC operation shortly after startup. If you are uncertain if the camera is receiving power, it may be useful to listen to the camera to hear if the click-click of the shutter mechanism can be heard. It may be only be possible to perform this test when the camera is on a work bench rather than in its installed position.

If the camera still does not produce an image, contact the FLIR dealer or reseller who provided the camera, or contact FLIR directly (contact information is provided on the rear cover of this manual).

2.8.3 Performance varies with time of day

You may observe differences in the way the camera performs at different times of the day, due to the diurnal cycle of the sun. Recall that the camera produces an image based on temperature differences.

At certain times of the day, such as just before dawn, the objects in the image scene may all be roughly the same temperature, compared to other times of the day. Compare this to imagery right after sunset, when objects in the image may be radiating heat energy that has been absorbed during the day due to solar loading. Greater temperature differences in the scene generally will allow the camera to produce high-contrast imagery.

Performance may also be affected when objects in the scene are wet rather than dry, such as on a foggy day or in the early morning when everything may be coated with dew. Under these conditions, it may be difficult for the camera to show the temperature the object itself, rather than of the water coating.

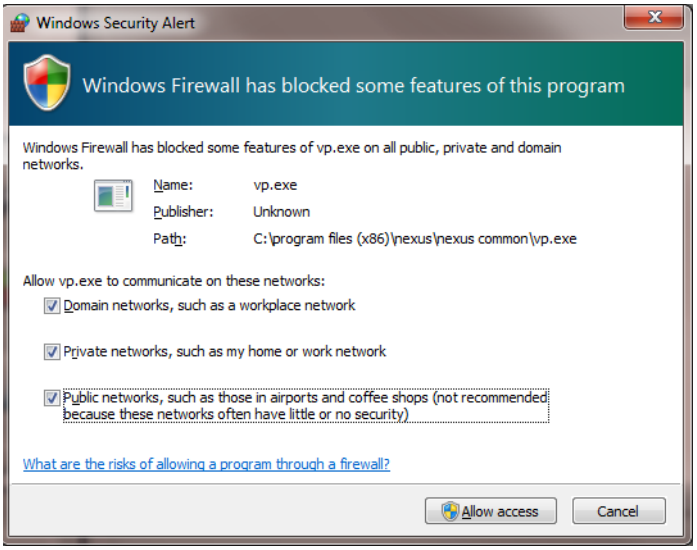
2.8.4 Unable To Communicate Over Ethernet

First check to ensure the physical connections are intact and that the camera is powered on and providing analog video to the monitor. When the camera is turned on, confirm the startup information is displayed on the analog monitor after approximately 90 seconds. For example:

```
S/N: 1234567
IP Addr: 192.168.250.116
PelcoD (Addr:1): 9600 SW
```

Confirm that the IP address for the PC (for example, 192.168.250.1) is on the same network as the camera.

Next determine if Windows Personal Firewall is blocking the packets. You can turn off the firewall or add an exception for the FSM program. Typically when FSM runs for the first time, a pop-up notification may ask for permission to allow the FLIR Sensors Manager (fsm.exe) to communicate on the network. Select the check boxes (domain/private/public) that are appropriate for your network.



By default the camera will broadcast a “discovery” packet two times per second. When FSM starts up, it listens to the network for the discovery packets. If no cameras are listed in the Discovered Servers list, press the Refresh button. If the list is still empty, it indicates no discovery packets were received. This could be due to a wide variety of problems with the network, the PC, or the camera.

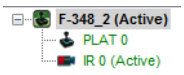
If necessary, use a packet sniffer utility such as Wireshark to capture packets and confirm the packets are being received by the PC from the camera.

2.8.5 Unable to control the camera

If the camera does not respond to commands from FSM (for example, the camera does not zoom when the zoom in button is clicked), the camera may not be the “Active” camera, or you may not have “control” of the camera. By default FSM will automatically request control of the camera and make it active, but if there are multiple cameras and/or multiple FSM clients, it may be necessary to manually make the camera active and take control of it.

Also, if the camera has a serial control interface connected to it, the serial device has the highest priority, and a command from the serial device can automatically take control of the camera away from any FSM client.

In the Sensors Panel, if the camera is the active sensor, there will be an “(Active)” notification next to the name of the camera. Only one camera or sensor can be active at a time. To make the camera active, right click on the icon to the left of the camera name and select “Set Active”, or simply double-click on the icon.



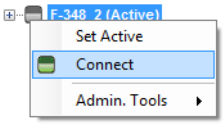
The icon to the left of the camera name indicates the status of the sensor. The following is a list of the possible icons and the meaning of each one.

Connected and Controlled

This icon indicates the camera has been discovered and added to the list of active servers, and the camera is actively “connected” to the FSM client and receiving status updates. The joystick in the icon indicates the user has control of the camera. To release control of the camera, right click on the icon and select “Release Control”.

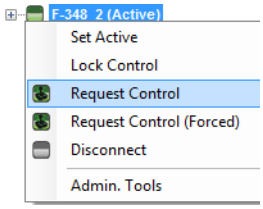
Discovered

This icon indicates the camera has been discovered and added to the list of active servers, but the camera is not actively “connected” to FSM, and therefore FSM is not receiving status updates. To connect to the camera, right click on the icon and select “Connect”. Alternatively, it is possible to double-click the icon to connect.



Connected

This icon indicates the camera has been discovered and added to the list of active servers, and the camera is actively “connected” to FSM and receiving status updates. To take control of the camera, right click on the icon and select “Request Control”. Alternatively, it is possible to double-click the icon to take control.

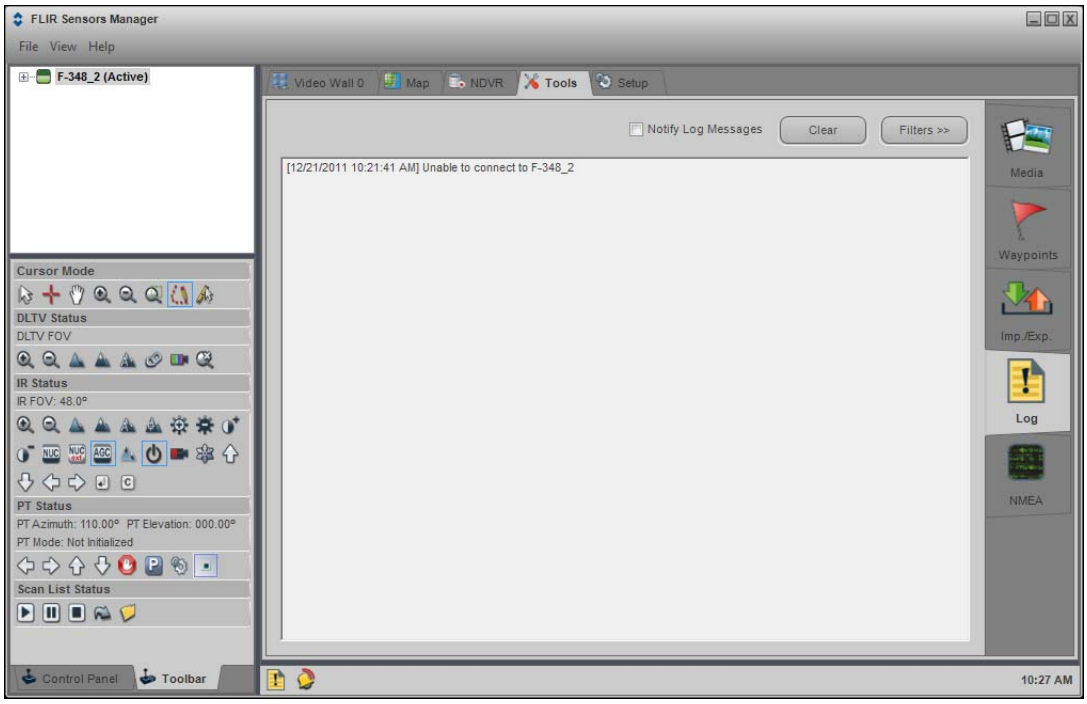


Not Connected

This icon indicates the camera has been discovered and added to the list of active servers, and FSM is trying to connect to the camera, but some kind of problem is preventing FSM from receiving status updates the camera. This could be do to a wide variety of problems in the camera, network or PC. Most often this situation occurs when a firewall allows certain packets (such as the discovery packets) but not others (the packets needed for a “connection”).

2.8.6 General Errors

In the status bar at the bottom of the screen there may be an indication that an error has occurred. When you position the cursor over the error icon (exclamation mark), the error will be displayed in a temporary pop-up. It is possible to view all the error messages by selecting the Tools tab at the top of he screen, and then select the Log button to the left.



2.8.7 Unable to View Video Stream

If the video stream from the camera is not displayed in FSM, it could be that the packets are blocked by the firewall, or there could be a conflict with video codecs that are installed for other video programs.

When displaying video with FSM for the first time, the Windows Personal Firewall may ask for permission to allow the FLIR Video Player (vp.exe) to communicate on the network. Select the check boxes (domain/private/public) that are appropriate for your network.

If necessary, test to make sure the video from the camera can be viewed by a generic video player such as VLC media player (http://www.videolan.org/vlc/).To view the video stream, specify RTSP port 554 and the appropriate stream name such as “ch0”. For example:

rtsp://192.168.250.116:554/ch0

2.8.8 Noisy image

A noisy image is usually attributed to a cable problem (too long or inferior quality) or the cable is picking up electromagnetic interference (EMI) from another device. Although coax cable has built-in losses, the longer the cable is (or the smaller the wire gauge/thickness), the more severe the losses become; and the higher the signal frequency, the more pronounced the losses. Unfortunately this is one of the most common and unnecessary problems that plagues video systems in general.

Cable characteristics are determined by a number of factors (core material, dielectric material and shield construction, among others) and must be carefully matched to the specific application. Moreover, the transmission characteristics of the cable will be influenced by the physical environment through which the cable is run and the method of installation. Use only high quality cable and ensure the cable is suitable to the marine environment.

Check cable connector terminations. Inferior quality connections may use multiple adapters which can cause unacceptable noise. Use a high-quality video distribution amplifier when splitting the signal to multiple monitors.

2.8.9 Image too dark or too light

By default the D-Series C thermal camera uses an Automatic Gain Control (AGC) setting that has proven to be superior for most applications, and the camera will respond to varying conditions automatically. The installer should keep in mind that the sky is quite cold and can strongly affect the overall image. It may be possible to avoid a problem by slightly moving the camera up or down to include (or exclude) items with hot or cold temperatures that influence the overall image. For example, a very cold background (such as the sky) could cause the camera to use a wider temperature range than appropriate.

2.8.10 Eastern or Western Exposure

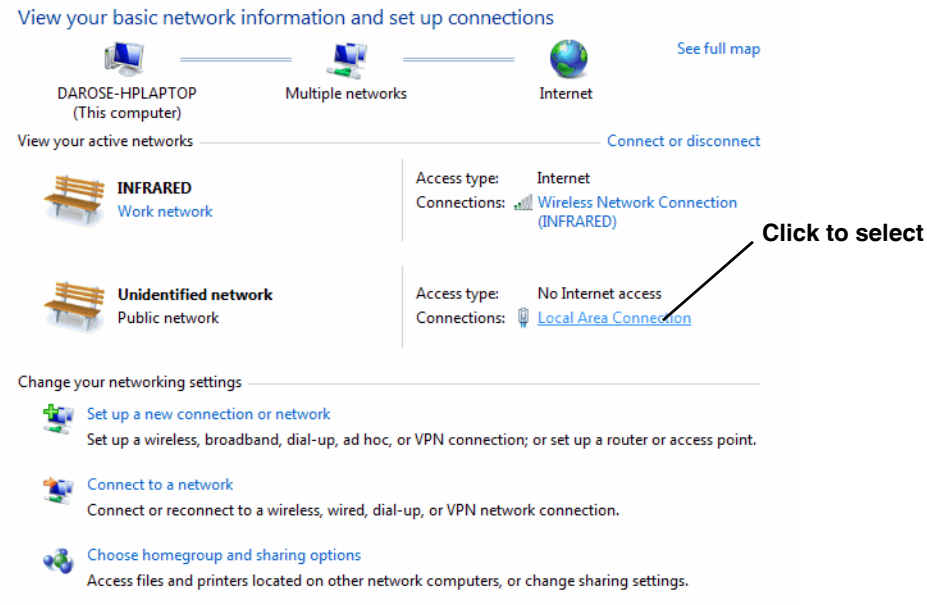
Once installed, the camera may point directly east or west, and this may cause the sun to be in the field of view during certain portions of the day. We do not recommend intentionally viewing the sun, but looking at the sun will not permanently damage the sensor. In fact the thermal imaging camera often provides a considerable advantage over a conventional camera in this type of back-lit situation. However, the sun may introduce image artifacts that will eventually correct out. and it may take some time for the camera to recover. The amount of time needed for recovery will depend on how long the camera was exposed to the sun. The longer the exposure, the longer the recovery time needed.

Figure 2-4: Images facing sun from standard camera (left) and thermal camera (right)

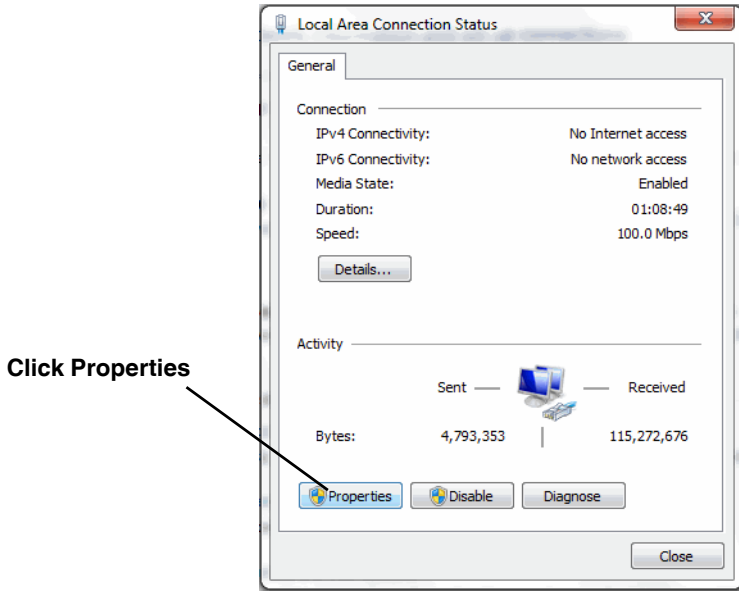
2.9 Setting the IP address on a Windows PC

To set the computer IP address in Windows, first connect the PC to a switch, or connect it to the camera and ensure the camera has power.

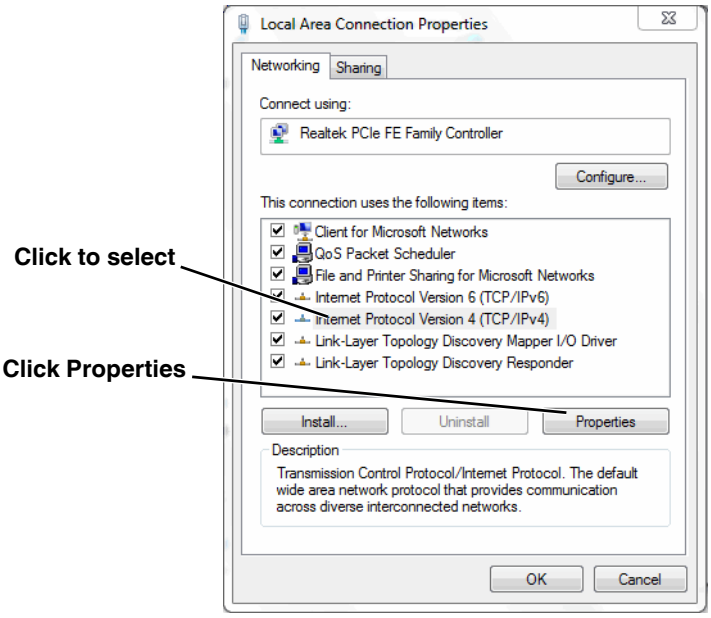
Step 1 With the PC or laptop connected to the switch (or if back-to-back with the camera, with the camera powered on), open the Control Panel, Network and Sharing Center (a Windows 7 example is shown). The connection to the camera should show in your Active Networks.



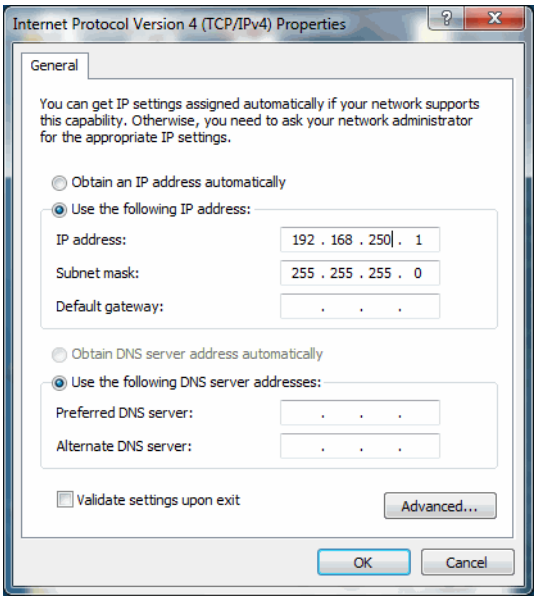
Step 2 Click to select the Local Area Connection then click Properties, as shown at the right.



Step 3 Select Internet Protocol Version 4 (TCP/IPv4) as shown. Then click Properties.



Step 4 Select **Use the following IP address**, then enter 192.168.250.xxx, where xxx is any number between 1-255, other than 116 (the camera default).



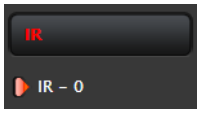
Step 5 Set the Subnet mask to 255.255.255.0, then click OK.

3 Advanced Configuration

In this chapter, additional configuration settings related to the following topics are described:

- Optimizing the thermal image (Setup web pages)
- Using the Surveillance features (Auto Scan, Scan List)
- Starting and stopping the Nexus server (Maintenance web pages)
- Configuring the camera to work with a serial device such as a keyboard
- Configuring the camera to work with a third-party VMS (ONVIF)
- Setting up the video streams to optimize quality and network performance
- Making a backup of the configuration

When configuration changes are made with the web browser, the settings are saved to a configuration file. It is a good idea to make a backup of the existing configuration file prior to making changes, and another backup once the changes are finalized. If necessary the camera can be restored to its original factory configuration or one of the saved configurations. For more information, refer to section 3.7 “Configuration File” on page 3-16.

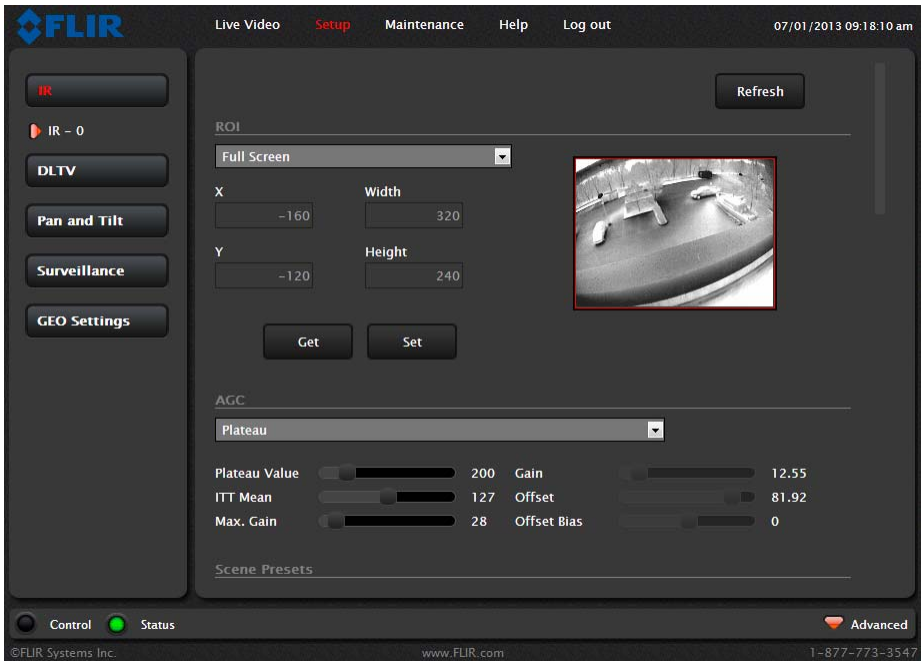


3.1 Thermal Image Setup

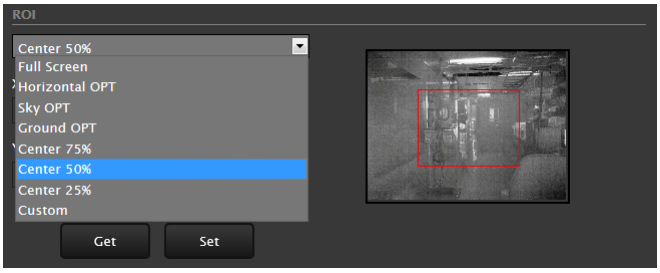
In most installations it will not be necessary to change the thermal camera from it’s default settings. However in some situations, depending on weather, time of day and so on, it may be useful to make changes to the video image to enhance the image by modifying one or more of the parameters.

The **Setup** menu has configuration options for making changes to the IR (thermal) camera, the daylight camera (DLTV), and the pan/tilt. The changes made through the **Setup** page generally have an immediate effect (it is not necessary to stop and restart the server). Note, it is necessary to save the changes if it is desirable to use the new settings at power up (see section 3.1.1 “Save Settings”).

In the **Setup** page for the **IR** camera, a single JPEG image (a snapshot) is displayed in the upper right-hand corner. To update this image at any time, it is necessary to select the Refresh button. This will cause the entire page to refresh, including the image and all the parameter values (be patient, this may take some time).



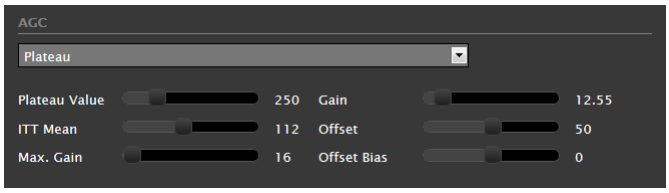
ROI



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.

AGC

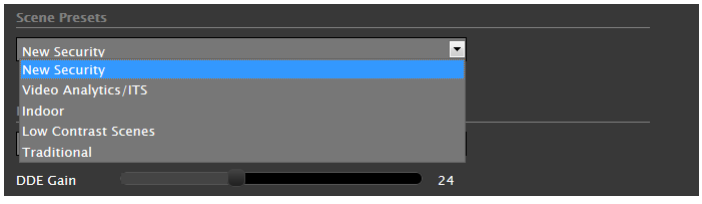
The AGC parameters affect how the overall video image appears. The default Plateau algorithm is suitable for most installations, but in some cases one of the other selections may provide a more appealing image, depending on personal preferences. Be aware the settings that are optimal at one time may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



Experiment with different AGC modes to find the settings that work best for the particular installation (it may be best to start with the Scene Presets options, see below). It is always possible to return to the default settings by selecting the Factory Defaults button at the bottom of the page.

With the Plateau mode, the ITT Mean parameter will effect overall brightness, and the Max Gain parameter can generally be used to increase contrast (although it may also increase noise due to gain).

Scene Presets



Each Scene Preset provides a combination of AGC and Digital Detail Enhancement (DDE, see below) parameters that are preferred for certain types of conditions. Select a preset that provides an image that is optimal for the installation.

Digital Detail Enhancement (DDE)

DDE is an image processing technique that enhances details by emphasizing lines and edges. Increasing the DDE setting may make it possible to see fine details more easily, but it could also make the image somewhat more grainy or pixilated.

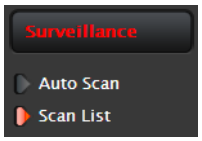
Flat Field Correction (FFC)

A Flat Field Correction operation can be used to correct for non-uniform responsivity within the pixel array. A shutter activates inside the camera and provides a target of uniform temperature, allowing the camera to correct for ambient temperature changes and provide the best possible image. The camera performs FFC at regular intervals or when the ambient temperature changes, but can also be performed as desired and may cause an overall image improvement. Refer to section 2.8.1 “Image freezes momentarily” on page 2-19.

3.1.1 Save Settings

All of the IR-0 settings in the **Setup** page are dynamic and have an immediate effect, similar to the Advance Sensor Panel of FSM. When the Save Settings button at the bottom of the page is selected, the camera will use the saved settings whenever the power is cycled. To restore the IR camera to the original settings, select the Factory Defaults button and then click on Save Settings.

3.2 Surveillance (Auto Scan / Scan List)



The **Setup** page also provides access to two convenient **Surveillance** features, Auto Scan and Scan List. The web interface can be used to start or stop an Auto Scan or Scan List, and provides limited configuration and management options. For greater flexibility, the FSM program is especially useful for setting up and managing Auto Scan, Scan Lists and Presets.

3.2.1 Auto Scan

It is possible to operate the camera in a simple back-and-forth (left-right) scan mode. To use the Auto Scan feature (also known as AutoPan when using serial communications), set the scan width (narrow, medium, or wide) relative to the current position and the scan speed (fast, medium, or slow) and then click Start. It is also possible to set absolute left and right limits (in degrees) and the pan speed, and then start the Auto Scan mode.

3.2.2 Scan List

In many cases with a pan/tilt camera, it may be useful to designate certain commonly-used pan/tilt locations as Presets, and to put the camera in Scan List mode where it automatically moves from one Preset to the next sequentially and repeats the pattern continuously. It may be useful to have several Scan Lists available, for different times of the day or for different circumstances.

It may be more convenient to use FSM to set up the Presets and Scan Lists, since it allows viewing of the video at the same time. However, the web interface can be used to add/change a particular Preset or to set up a simple Scan List.

To create a Scan List with the browser, point the camera toward a preferred location/scene, select a Preset ID from the pull-down list, and then click on Set. To add a new preset, move the camera to the next location, select a new Preset ID, and click Set again. Up to 128 Preset locations can be used in a Scan List. If more than one Scan List has been created using FSM, a particular Scan List can be loaded from the browser and started.

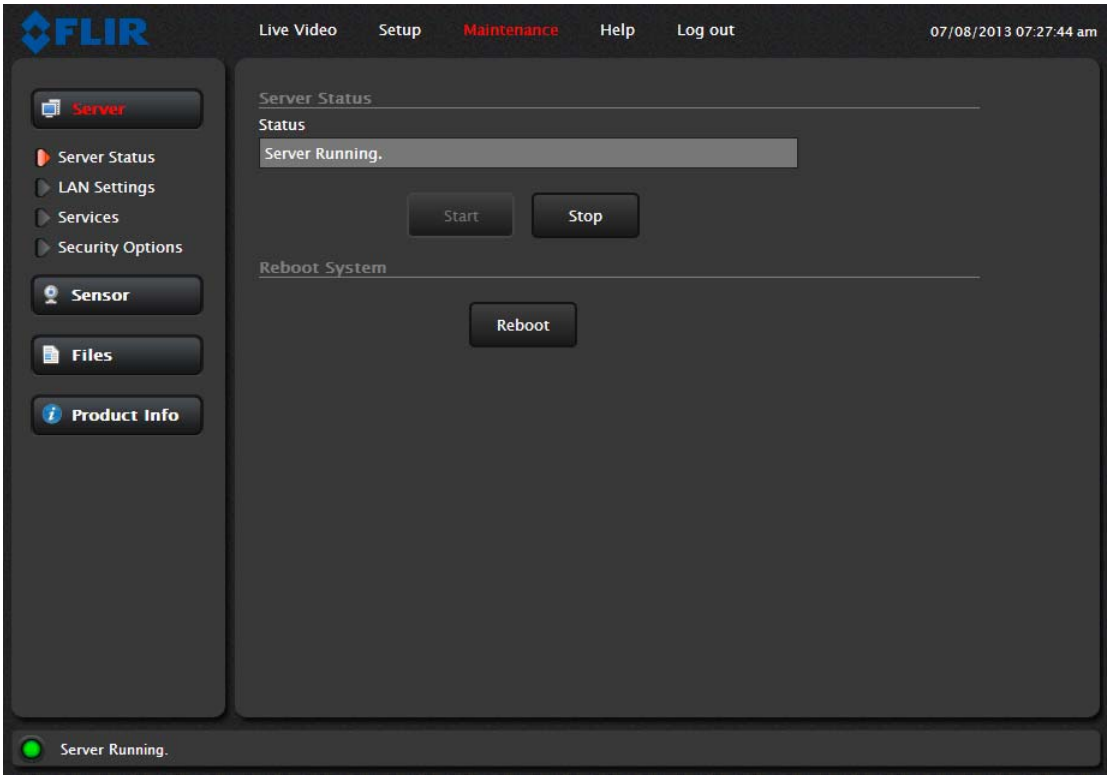
3.3 Maintenance Mode

When **Maintenance** is selected at the top of the page, the configuration changes that are allowed are grouped according to the primary buttons on the left: Server, Sensor, and Files. In the previous chapter, the Server settings (LAN Settings, Services, and Security Options) were described. The following paragraphs describe additional **Sensor** configuration options available under the Maintenance mode that are used in some installations. For the configuration changes in the remainder of this chapter, it is necessary to save the changes, then stop and restart the server to make the changes effective.

3.3.1 Configuration Changes That Require Restart

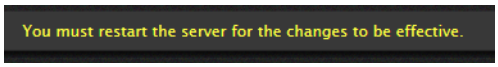
Many additional configuration options are available that are not described in this manual. It is recommended you contact FLIR Technical Support if you need information about additional configuration options that are not described in this manual.

When the **Maintenance** page is first selected, the **Server Status** page is displayed by default. 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.



After making configuration changes, it is necessary to save the changes to the server (there is a Save button at the bottom of each configuration page). Once you save configuration changes to the server, the changes do not take effect immediately. Generally it is also necessary to stop and restart the server for the changes to become effective. The server has a configuration that is active and running, and another configuration that is saved (and possibly different than the running configuration).

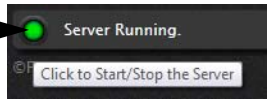
The message at the bottom of the page indicates the saved configuration is different than the active (running) configuration, and it is necessary to restart the server.



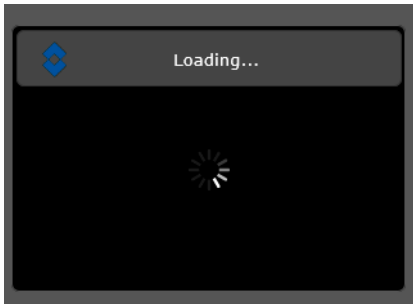
3.3.2 Restarting the Server

After changes have been saved, it is possible to return to the **Server Status** page and click on the Stop button. However, it is even easier to simply click on the green light at the lower left next to “Server Running” to stop the server.

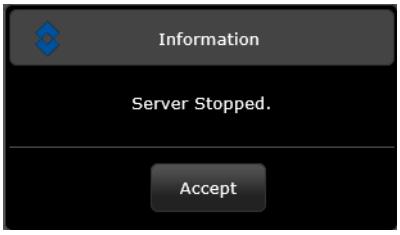
Click here to stop the server



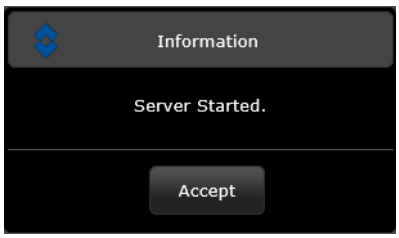
It may take up to 20 seconds or more to stop the server, especially when there are multiple video streams open. Be patient when stopping the server.



When the server is stopped and the page is refreshed, the status will show as “Server Stopped.” and the light will be off. On the Status page, the Start button will be enabled rather than Stop.



Click on the light again (or the Start button on the Status page) to restart the server, and 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.



3.4 Serial Communications (Serial Remote)

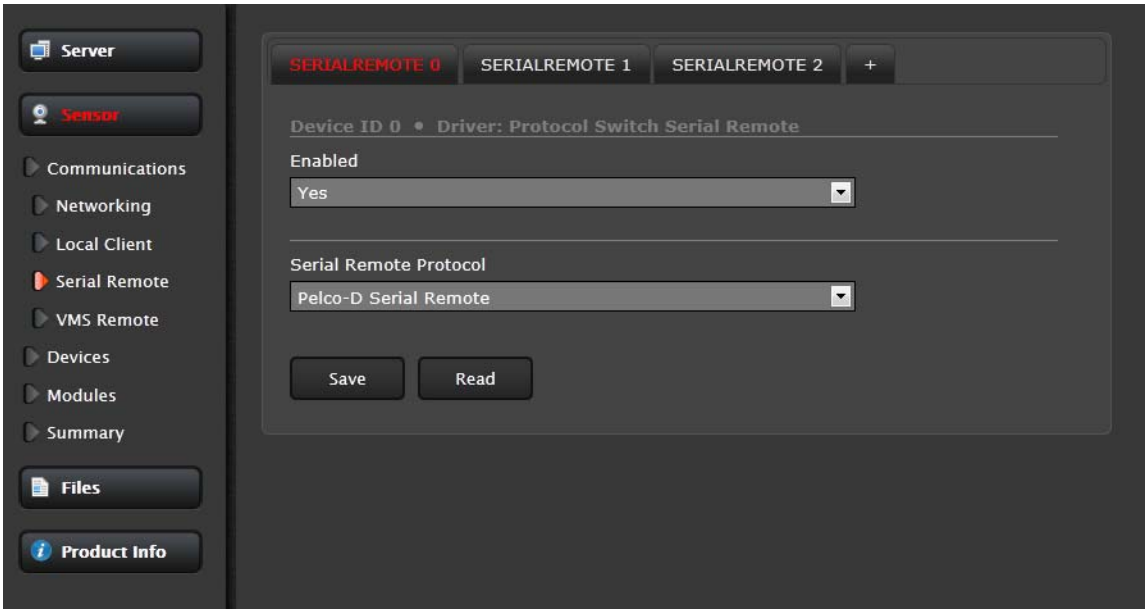
In some installations, a serial device such as a keyboard, joystick, or other device is used to control camera functions such as pan/tilt or zoom. A serial device can also be used to access functions that are specific to thermal cameras, such as changing the polarity from white hot to black hot. Refer to section 3.4.1 “AutoPan Function” on page 3-9 for additional information.

Serial Remote

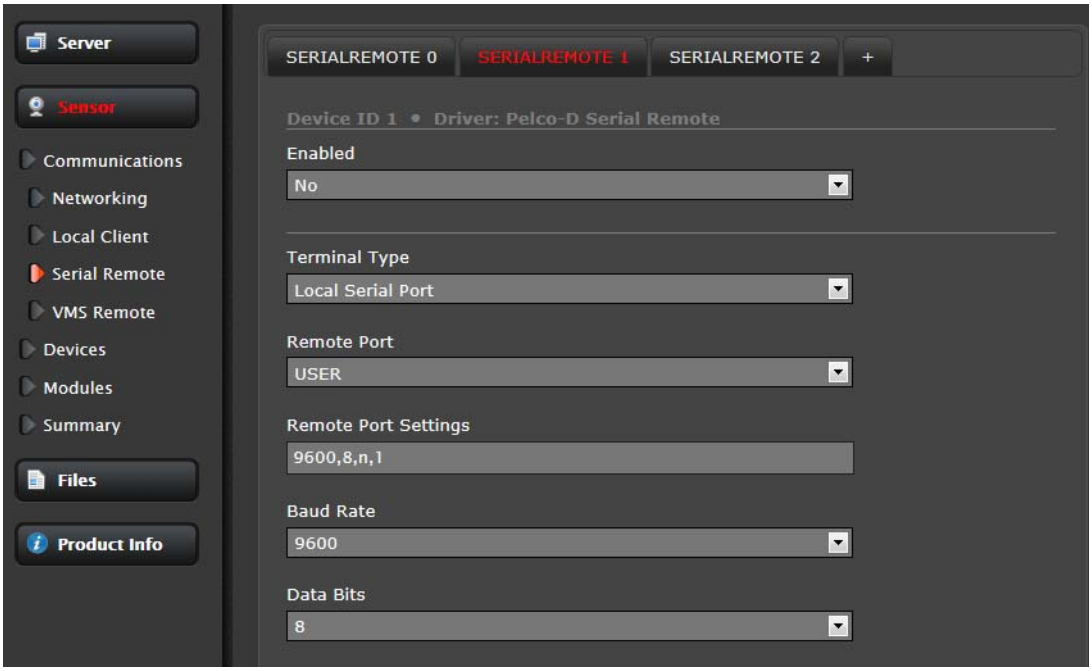
The Serial Remote settings are used to configure the serial communication parameters when the camera is controlled with a serial device. For serial communications, it is necessary to set the parameters such as the signalling standard (RS-232 or RS-422), baud rate, number of stop bits, parity and so on. It is also necessary to select the communication protocol used (either Pelco D or Bosch) and the camera address.

On the **Serial Remote** configuration page, the buttons at the top of the page allow configuration of three SerialRemote devices: 0, 1, and 2. **SerialRemote 0** is used as a switch to select either Pelco D or Bosch serial communications protocol. The actual serial parameters (such as baud rate) are configured for either SerialRemote 1 (for Pelco D) or SerialRemote 2 (for Bosch).

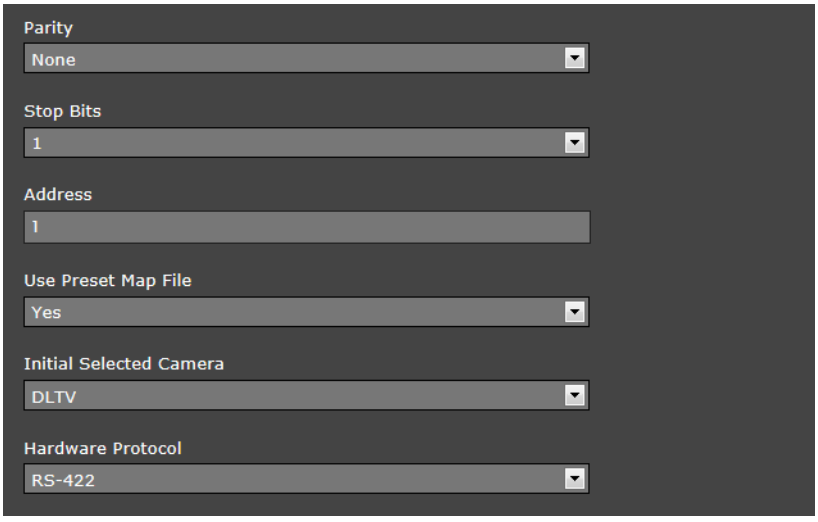
With SerialRemote 0 selected, set the Serial Remote Protocol to either Pelco D Serial Remote or Bosch Serial Remote. Ensure the Enabled parameter is set to Yes. If necessary, click Save to save the changes.



If the Pelco D protocol is to be used, select **SerialRemote 1** and wait for the page to refresh, and then configure the Remote Port Settings such as Speed (baud rate), Data Bits, Parity and Stop Bits. Set the Address parameter to the appropriate Pelco address. It may be necessary to use the scroll bar on the right side of the page to access the settings.

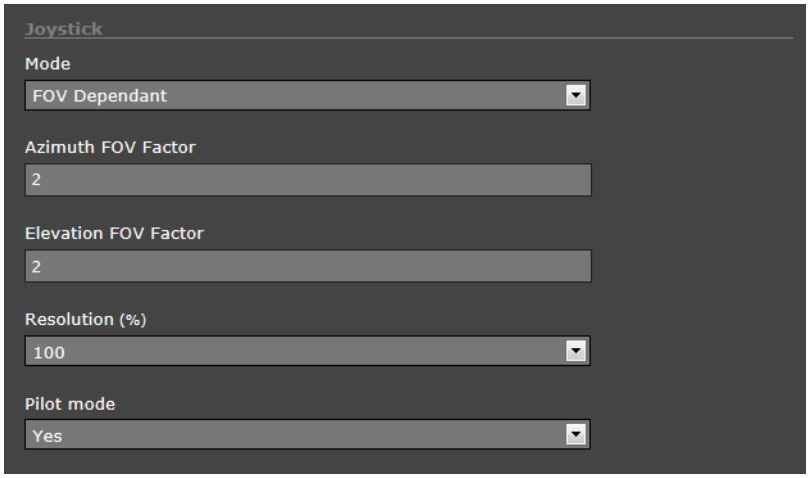


When Use Preset Map File is set to Yes (the default), then presets (and special functions known as Aux commands) can be used to access certain settings that are specific to the FLIR thermal camera, such as switching between White Hot and Black Hot settings. See section 3.4.3 “Preset Map File” on page 3-10 for information about the Preset Map File.



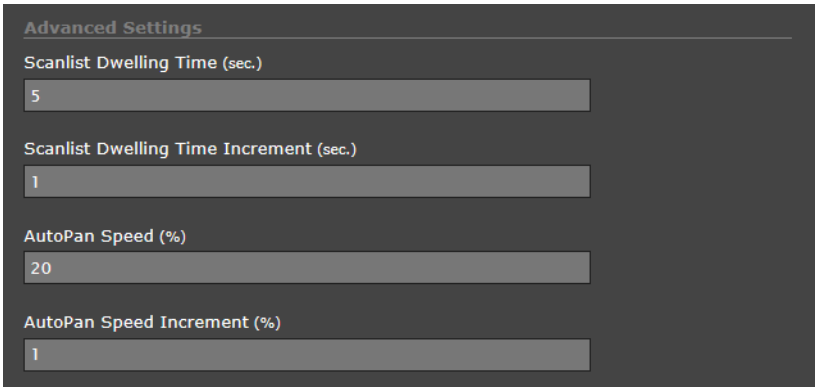
The Initial Selected Camera is used to designate which camera (IR or DLTV) in a multi-sensor camera is selected as the initial Active camera. When a command such as “Zoom In” is sent to the camera, it will affect the Active camera, regardless of which video stream is displayed.

In the Joystick settings, the Mode parameter, when set to FOV Dependant, allows a pan/tilt camera to adjust the pan speed automatically, depending on the current field of view (FOV). For a narrow FOV, the camera moves more slowly. If you do not want to limit the pan speed according to the FOV, set the parameter to Absolute.



The Pilot Mode parameter controls the direction of tilt when the joystick is moved forward or backward. When Pilot Mode is set to yes, the camera points downward when the joystick is moved forward, similar to the way an aircraft would move. If the mode is set to no, the joystick operates as one would expect with a video game controller.

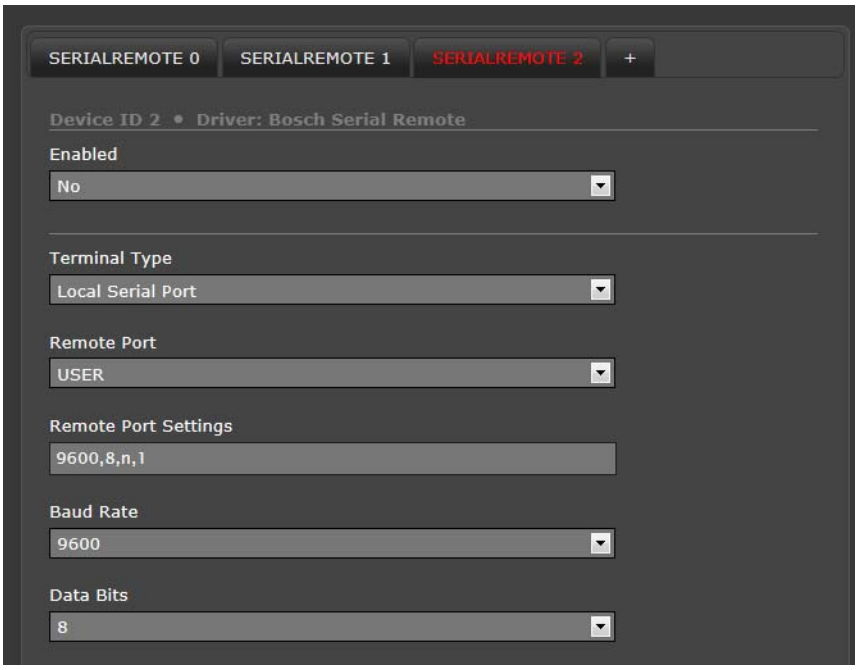
The parameters in the Advanced Settings are related to Scan Lists and the AutoPan feature. Refer to section 3.4.3 “Preset Map File” and section 3.4.1 “AutoPan Function” below for more information about these features.



If any of the parameters for SerialRemote 1 are changed, click Save to save the changes. Generally most of the other Serial Remote parameters which were not specifically described above do not need to be changed (for SerialRemote 1 and SerialRemote 2, it is ok if the Enabled parameter is set to no).

If the Bosch protocol is to be used instead, select **SerialRemote 2** and wait for the page to refresh, and then configure the Remote Port Settings such as Speed (baud rate), Data Bits, Parity and Stop

Bits. Select the appropriate Hardware Protocol (RS-422 or RS-232), and set the Address parameter to the appropriate Bosch address. If necessary, click Save to save the changes.



Note

Typical Bosch systems operate over a biphase connection and the FLIR cameras do not accept biphase signals directly. It may be necessary to install a biphase converter in order to use the Bosch protocol.

3.4.1 AutoPan Function

In many cases with a pan/tilt camera, it may be desirable to use a simple back-and-forth (left-right) scan pattern, rather than a Scan List set of presets. To use the AutoPan feature (also known as Auto Scan), set the left and right pan limits and the pan speed, and then start the AutoPan mode. The functions for setting up the AutoPan limits and for controlling the AutoPan function are available using presets and are described in the following table..

Table 3-1: AutoPan functions

PRESET GOTO 90	GoToPanLimitLeft
PRESET GOTO 91	GoToPanLimitRight
PRESET GOTO 92	SetPanLimitLeft
PRESET GOTO 93	SetPanLimitRight
PRESET GOTO 94	IncrementAutoPanSpeed
PRESET GOTO 95	DecrementAutoPanSpeed
PRESET GOTO 96	StopAutoPan
PRESET GOTO 99	StartAutoPan

3.4.2 Serial Extensions

In addition to the set of standard commands that would be used on an ordinary CCTV camera, control commands that allow access to more advanced features, or features that are specific to a particular type of equipment, are available through extensions to the serial protocol. These extended commands are quite useful when controlling features that are specific to FLIR thermal cameras.

In the Pelco D protocol, these additional functions can be accessed using the Aux On and Aux Off extensions and are available by default. Many keyboards that support Pelco protocols have Aux On and Aux Off buttons for selecting these functions. As an example, the following functions are typically supported by default

Table 3-2: Aux Functions

AuX ON 1	IRPolarityBlackHot
AUX OFF 1	IRPolarityWhiteHot
AUX ON 2	DLTVChangeActiveSource
AUX OFF 2	IRChangeActiveSource
AUX ON 3	TogglePlateauValue
AUX OFF 3	IRToggleAGCType
AUX ON 4	ToggleAutofocus
AUX OFF 4	IRStartNUCCalibration
AUX OFF 5	IRToggleLUTPalette
AUX ON 6	IRToggleDDEGain
AUX OFF 6	IRToggleAGCROI
AUX ON 7	IRToggleFOV
AUX OFF 7	IRToggleAGCMaxGain
AUX ON 8	SwitchCameraOn
AUX OFF 8	SwitchCameraOff
AUX ON 9	InitializePT
AUX OFF 9	GoToParkPosition

3.4.3 Preset Map File

Most pan/tilt cameras support predetermined pan/tilt locations that are stored as “presets’. A collection of presets is known as a Scan List (also referred to as a Pattern or Tour), A Scan List is used to direct the camera to a sequence of locations that are typically viewed, or are considered important or high-priority. Using the FSM software, multiple scan lists for a camera can be set up and scheduled according to time of day and other factors.

However, presets can also be used to access other functions. The camera is capable of storing up to 128 Presets, but generally not that many are needed, so some presets can be reassigned to access the other functions. For keyboards that do not have the Aux buttons, camera presets can be used to accomplish the extended functions described above. For example, if preset 41 is not being used for an actual preset location, it can be mapped to one of the above functions, such as IRPolarityBlackHot. To allow mapping of the serial functions, set the “Use Preset Map File” parameter to yes.

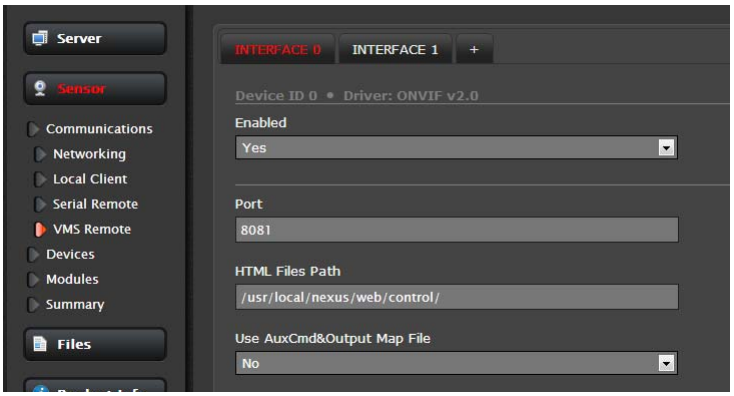
On the **Files** page under PelcoD Map, use the Download link to open the text file that is used for mapping the functions to Aux commands and Presets. If it is necessary to change the mapped functions, edit the file and upload the new map file to the camera using the Upload button. Once a file has been edited and tested, it can also be uploaded to other cameras so that each camera operates the same way.

Remote/VMS

3.5 Remote/VMS (ONVIF Interface)

Several types of third-party Video Management System (VMS) systems are supported by FLIR IP cameras. Because these systems tend to evolve and change over time, contact your local FLIR representative or FLIR Technical Support if you have any difficulties or questions about using this feature.

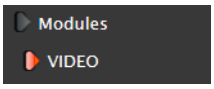
Select the **Remote/VMS** link on the left side of the page to configure the camera to operate with a VMS Interface. By default, the camera is configured with a Remote/VMS interface with ONVIF 2.0 parameters.



The ONVIF (Open Network Video Interface Forum) is an open industry forum for the development of a global standard for the interface of network video products. An ONVIF-compliant VMS can be used to control a FLIR camera, display video, and, for pan/tilt cameras, access up to 50 pan/tilt presets.

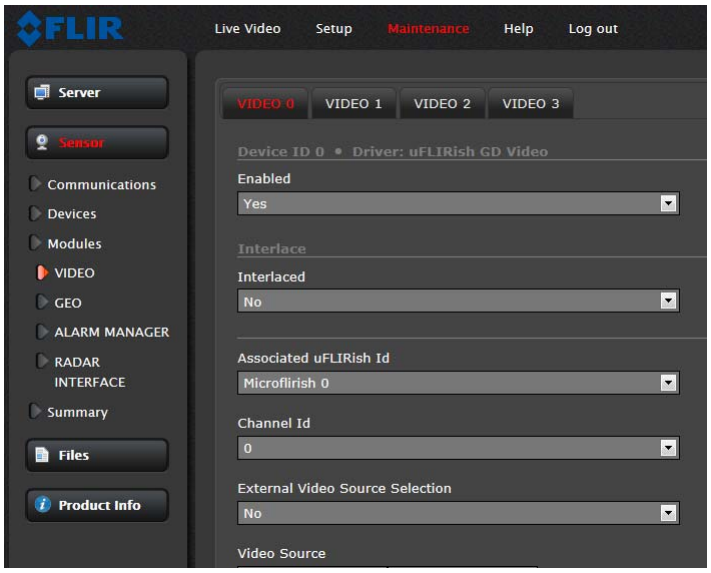
If the camera is to be used with a third-party VMS that is compliant with ONVIF, the parameters can be adjusted (if needed) to work with the VMS. Refer to the VMS documentation to determine what parameter values are needed.

After the interface is configured, scroll down and click on the Save button to save the configuration, and then restart the server.



3.6 Video Stream Parameters

From the **Maintenance** menu, it is possible to modify the video stream parameters by selecting the Sensor > Modules > Video page. Various parameters that affect both image quality and transmission bandwidth are available.



By default, two video streams are enabled for the thermal (IR) camera (Video 0 and Video 1) and two for the daylight (DLTV) camera (Video 3 and Video 4). The Video 0 and Video 2 streams are available for viewing from a client program such as FSM, a stand-alone video player, or a third-party VMS. The Video 1 and Video 3 streams are used by the web browser Live Video display.

To modify parameters that affect a particular IP Video stream from the camera, select the appropriate link at the top (for example, Video 0). For a video stream that is used by the Live Video web page, it is only possible to change the frame rate and image size.

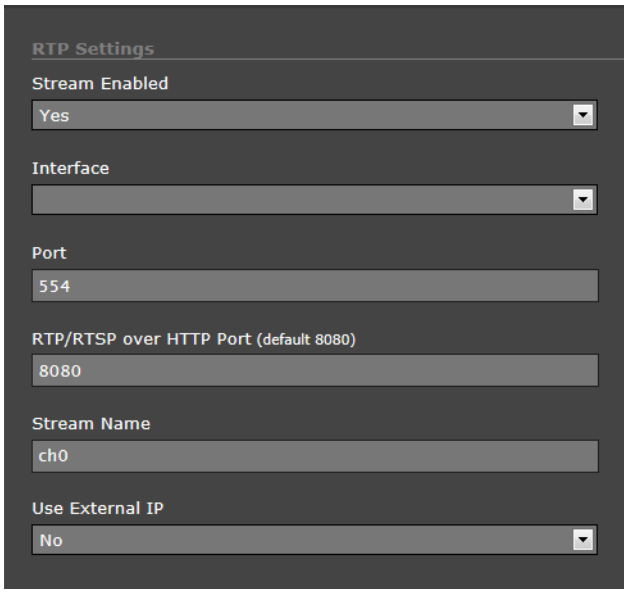
The default settings for each video stream provide high-quality, full frame-rate video. In general, for most installations it will not be necessary to modify the default parameters. However in some cases, such as when a video stream is sent over a wireless network, it may be useful to “tune” the video stream to try to reduce the bandwidth requirements. In particular, the **RTP Settings**, **Network Options** and the **Settings** parameters are described below.

There are some challenges with streaming video over an IP network, when compared to other traditional IP applications which are less time-critical, such as email and web browsing. In particular, there are requirements which must be fulfilled to ensure satisfactory video quality in professional security environments. There are many parameters and factors related to network infrastructure, protocols, codecs and so on that can affect the quality and bit rate of a video stream when it is established between the camera and a client.

The video streaming is done using a protocol generally referred to as Real-time Transport Protocol (RTP), but there are actually many protocols involved, including Real-Time Transport Control Protocol (RTCP) and Real Time Streaming Protocol (RTSP). In the background, a “negotiation” takes place to establish a session between the client (such as FSM, or a third party VMS or video player) and the camera. The ports which form a session are negotiated using a protocol such as RTSP. A client typically requests a video stream using its preferred settings, and the camera can respond with its preferred settings. As a result, many of the details are established dynamically, which may run contrary to network security requirements.

RTP Settings

According to the specification, RTP is originated and received on even port numbers and the associated RTCP communication uses the next higher odd port number; the default RTP Port is 554. The Stream Name is used when establishing a session from a client. The default value recognized by FSM for the first stream is ch0; the complete connection string is: rtsp://192.168.250.116/ch0.



If necessary, this stream name can be used to open a video stream with a third-party video player.

By default the video stream uses the IP address of the camera. If the Use External IP parameter is set to “yes”, an alternate IP address can be entered.

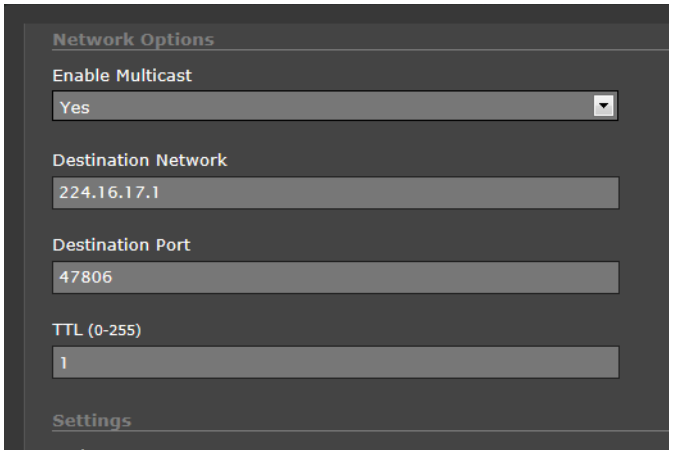
Note, always use an even port number for the RTP Port parameter.

Network Options (Unicast/Multicast)

By default, the video streams from the camera are sent using unicast packets rather than multicast. This means a given packet of IP Video will be sent separately to each client that has that video stream open (for example, FSM clients, nDVR, and so on). Therefore each additional client will cause the bandwidth consumption to go up and cause more overhead on the system in comparison to multicast.

On the other hand, video packets sent using multicast are shared by streaming clients, so additional clients do not cause bandwidth consumption to go up as dramatically. If the video streams are used by more than one client/location, it may be wise to use multicast for more efficient bandwidth usage.

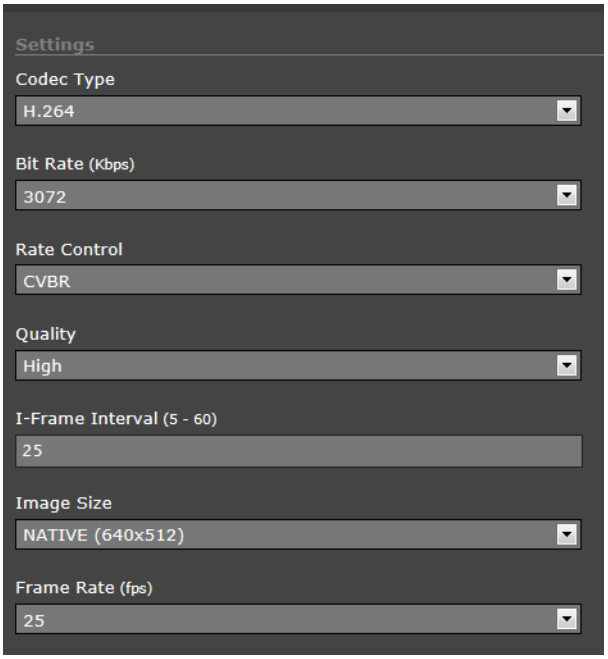
To set the camera to use Multicast, set the Enable Multicast parameter to “yes”, and set the Destination Network address and Destination Port to a unique combination that will not conflict with other IP Video devices on the network (the Destination Port must be an even number).



If more than one camera is providing multicast streams on the network, be sure to configure each stream with a unique multicast Destination Network IP address and Destination Port combination. The destination address on each camera will default to 232.0.1.1 when the Enable Multicast parameter is set to “yes”.

Settings

The parameters in the Settings section will have a significant impact on the quality and bandwidth requirements of the video stream. In general it is recommended that the default values are used initially, and then individual parameters can be modified and tested incrementally to determine if the bandwidth and quality requirements are met. The proper settings for a given installation will depend on many factors, including the network capabilities, the processing power in the camera as well as the client computer, the scene contrast, and personal preferences. When the installer is faced with limitations (such as restricted bandwidth due to a wireless network link), it will be necessary to compromise image size, frame rate, and/or image quality in order to achieve an acceptable video stream.



For each video stream, the **Codec Type** options are MPEG4, H.264 or MJPEG. MPEG4 requires the least amount of processing, and MJPEG requires the most. See section “MJPEG Codec Type” on page 3-15 for additional notes on the MJPEG type, which is used by the Live Video stream

The **Bit Rate** parameter is only used when the Rate Control parameter is set to CBR (Constant Bit Rate). With the CBR setting, the system attempts to keep the resulting bit rate of the video at or near the target bit rate.

By default, the **Rate Control** parameter is set to CVBR (constrained variable bitrate) for MPEG4 and H.264 streams. The VBR (variable bit rate) option attempts to maintain a specified quality at a constant level by varying the bit rate depending on the scene content. The CBR (constant bit rate) option uses a best effort attempt to adhere to the Bit Rate setting; with high contrast/detail scenes, the quality may be compromised due to the bit rate limitation. With the CVBR option, the stream may exceed the bitrate momentarily while attempting the maintain the quality level.

The **Quality** parameter works in cooperation with the Rate Control. The quality setting (Low, Medium or High; default: High) provides a relative way to balance video quality, latency and bandwidth. When set to High, the video image will be high quality with high bandwidth and the possibility of some latency since the encoder may take longer to compress the video.

The I**-Frame Interval** parameter controls the number of P-frames used between I-frames. I-frames are full frames of video and the P-frames contain the changes that occurred since the last I-frame. A smaller I-Frame Interval results in higher bandwidth (more full frames sent) and better video quality. A higher I-Frame Interval number means fewer I-frames are sent and therefore results in lower bandwidth and possibly lower quality.

The **Image Size** parameter controls the video resolution size and therefore can have a considerable impact on bandwidth usage. The larger the size of the frame, the better the resolution and the larger the network bandwidth required. The following table provides the corresponding resolution for each Image Size setting (note, some settings are not available on all cameras).

Table 3-3: Image Size Settings

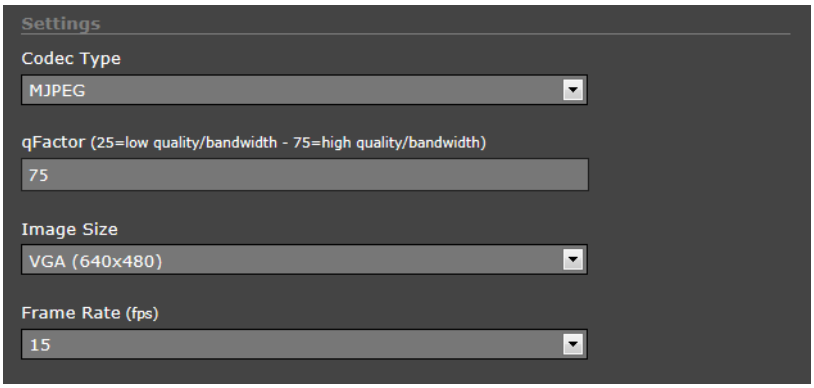
Image Size	NTSC	PAL
D1	720x480	720x576
4SIF/4CIF	704x480	704x576
VGA/Native	640x480	640x512
SIF/CIF	352x240	352x288
QVGA/QNative	320x240	320x256

Note, the image size for FC-Series cameras with 320 resolution is expanded to be equivalent to the image size for 640 cameras.

As a rule of thumb, if the video will be viewed on its own and on a reasonably large screen, a large image size setting may look better. On the other hand, if the video is shown as a tile in a video wall, a smaller image size may look as good and consume less bandwidth.

MJPEG Codec Type

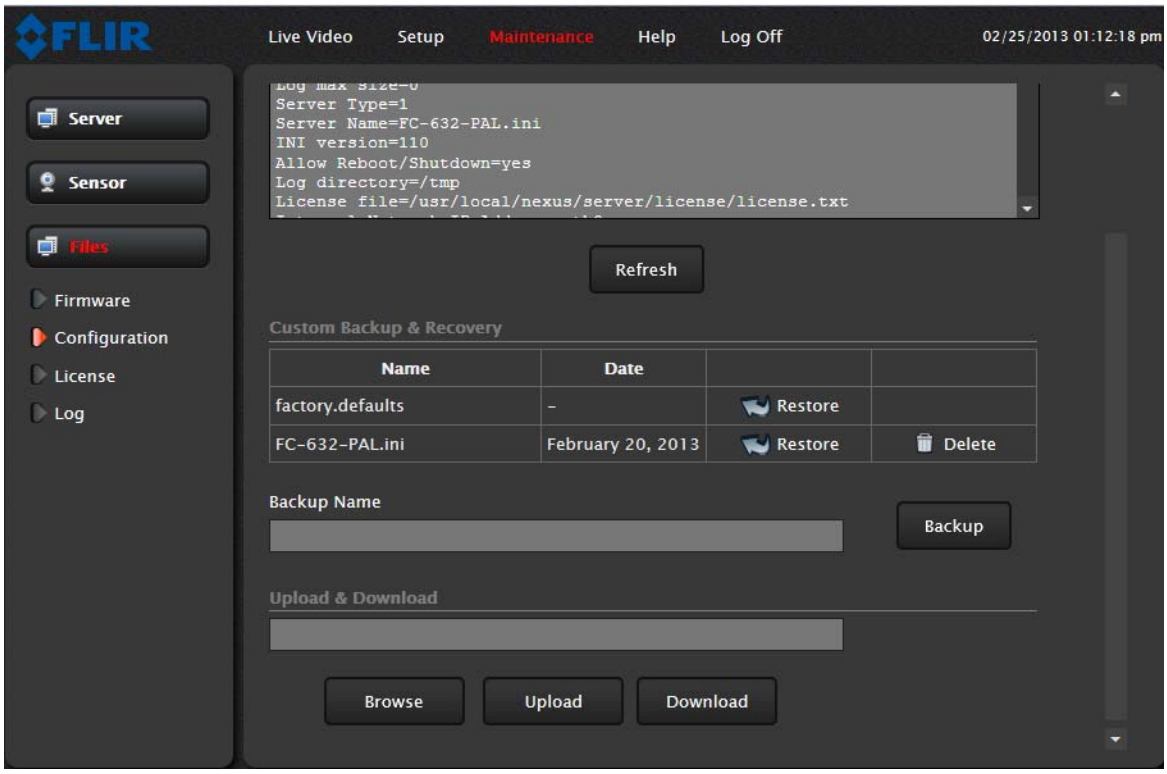
The video stream for the Live Video web page uses the MJPEG codec type. With this codec type, it possible to change the qFactor, Image Size and Frame Rate parameters. The qFactor parameter provides a relative balance of quality and bandwidth, similar to a percentage (25=low quality/ bandwidth - 75=high quality/bandwidth).



3.7 Configuration File

The Configuration File web page allows the Nexus Server configuration to be displayed or backed up locally (on the camera). The configuration file can also be downloaded to another computer for backup, or a new configuration file can be uploaded from a computer to the camera.

Shown at the top of the screen is the configuration script file in a scrollable window. This can be useful if you ever need help from a support engineer.



In the Custom Backup & Recovery section, click the Restore link associated with the factory.defaults configuration to restore the camera to its factory settings. This file can not be modified or deleted, so it is always available.

Use the Backup button to make a backup of your final settings. This will make a backup copy of the configuration file and store it locally on the camera.

In the Upload & Download section, the Download Configuration File link can be used to save a copy to a PC for safe keeping. A pop-up window will ask for a file name and destination folder.

The Upload button is used to transfer a configuration file from a PC to the camera.

3.8 Restoring the Factory Settings

The camera comes configured from the factory with default settings for the IP address (192.168.250.116), the login password (fliradmin), and all of the other configuration parameters (stored in a file called server.ini). In some cases, it may be necessary to restore the settings of the camera to the original factory settings. If necessary, this can be accomplished by temporarily connecting a loopback device to the Ethernet port during initial power-up. Approximately 30 seconds after power is turned on, the loopback should be removed to allow the camera to finish booting up.

Note

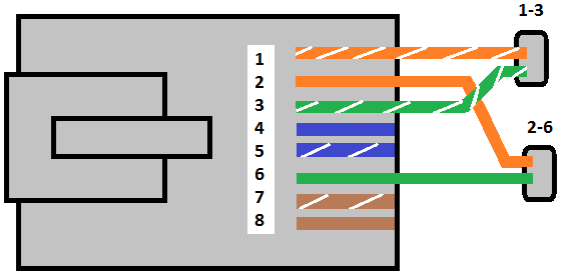
The camera will not finish booting up while the loopback device is connected to the camera. The camera will display analog video, but the Nexus Server will not start until the loopback is removed from the camera.

At each power-up, the system transmits a packet and then checks to determine if that same packet has been received. Detection of the received packet indicates the camera has a custom loopback connector installed on its Ethernet interface. The detection of the loopback packet cues the camera to restore Factory Defaults (including the IP settings, user passwords, and configuration file), reverting to the same configuration and behavior as when the camera left the factory.

The custom loopback connector is described below.

Pin #	Signal	Tied to pin #
1	Transmit +	3
2	Transmit -	6
3	Receive +	1
4	Unused	N/A
5	Unused	N/A
6	Receive -	2
7	Unused	N/A
8	Unused	N/A

The RJ45 loopback termination ties pin 1 to pin 3, and pin 2 to pin 6. The other pins are not connected. This type of device is available commercially (the Smartronix Superlooper Ethernet Loopback Jack and Plug is one example), or it can be easily made with an RJ45 plug, a couple wires, and a crimp tool.



After the camera boots up, confirm the startup information is displayed on the analog monitor after approximately 90 seconds. For example:

```
S/N: 1234567
IP Addr: 192.168.250.116
PelcoD (Addr:1): 9600 SW
```

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