AXIS 221 Network Camera

User's Manual

About this Document

This manual is intended for administrators and users of the AXIS 221 Network Camera, and is applicable for software release 4.15. It includes instructions for using and managing the AXIS 221 on your network. Previous experience of networking will be of use when using this product. Some knowledge of UNIX or Linux-based systems may also be beneficial, for developing shell scripts and applications. Later versions of this document will be posted to the Axis Website, as required. See also the product's online help, available via the Web-based interface.

Safety Notices Used In This Manual

Caution! - Indicates a potential hazard that can damage the product.
Important! - Indicates a hazard that can seriously impair operation.
Do not proceed beyond any of the above notices until you have fully understood the implications.

Intellectual Property Rights

Axis AB has intellectual property rights relating to technology embodied in the product described in this document. In particular, and without limitation, these intellectual property rights may include one or more of the patents listed at http://www.axis.com/patent.htm and one or more additional patents or pending patent applications in the US and other countries.

This product contains source code copyright Apple Computer, Inc., under the terms of Apple Public Source License 2.0 (see http://www.opensource.apple.com/apsl/).
The source code is available from:
http://developer.apple.com/darwin/projects/rendezvous/

Legal Considerations

Video and audio surveillance can be prohibited by laws that vary from country to country. Check the laws in your local region before using this product for surveillance purposes.

Electromagnetic Compatibility (EMC)

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 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: Re-orient or relocate the receiving antenna. Increase the separation between the equipment and receiver. Connect the equipment to an outlet on a different circuit to the receiver. Consult your dealer or an experienced radio/TV technician for help. Shielded (STP) network cables must be used with this unit to ensure compliance with EMC standards.

USA - This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his/her own expense will be required to take whatever measures may be required to correct the interference.

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

Europe - $C\epsilon$ This digital equipment fulfills the requirements for radiated emission according to limit B of EN55022/1998, and the requirements for immunity according to EN55024/1998 residential, commercial, and industry.

Japan - This is a class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

Australia - This electronic device meets the requirements of the Radio communications (Electromagnetic Compatibility) Standard 1998 AS/NZS 3548.

Liability

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Support

Should you require any technical assistance, please contact your Axis reseller. If your questions cannot be answered immediately, your reseller will forward your queries through the appropriate channels to ensure a rapid response. If you are connected to the Internet, you can:
• download user documentation and firmware updates
• find answers to resolved problems in the FAQ database. Search by product, category, or phrases
• report problems to Axis support by logging in to your private support area
• visit Axis Support at www.axis.com/techsup/

Safety Notice - Battery Replacement

The AXIS 221 uses a 3.0V CR2032 Lithium battery as the power supply for its internal real-time clock (RTC). Under normal conditions this battery will last for a minimum of 5 years. Low battery power affects the operation of the RTC, causing it to reset at every power-up. A log message will appear when the battery needs replacing.

The battery should not be replaced unless required!
If the battery does need replacing, please observe the following:
• Danger of Explosion if battery is incorrectly replaced
• Replace only with the same or equivalent battery, as recommended by the manufacturer.
• Dispose of used batteries according to the manufacturer's instructions.

Contents

Product Features

The AXIS 221 is part of the latest generation of fully featured Axis Network Cameras, based on the AXIS ARTPEC-2 compression chip. The AXIS 221 features a DC-Iris and supports Power over Ethernet. The AXIS 221 has a metal casing and an infrared (IR) filter so it can operate day and night.

The video from the camera is made available on the network as a real-time, full frame rate Motion JPEG stream and/or full frame rate MPEG-4 video stream. The camera includes **Video Motion Detection**, which can be used to trigger e.g. image uploads when there is activity in the video image. Uploads can also be scheduled to run at specified times. Security features include IP address filtering, encrypted browsing with HTTPS and multilevel password protection.
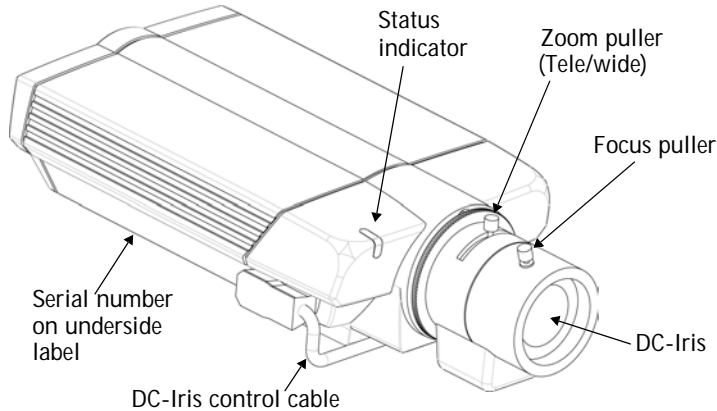
The AXIS 221 is equipped with two alarm inputs and one output, which can be connected to various external devices, e.g. door sensors and alarm bells.

Video can be viewed in various different resolutions. Up to 20 viewers can access the camera simultaneously when using Motion JPEG. If MPEG-4 multicast is used, the number of viewers is unlimited, but each viewer needs a separate MPEG-4 license. There is one license included in the product, additional licenses can be purchased separately.

The camera has a built-in Web server, providing full access to all features through the use of a standard web browser. The built-in scripting tool allows the creation of basic applications. For advanced functionality, the camera can be accessed via the AXIS HTTP API (more info at www.axis.com/developer).
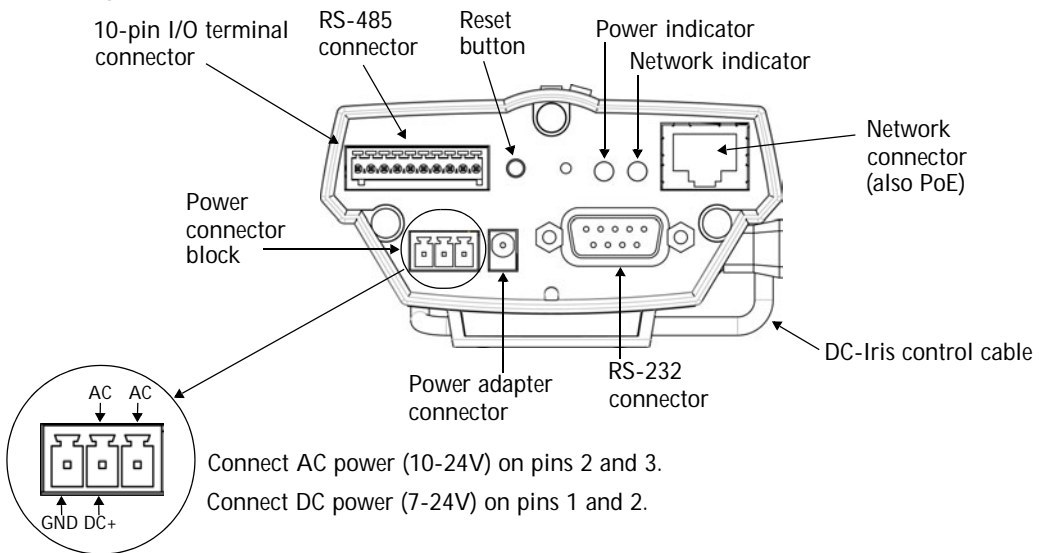
The AXIS 221 features a varifocal lens with DC-Iris, which automatically regulates the amount of light entering the camera. Tele/wide and focus are adjusted manually with the aid of the pullers mounted on the lens. The AXIS 221 is also available without a lens.

The AXIS 221 can be powered from the network cabling and supports Power over Ethernet (PoE) network transformers conforming to IEEE 802.3af.

Overview

Status indicator

Zoom puller (Tele/wide)

Focus puller

Serial number on underside label

DC-Iris

DC-Iris control cable

Rear panel

10-pin I/O terminal connector

RS-485 connector

Reset button

Power indicator

Network indicator

Network connector (also PoE)

Power connector block

DC-Iris control cable

AC AC

Power adapter connector

RS-232 connector

GND DC+

Connect AC power (10-24V) on pins 2 and 3.

Connect DC power (7-24V) on pins 1 and 2.

Power Adaptor Connector - For connection of the PS-K power adapter (included).

I/O Connector - The I/O terminal connector provides the physical interface to one solid state relay output, two digital photo-coupled inputs, RS-485 and an auxiliary connection point for DC power. For more information, see *The I/O Units Connectors*, on page 43.

Network Connector - The camera connects to the network via a standard RJ-45 connector. Supporting NWAY, the camera detects the speed of the local network segment (10BaseT/100BaseTX Ethernet). This socket can also be used to power the AXIS 221 via PoE (Power over Ethernet). The camera can also negotiate the correct power level when using PoE.

RS-232 Connector- Single 9-pin D-SUB RS-232 connector, max 115 kbit/s, half-duplex.

Serial Number - This number is used during installation.

Reset Button - Press this button to install using the AXIS Internet Dynamic DNS Service or to restore the factory default settings, as described in *Resetting to the Factory Default Settings,* on page 37.

LED Indicators

After completion of the startup and self test routines, the multi-colored Network, Status, and Power LED indicators flash as follows:

Network	Amber	Steady for connection to 10 Mbit/s network. Flashes for network activity.
	Green	Steady for connection to 100 Mbit/s network. Flashes for network activity.
	Red	Flashes rapid red, together with the Status indicator, for hardware error.
	Unlit	No connection.
Status	Green	Shows steady green for normal operation. Can be configured to flash green at intervals whenever the camera is accessed. See the online help for more information.
	Unlit	When configured for "no flash" on camera access.
	Amber	Shows steady amber during reset to factory default or when restoring settings.
	Red	Slow flash for failed upgrade (see *Emergency Recovery Procedure,* on page 39). Rapid flash, together with the Network indicator, for hardware error.
Power	Green	Normal operation.
	Amber	Flashes green/amber during firmware upgrade.

Accessing the Camera

Follow the instructions in the AXIS 221 Installation Guide to install the camera. The camera can be accessed with most standard operating systems and browsers. The recommended browser is Internet Explorer with Windows, and Mozilla with other operating systems. See also the *Technical Specifications,* on page 48.

Note: To view streaming video in Microsoft Internet Explorer, you must set your browser to allow ActiveX controls and allow the AXIS Media Control (AMC) to be installed on your workstation. AMC is required for MPEG-4. If your workstation restricts the use of additional software components, the camera can be configured to use a Java applet for updating JPEG images. Please see the online help for more information.
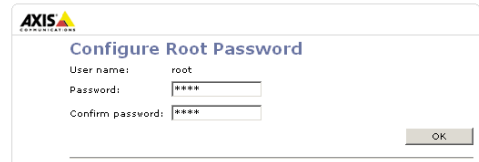
Access From a Browser

1. Start a browser (e.g. Internet Explorer, Mozilla)

2. Enter the IP address or host name of the camera in the **Location/Address** field of your browser.

3. If this is the first time the camera is accessed, see *Setting the Password,* on page 9. Otherwise enter your user name and password, as set by the administrator.

4. The camera's **Live View** page is now displayed in your browser.

Note: The layout of the live view page in the camera may have been customized to meet specific requirements. Consequently, some of the examples and functions featured here may differ from those displayed on your own Live View page.

Setting the Password

1. When accessing a camera for the first time, the '**Configure Root Password**' dialog will be displayed on the screen.

AXIS

Configure Root Password

User name: root

Password: ****

Confirm password: ****

OK

2. Enter a password and then re-enter it, to confirm the spelling. Click **OK**.

3. The '**Enter Network Password**' dialog will appear. Enter the User name: **root**
   Note: The default administrator user name **root** is permanent and cannot be deleted or altered.

4. Enter the password as set in step 2 above, and click **OK**. If the password is lost, the camera must be reset to the factory default settings. See page 37.

5. If required, click **Yes** to install the AXIS Media Control (AMC). You will need administrator rights on the computer to do this.

## Accessing the camera from the Internet

Once installed, the camera is accessible on your local network (LAN). To access the camera from the Internet you must configure your router/firewall to allow incoming data traffic. For security reasons this is usually done on a specific port. Please refer to the documentation for your router/firewall for further instructions.

For more information, please visit the AXIS Internet Dynamic DNS Service at www.axiscam.net or, for Technical notes on this and other topics, visit the Axis Support Web at www.axis.com/techsup

Focusing

To focus the **AXIS 221**, follow the instructions below.

1. From the **Basic Configuration** page in the setup tools, open the **Focus adjustment page**.

2. Set the DC-Iris to *Disabled* and click **Save**.

Zoom puller
(Tele/wide)

Focus puller

3. Unscrew the zoom puller on the lens by turning it anti-clockwise. Adjust the zoom setting as required. Re-tighten the zoom puller.

4. Unscrew the focus puller on the lens. Adjust the focus as required. Re-tighten the focus puller.

5. From the Focus adjustment page, set the DC-Iris to *Enabled* and click **Save**.
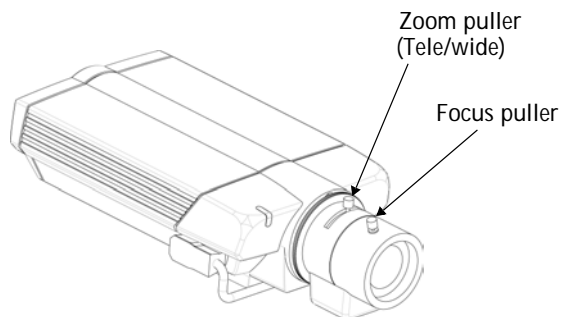
Note: The DC-Iris should always be disabled while focusing the camera. This opens the iris to its maximum, which gives the smallest depth of field and thus the best conditions for correct focusing. When the focus is set with this method it will then be maintained in any light conditions.

The Live View Page

Depending on whether or not the Live View page has been customized, the buttons described below may or may not be visible.
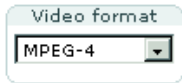
From the **Video Format** list, select the required video stream format. Note that **Multicast** has to be enabled if MPEG-4 is selected. This is configured under **Setup** > **System Options** > **Network** > **RTP (multicast)**.

The **Output buttons** control the output directly from the **Live View** page. These buttons are configured under **Setup** > **Live View Config** > **Layout**.

Pulse - click this button to activate the port for a defined period of time, e.g. to switch on a light for 20 seconds.
Active/Inactive - click these buttons to manually start and stop a connected device, e.g. switch a light on/off.

These buttons start and stop the **Sequence Mode**. This mode is created in **Setup** > **Live View Config** > **Sequence mode**, and automatically displays the view from 2 or more video sources at set intervals.

From the **Source** list, select the desired external video source. Note that Sequence Mode must be stopped before selecting a source from this list.

The **Action buttons** can trigger an event directly from the **Live View** page. These are configured under **Setup** > **Live View Config** > **Layout**.

The **Snapshot** button saves a snapshot of the video image currently being displayed. Right-click on the video image to save it in JPEG format on your computer. This button is primarily intended for use when the AMC viewer toolbar is not available.

The **AMC viewer toolbar** (AXIS Media Control) is available in **Microsoft Internet Explorer only**. It displays the following buttons:

The **Play/Stop** button starts and stops the live video stream.

The **Snapshot** button saves a snapshot of the video image currently being displayed. The Snapshot function and the target directory for saving snapshots can be configured from the AMC Control Applet in the Windows Control Panel (Internet Explorer only).

Click the **View Full Screen** button to make the video image fill the entire screen area. No other windows will be visible. Press **Esc** (Escape) on the computer keyboard to exit full screen.

Configuration

This section describes how to configure the camera, and is intended for product **Administrators,** who have unrestricted access to all the Setup tools, and **Operators**, who have access to the settings for Video & Image, Audio, Live View Config and Event Configuration.

The camera is configured under **Setup** from a standard browser (see *Supported Web Browsers,* on page 49).

Accessing the Setup tools

Follow the instructions below to access the Setup Tools from a browser.

1. Start your browser and enter the IP address or host name of the camera in the location/address field.

2. The **Live View** page is now displayed. Click **Setup** to display the **Setup** tools.

Overview of the Setup tools

Basic Configuration

The links under Basic Configuration are shortcuts providing a convenient way of making the basic settings the first time the unit is configured.

Tools	Description
Instructions	General Instructions.
Users	See System Options > Security > Users below.
TCP/IP	See System Options > Network > TCP/IP below.
Date & Time	See System Options > Date & Time below.
Video & Image	See Video & Image below.
Focus	For help, see the Focus adjustment page in the Setup tools, or see page 9 of this manual.

Video & Image (Administrator/Operator)

Tools	Settings	Description
Image	Image Appearance	Basic video image settings - resolution, compression, image rotation, color, brightness and contrast.
	Video Stream	Used to limit the video stream display time and frame rate.
Overlay/Mask	Text Overlay	Add date, time or other text to the video image and choose the location and color of text.
	Overlay/Mask Type	Choose between having an image on top of the video image or blacking-out certain parts of the image using a mask. The location of images and masks is configurable.
Advanced	Camera	Adjust camera to suit different light conditions - white balance, exposure control, exposure area, IR filter and DC iris. Also possible to prioritize frame rate or image quality in low light conditions.
	MPEG	Select the MPEG-4 profile and level, GOV structure and GOV length.

Live View Config (Administrator/Operator)

Tools	Description
Layout	Customize the Live View page, by adding e.g. custom links, manual trigger buttons and manual output control buttons. Default Viewer: set your preferred method of viewing moving video images.
HTML Examples	Add live video from your camera to your own web site, or to an HTML page on your local hard disk. The pages provide the HTML code to have either MJPEG or MPEG-4 video image streaming.
External Video	Display live video from an external source, i.e. from another Axis device on the network.
Sequence Mode	Configure the camera to automatically display the available video sources at regular intervals. The video images can be displayed in order or randomly. The time interval can be set to up to 59 minutes.

Event Configuration (Administrator/Operator)

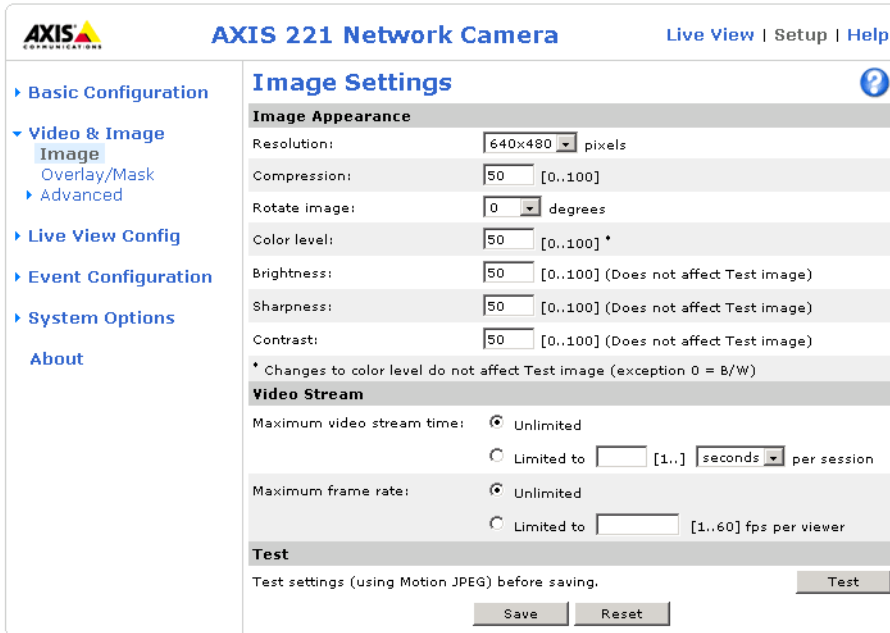| Tools	Settings / Options / Description
Instructions	General Instructions
Event Servers	Specify destinations for uploaded image files and/or notification messages sent by the camera. FTP servers and HTTP servers can save image files. HTTP servers and TCP servers can receive notification messages.
Event Types	Set up event types so that the camera will perform various actions, e.g. upload images to a specified destination. These event types can be Triggered - e.g. they run when an alarm is activated, or Scheduled - the event type runs at a set time.

Tools	Settings / Options / Description
Motion Detection	Set up areas in the video image where an alarm is activated whenever movement occurs there. Each motion detection window can be moved, re-sized, or disabled at any time. The behavior for each window is defined by adjusting the Object size, History, and Sensitivity profile sliders. Exclude windows can be used to mask areas where motion should not activate alarms.
Port Status	Shows the status for the camera's input and output - see **Ports & Devices** under **System Options**.

System Options (Administrators only)

Tools	Settings / Options / Description	
Security	Users	Access to the camera can be restricted to defined users only (maximum 20). An administrator has unrestricted access to the Setup tools and can determine rights for users at 3 levels; Administrator, Operator or Viewer.
	IP Address Filter	Once enabled, only the IP addresses shown in the list of allowed addresses will be permitted to access the camera. All others will be blocked.
	HTTPS	Provides encryption for page requests from users and for the pages returned by the web server.
Date & Time		Define the date and time settings for your camera, manually or automatically.
Network	Basic TCP/IP Settings	Specify IP address configuration and notification of changes to the IP address. Register/unregister for the AXIS Internet Dynamic DNS Service.
	Advanced TCP/IP Settings	Configure DNS and host name. Assign an additional IP address, which can be used to access the unit from other hosts on the same segment of the local network. Specify the HTTP port and network traffic preferences.
	SOCKS	Specify a SOCKS server to use when communicating with hosts on the other side of a firewall/proxy server.
	SMTP	Specify the host names or addresses for your primary and secondary mail servers in the fields provided to allow the camera to send event and error email messages to pre-defined email addresses.
	SNMP	Enables network administrators to manage network performance, find and solve network problems, and plan for network growth
	UPnP™	The camera includes support for UPnP. Enable UPnP and enter a user-friendly name for the camera. Note that UPnP is enabled by default.
	RTP (multicast)	Enable/disable multicast and specify multicast addresses. Only applicable when MPEG-4 is used as the video format.
Ports and Devices	I/O Ports	Configure the camera's input and output. Enter descriptive names and specify the ports' Normal states (Open circuit or Grounded circuit).
LED settings		The Status LED can be made to flash whenever the camera is accessed.
Maintenance		Functions for restarting the camera, restoring settings, upgrading the camera, backing up and restoring configurations.
Support	Support Overview	Links to the Troubleshooting guide, the Server report (always include this when requesting support) and the Axis Support Service.
	Logs & Reports	Generate Logs (all log information is shown in one file), reports (information about the camera's status) and a parameter list.
Advanced	Scripting	This powerful function allows users to customize and use their own scripts, for creating specialized applications.
	Plain Config	Plain config allows direct access to all the configurable parameters.

Video and Image

The following descriptions offer examples of the features available in the AXIS 221. For details of each setting, please refer to the online help available from the setup tools. Click 🅠 to access the online help.

Image Settings

Use the **Image Appearance** settings to change the image as required.

The configuration of the video image will affect the camera's overall performance, depending on how it is used and on the available bandwidth. Lower compression improves video image quality, but increases the bandwidth.

Note: When using MPEG-4 as the video format, this setting will define the minimum compression level. The compression level will temporarily increase as and when required, i.e. when the bit rate approaches the maximum value as defined in the current profile@level combination. See *MPEG-4 Settings,* on page 18 for more information.

The video image can be rotated and fine-tuned by adjusting the color level, the brightness, sharpness and the contrast. Please see the online help for further information on these settings.

Changed video image settings have immediate effect on the MPEG-4 stream, but the Motion JPEG stream will have to be started (or restarted) before the settings take effect.

Video Stream

Define the maximum **video stream time** per session in seconds, minutes or hours. When the set time has expired, a new stream can be started by refreshing the page in the Web browser. For unlimited video stream time, set this value to 0. This setting is only applicable to Motion JPEG.

The **frame rate** allowed to each viewer can also be limited, to avoid bandwidth problems on the network.

Test

For a preview of the image before saving, click **Test**. When satisfied with the settings, click **Save**. Please note that the preview image will be in JPEG format, even though the settings are valid both for Motion JPEG and MPEG-4.

Overlay/Mask Settings

The **Text Overlay** settings enable you to place text at the top or bottom of an image, e.g. date, time or some other text.

Overlay/Mask Type

There are three different options. Choose an image overlay that adds information to the image. You can also conceal part of the video image using an image (privacy mask) or by blacking out areas of the image.

To upload an overlay image/privacy mask:

1. To upload the file (image) to the camera, click the **Browse** button and locate it on your computer or server.

2. Click the **Upload** button and follow the on-screen instructions.

3. The image is now available in the **Use overlay image** drop-down list.

4. Choose the location for the image by editing the x and y coordinates.

5. Click **Save**.
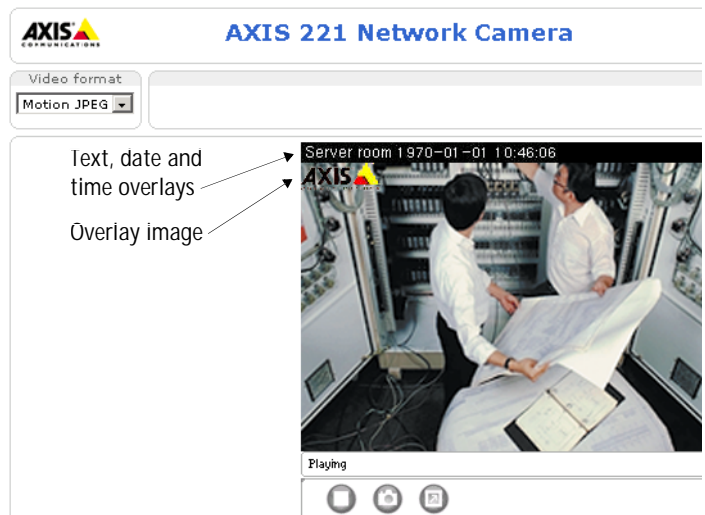
Overlay image/privacy mask requirements:

Image Formats	Image Size
• Windows 24-bit BMP (full color)	The height and width of the overlay image in pixels must be exactly divisible by 4.
• Windows 4-bit BMP (16 colors)	
• OS/2 4-bit BMP (16 colors)	

There are a number of limitations when using overlay images and privacy masks, such as the size and positioning of images/masks. Please refer to the online help for more information ❓.

Advanced Settings

These web pages include different settings for fine-tuning the video image.

Camera Settings

To compensate for the **Lighting conditions** the **white balance**, the **exposure control**, the **exposure area** and the **IR cut filter** can be adjusted. **DC-Iris** should always be enabled except during focusing, or when using a non-DC-Iris lens.

The settings for **Low-light behavior** determine how the camera will behave at low light levels. These settings all affect video image quality and are basically a measure of how much noise to allow in the video images.

Please see the online help for further information on these settings. ❓

MPEG-4 Settings
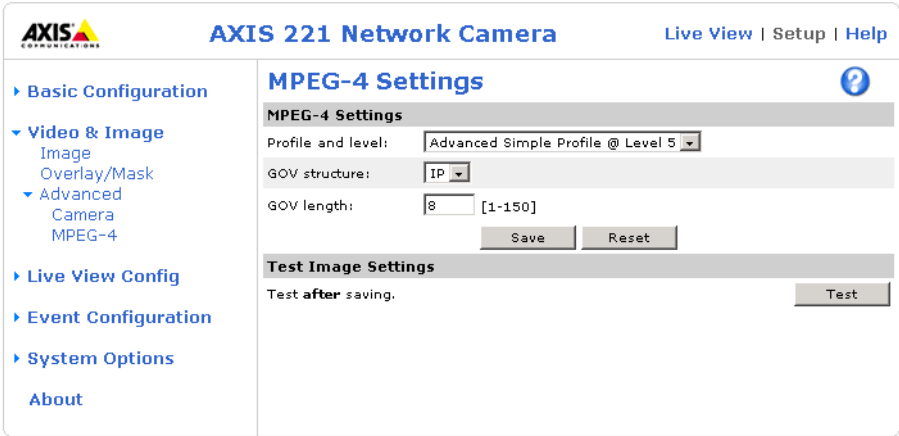
The MPEG-4 standard provides many different coding tools for various applications in different situations. Usually, subsets are defined and used, as it is not reasonable to expect all MPEG-4 clients to support all of these tools. The viewing client must support the subset used for the video stream or the MPEG-4 stream cannot be viewed. The subset used is commonly referred to as **profile@level**, where the **profile** defines the syntax and semantics of the tool subset and the **level** describes the restrictions imposed on the profile, in terms of e.g. bandwidth.

The profiles and levels supported by the camera are as follows:

Profile@Level	Properties
Advanced Simple Profile @ Level 3	Max bit rate = 768 kbit/s ISMA compliant
Advanced Simple Profile @ Level 5	Max Bit rate = 8 Mbit/s

Level 5 should be used if there is enough bandwidth available, as the image quality of the video stream will be better than if level 3 is used.

The **GOV structure** can be set to either **I** or **IP**, which describes the type of images included in the video stream, as well as their internal order. An **I-image** is a complete image, whereas a **P-image** is the differences in the image compared to the previous image in the video stream. The **I-structure** thus consists of a sequence of complete images. The **IP-structure** consists of I-images each followed by a number of P-images, using much less bandwidth than the I-structure.

The **GOV length** determines the sum total of P-images and I-images in a GOV. Setting the GOV length to a high value saves considerably on bandwidth. However there may be noticeable decay in the image at high values.

Note: GOV = Group of VOPs
        VOP = Video Object Plane
        Video Object Plane = image

AXIS Media Control

The AXIS Media Control (AMC) is installed automatically the first time the camera is accessed from a browser. The AMC control panel can be opened by right-clicking on the video image in the Live View web page. The AMC control panel can be used to configure various video and audio settings, such as push to talk. Please see the readme file included in the tool for more information.

Live View Config

The features on the camera Live View page can be customized to suit your requirements, or you can upload and use your own custom web page. This is done by the administrator from **Setup** > **Live View Config** > **Layout**.

Custom Settings

To use your own custom web page, click the radio button **Use custom settings** and click **Configure**.

Upload Own Web Files

Your own web files, background pictures, etc., must first be uploaded to the camera in order to be available for selection in the **Custom Settings setup** dialog. Once uploaded, the files are shown in the drop-down lists.

1. Click the **Upload/Remove** button.

2. Enter the path to the file, e.g. a file located on your computer or click the **Browse** button.

3. Select the user level for the uploaded file. Setting the user access level means that you have complete control over which pages can be viewed by which users.

4. When the path is shown correctly in the text field, click the **Upload** button.

All uploaded files are shown in the list in the lower section of the page. To remove a file, check the box provided next to it and then click the **Remove** button.

Modify the Axis Look

The Axis Look of the default home page can be modified from this dialog, using previously uploaded files or files located elsewhere.

• To use your uploaded file, check the **Own** radio button and select the file from the drop-down list.

• To use a file located somewhere other than in the camera, click the **External** radio button and enter the URL.

Unchecking the box for **Show setup link** will remove the setup link from the product's Home Page. The Setup Tools will then only be accessible by entering the full setup address into the address/URL field of a browser.

> If the setup link is missing, setup can be reached at this url:
> http://<ip address>/operator/basic.shtml.

Own Home Page

To use a previously uploaded web page as the default page, check the box, select the page from the drop-down list and click OK.

User-defined Links

Enter a descriptive name and enter the URL in the provided field.

Example

1. Check **Show Custom Link 1**

2. Enter a descriptive name, e.g. My Website

3. Check the radio button for **web link**.

4. Enter the web link: e.g. http://www.example.com

5. Click **Save**.

This link will then be shown on the Live View page and will open the specified website.

User-defined CGI links can be used to issue advanced commands via the Axis HTTP API. For more information, see the Developer pages at www.axis.com/developer

Action Buttons

The manual trigger buttons can be used to manually trigger and stop an event from the Live View page. See *Event Configuration,* on page 25.

Enabling the display of the **Snapshot** button allows users to save a snapshot from the video stream by clicking the button. This button is mainly intended for use with browsers other than Internet Explorer, or when otherwise not using ActiveX to view the video stream. The ActiveX viewing component (AXIS Media Control) for Internet Explorer provides its own snapshot button.

Output Buttons

These buttons can then be used to manually activate the output from the Live View page, e.g. to switch a light on and off. There are 2 options for how the output is activated:

- The Pulse button activates the output for a defined period
- Active/Inactive displays 2 buttons, one for each action (on/off)

Default Video Format in Internet Explorer for Windows.

Select default video format from the drop-down list. Check the box to enable video format selection on the Live View Page. When using MPEG-4 as video format, the default viewer is AXIS Media Control with Internet Explorer.

Note: It is also possible to view Motion JPEG when MPEG-4 is chosen as default and vice versa.

AXIS Media Control **Settings (see** *AXIS Media Control,* **on page 19)**

Check the **Show viewer toolbar** box to display the AXIS Media Control (AMC) viewer toolbar under the video image in your browser. The toolbar is only available when using AMC.

Default Viewer for Motion JPEG.

Select the appropriate radio button to define the method for viewing moving video images, depending on your browser and settings.

Please see the online help 🔵 for more information.

HTML Examples

You can add live video from the camera to your own web site. The camera can transmit a Motion JPEG stream to up to 20 simultaneous connections, although an administrator can restrict this to fewer. If MPEG-4 is set as video format, multicasting is used and the video stream will be available for an unlimited number of viewers connected to the parts of the network where multicast is enabled. Please note that a separate MPEG-4 license is required for each viewer.

Enter the **Video Format**, **Image Type**, **Image size** and other settings to suit your Web page and click **Update**. The camera then generates the required source code for your configuration. Copy this code and paste it into your own Web page code.

External Video

The camera can also display video images from other Axis network cameras and video servers. These are known as **External Video** sources. Each external video source is available from the drop-down list on the Live View page.

Click the **Add** button to open the External Video Source Setup dialog, which is used to make all the necessary settings. Enter the IP address or host name of the external video source you wish to add. The user can then choose to receive either MPEG-2, MPEG-4 or Motion JPEG video stream.

Sequence Mode

The Live View page can be configured to rotate through the internal and selected external video sources, in order, or randomly.

Select the desired video sources and enter the time in seconds to display each source (up to 59 minutes). Click **Save**.

The Sequence buttons will appear on the Live View page to enable the viewer to start and stop the sequence mode.

Please see the online help 🔵 for more information.

Event Configuration

An event in the camera is when an **Event Type** is activated and causes certain actions to be performed. The event type is the set of parameters (or conditions) that specifies how and when which actions will be performed. A common event type is when the camera uploads images when an alarm occurs. Many event types use an **Event Server**, to e.g. upload images to.

This section describes how to set up event servers and event types, i.e. how to configure the camera to perform certain actions when events (e.g. alarms) occur.

Definitions

Event type	A set of parameters describing how and when the camera will perform certain actions	
Triggered Event - see page 26	The circumstances that start an event.	E.g. on a signal from an external device, such as a door switch or a motion sensor.
Scheduled Event - see page 27	Time period(s) in which an event will run.	Pre-programmed time periods.
Action	What occurs when the event triggers.	E.g. the upload of images to an FTP server, email notification, etc.

Event Servers

Event Servers are used to receive e.g. uploaded image files and/or notification messages. To set up Event server connections in your camera, go to **Setup > Event Configuration > Event Servers** and enter the required information for the required server type.

Server type	Purpose	Information required
FTP Server	• Receives uploaded images	• Descriptive name of your choice • Network address (IP address or host name) • User Name and Password (for FTP server) • Upload path e.g. images/ • Port number • Use passive mode if there is a firewall between the camera and FTP server
HTTP Server	• Receives notification messages • Receives uploaded images	• Descriptive name of your choice • URL (IP address or host name) • User Name and Password (for HTTP server) • Proxy address/Proxy port (if required) • Proxy User Name and Password (if required)
TCP Server	• Receives notification messages	• Descriptive name of your choice • Network address (IP address or host name) • User Name and Password (for TCP server) • Port number

For details on each setting, please see the online help ❔ available from each web page.

When the setup is complete, the connection can be tested by clicking the **Test** button (the connection test takes approximately 10 seconds).

Configuring Event Types

An **Event Type** describes how and when the camera will perform certain actions.

Example: If somebody passes in front of the camera, and an event that uses motion detection has been configured to act on this, the camera can

e.g. record and save images to an FTP server, and/or send a notification email to a pre-configured email address with a pre-configured message. Images can be sent as email attachments.
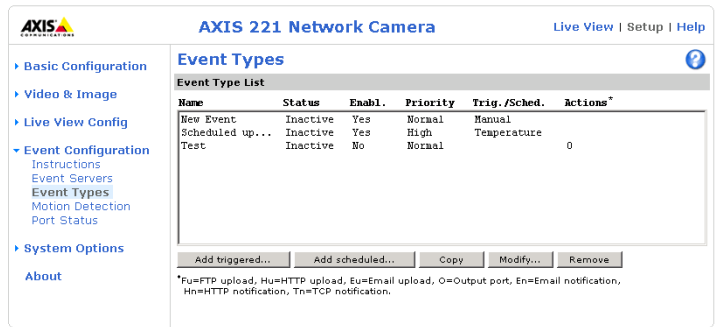
Triggered Event

A Triggered event can be activated by e.g:

- a switch (e.g. a push button) connected to the camera's input port
- detected movement in a configured motion detection window
- a manually activated action, e.g. from an action button in the web interface
- on restart (reboot) after e.g. power loss
- temperature warning

How to set up a triggered event

This example describes how to set the camera to upload images when e.g the main door is opened:

1. Click **Add triggered** on the **Event types** page.
2. Enter a descriptive **name** for the event, e.g. Main door open.
3. Set the **priority** - High, Normal or Low (see the online help).
4. Set the **Respond to Trigger...** parameters for when the event will be active, e.g. only after office hours.
5. Select the trigger alternative from the **Triggered by...** drop-down list, e.g. select Input ports, for the sensor connected to the door.
6. Set the **When Triggered...** parameters, i.e. define what the camera will do if the main door is opened e.g., upload images to an FTP server.
7. Click **OK** to save the Event in the Event Types list.

Please see the online help ❷ for descriptions of each available option.

Note: Up to 10 event types can be configured in the camera, and up to 3 of these can be configured to upload images.

Pre-trigger and Post-trigger buffers

This function is very useful when checking to see what happened immediately before and/or after a trigger, e.g. 30 seconds before and/or after a door was opened. Check the **Upload images** checkbox under **Event Types** > **Add Triggered...** > **Triggered by...** to expand the web page with the available options. All uploaded images are JPEG images.

Include pre-trigger buffer - images stored internally in the server from the time immediately preceding the trigger. Check the box to enable the pre-trigger buffer, enter the desired length of time and specify the required image frequency.

Include post-trigger buffer - contains images from the time immediately after the trigger. Configure as for pre-trigger.

Notes: •Pre-trigger and Post-trigger buffers will be lost if the connection to the event server fails.

•The maximum length of the pre-/post-buffer depends on the video image size and selected frame rate.

•If the pre- or post-buffer is too large for the camera's internal memory, the frame rate will be reduced and individual images may be missing. If this occurs, an entry will be created in the unit's log file.

Continue image upload (unbuffered) - enables the upload of video images for a fixed length of time. Specify the length of time for the uploaded recording, in seconds, minutes or hours, or for as long as the trigger is active. Finally, set the desired image frequency to the maximum (the maximum available) or to a specified frame rate. The frame rate will be the best possible, but might not be as high as specified, especially if uploading via a slow connection.

Scheduled Event

A **Scheduled event** can be activated at preset times, in a repeating pattern on selected weekdays.

Configuration example:

1. Click **Add scheduled** on the **Event types** page.
2. Enter a descriptive **name** for the event, e.g. "Scheduled email upload."
3. Set the **priority** (High, Normal or Low).
4. Set the **Activation Time** parameters (24h clock) when the event will be active, e.g. start on Sundays at 13.00 with a duration of 12 hours.
5. Set the **When Activated...** parameters, i.e. set what the camera will do at the specified time, e.g. send uploaded images to an email address.
6. Click **OK** to save the Event in the Event Types list.

Please see the online help ❓ for descriptions of each available option.

Motion Detection

The motion detection feature is used to generate an alarm whenever movement occurs (or stops) in the video image. A total of 10 Include and/or Exclude windows can be configured.

- **Included** windows target specific areas within the whole video image
- **Excluded** windows define areas within an Include window that should be ignored (areas outside Include windows are automatically ignored)

Once configured, the motion detection windows will appear in the list of available triggers, for triggering events. See *How to set up a triggered event* above.

Note: Using the motion detection feature may decrease the camera's overall performance.

How to configure Motion Detection

1. Click **Motion Detection** in the **Event Configuration** menu.

2. Click the **Configure Included Window** radio button.

3. Click **New**.

4. Enter a descriptive name under **Window name**.

5. Adjust the size (drag the bottom right-hand corner) and position (click on the text at the top and drag to the desired position).

6. Adjust the Object size, History and Sensitivity profile sliders (see table below for details). Any detected motion within an active window is then indicated by red peaks in the **Activity** window (the active window has a red frame).

7. Click **Save**.

> To exclude parts of the Include window, click the **Configure Excluded Windows** button and position the Exclude window as required, within the Include window.

Please see the online help ❓ for descriptions of each available option.

	Object Size	**History**	**Sensitivity**
High level	Only very large objects trigger motion detection	An object that appears in the region will trigger the motion detection for a long period	Ordinary colored objects on ordinary backgrounds will trigger the motion detection
Low level	Even very small objects trigger motion detection	An object that appears in the region will trigger motion detection for only a very short period	Only very bright objects on a dark background will trigger motion detection
Default value	Low	Medium to High	Medium to High

Examples:

- Avoid triggering on small objects in the video image by setting the **object size** level to high.
- To trigger motion detection as long as there is activity in the area, select a high **history** level.
- To reduce the number of triggers if there is a lot of movement during a short period of time, select a high history level.
- To only detect flashing light, low **sensitivity** can be selected. In other cases, a high **sensitivity** level is recommended.

Port Status

Under **Event Configuration** > **Port Status** there is a list showing the status for the camera's input and output. This is for the benefit of **Operators**, who have no access to the System Options section.

Example: If the Normal state for a doorbell push button connected to an input is set to **Open circuit** - as long as the button is not pushed, the state is **inactive**. If the doorbell button is pushed, the state of the input changes to **active**.

System Options

Security

User access control is enabled by default. An administrator can set up other users, by giving these user names and passwords. It is also possible to allow anonymous viewer login, which means that anybody may access the Live View page, as described below:

Users - the **user list** displays the authorized users and user groups (levels):

Viewer	Provides the lowest level of access, which only allows access to the Live View page.
Operator	An Operator can view the Live View page, create and modify event types and adjust certain other settings. Operators have no access to the System Options.
Administrator	An administrator has unrestricted access to the Setup Tools and can determine the registration of all other users.

User Settings - check the relevant checkboxes to enable:

- **Anonymous viewer login -** allows any viewer direct access to the Live View page.
- **Maximum number of simultaneous viewers -** enter a value here to restrict the number of Motion JPEG viewers accessing the unit. This is useful if you need to save on bandwidth.

IP Address Filter

The administrator can add up to 256 IP addresses to the **Allowed IP Addresses** list. If the IP address filtering checkbox is checked, only the IP addresses in the list will be allowed access to the camera.

The users from these IP addresses need to be specified in the user list with the appropriate access rights (**User**, **Operator** or **Administrator**).

Referrals - to prevent unauthorized clients from including the video stream from the camera into external Web pages, check the **Referrals** checkbox and enter the IP address or Host name of the computer that hosts the Web pages with the included video stream. Several IP addresses/host names can be defined and are separated by semicolons (;). This option is only applicable to Motion JPEG video streams.

Note: When you are restricting referrals, but also wish to allow normal viewing of the Live View page, the camera's IP address or host name must also be added to the list of allowed referrers.

HTTPS

The AXIS 221 supports encrypted browsing using HTTPS.

A **self-signed certificate** can be used until a Certificate Authority-issued certificate has been obtained. Click the **Create self-signed Certificate** button to install a self-signed certificate. Although self-signed certificates are free and offer some protection, true security will only be implemented after the installation of a signed certificate issued by a certificate authority.

A signed certificate can be obtained from an issuing Certificate Authority by clicking the **Create Certificate Request** button. When the signed certificate is returned, click the **Install signed certificate** button to import the certificate. The properties of any certificate request currently resident in the server or installed can also be viewed by clicking the **Properties**... button. The HTTPS Connection Policy must also be set in the drop-down lists to enable HTTPS on this server.

For more information, please refer to the online help ❷ .

Date & Time

Current Server Time - displays the current date and time (24h clock). The time can be displayed in 12h clock format in the Overlay Images (see below).

New Server Time - Select your time zone from the drop-down list. If you want the AXIS 221 clock to automatically adjust for daylight savings time, select the **Automatically adjust for daylight saving time changes**.

From the **Time Mode** section, select the preferred method to use for setting the time:

- **Synchronize with computer time** - sets the time from the clock on your computer.
- **Synchronize with NTP Server** - the camera will obtain the time from an NTP server every 60 minutes. Specify the **NTP server's** IP address or host name.
- **Set manually** - this option allows you to manually set the time and date.

Note: Note that if using a host name for the NTP server, a DNS server must be configured under TCP/IP settings. See **Network > TCP/IP** below.

Date & Time Format Used in Images - specify the formats for the date and time (12h or 24h) displayed in the Live View video streams.

Use the predefined formats or use your own custom date and time formats. See **Advanced File Naming & Date/Time Formats** in the help files ❷ for information on how to create your own file formats.

Network - Basic TCP/IP Settings

IP Address Configuration

The camera's IP address can be set automatically via DHCP, or a fixed IP address can be set manually. A host name can be used and there are options for setting up notification of changes in the IP address. DHCP is enabled by default.

Note: DHCP is a protocol for automatic IP address assignment on a network. IP address assignment via DHCP may lead to the situation where the IP address changes and you thus lose contact with the unit. To prevent this, configure the **options for notification of IP address change** (under **Services**) to receive notification whenever the IP address for the camera changes.

Alternatively, if your DHCP server can update a **DNS server**, you can access the camera by a host name, which is always the same, regardless of the IP address.

Services

Options for notification of IP address change - if the IP Address for the camera is changed automatically, e.g. by DHCP, you can choose to be notified of the change. Click **Settings**... and enter the required information.

AXIS Internet Dynamic DNS Service - If the camera has been registered with the Axis Internet Dynamic DNS service and the IP address for the product changes, the service is updated to reflect the change. Check the box to enable/disable automatic updates.

The domain name currently registered at the Axis Internet Dynamic DNS service for your product can be removed at any time. To do this click **Settings**... and follow the instructions. For more information, please refer to the online help.

Network - Advanced TCP/IP Settings

DNS Configuration

The Domain Name Service (DNS) provides the translation of host names to IP addresses on your network.

Obtain DNS server address via DHCP - automatically use the DNS server settings provided by the DHCP server. Click the **View** button to see the current settings.

Use the following DNS server address - enter the desired DNS server by specifying the following:

Domain name - enter the domain(s) to search for the host name used by the camera. Multiple domains can be separated by semicolons (;). The host name is always the first part of a Fully Qualified Domain Name, e.g. **myserver** is the host name in the Fully Qualified Domain Name **myserver.mycompany.com** where mycompany.com is the Domain name.

DNS servers - enter the IP addresses of the primary and secondary DNS servers.

Host Name Configuration

The camera can be accessed using a host name instead of an IP address. The host name is usually the same as the assigned DNS Name. It is always the first part of a Fully Qualified Domain Name and is always one word, with no period. For example, **myserver** is the host name in the Fully Qualified Domain Name myserver.mycompany.com.

Enable dynamic DNS updates - The camera includes support for dynamically updating local DNS servers whenever the product's IP address changes. Check this box to enable the function.

> Note that these settings concern the use of local DNS servers and should not be confused with the settings for the Axis Internet Dynamic DNS service.

Register DNS name - The name entered here will be associated with the camera's IP address in the DNS server. An example of a DNS name is Axisproduct.example.com

TTL (Time To Live) - This value determines how long (in seconds) the reply from the DNS server should be remembered by clients when they check that the domain name for the registered IP address is still valid. This reduces the number of times the client needs to query the DNS server, which in turn reduces network usage.

Link-Local Address

Auto-Configure Link-Local Address is enabled by default and assigns the camera an additional IP address for use with the UPnP protocol. The camera can have both a Link-Local IP and a static/DHCP-supplied IP address at the same time - these will not affect each other. See *Network - UPnP,* on page 34.

HTTP

The default HTTP port number **(port 80)** can be changed to any port within the range 1024-65535. This is useful for e.g. simple security port mapping.

Network Traffic

The default setting is **Auto-negotiate** which means that the correct speed is automatically selected. If necessary, the connection speed can be set by selecting it from the drop-down list.

Maximum bandwidth - Specify, in Mbit/s or Kbit/s, the maximum bandwidth that the camera is allowed to use on the network. This is a useful function when connecting the camera to busy or heavily loaded networks. The default setting is **Unlimited**. For more information, please refer to the online help .

Network - SOCKS

SOCKS is a network proxy protocol. The camera can be configured to use a SOCKS server to reach networks on the other side of a firewall/proxy server. This functionality is useful if the camera is located on a local network behind a firewall, but notifications, uploads, alarms, etc., need to be sent to a destination outside the local network (e.g. to the Internet).

Network - SMTP (email)

Enter the host names or addresses for your primary and secondary mail servers in the fields provided, to enable the sending of event and error email messages from the camera to predefined addresses via SMTP.

Network - SNMP

The Simple Network Management Protocol (SNMP) allows the remote management of network devices. Select the version of SNMP to use, depending on the level of security required. HTTPS should be enabled when setting the password for SNMPv3.

Network - UPnP

The camera includes support for UPnP, which is enabled by default. If also enabled on your computer, the camera will automatically be detected and a new icon will be added to "My Network Places."

Note: UPnP must also be enabled on your Windows XP or ME computer. To do this, open the Control Panel from the **Start Menu** and select **Add/Remove Programs**. Select **Add/Remove Windows Components** and open the **Networking Services** section. Click **Details** and then select **UPnP** as the service to add.

Network - RTP (multicast)

Multicast must be enabled for these settings to take effect. The settings are only valid when MPEG-4 is used as the video format. Multicast is automatically configured and should normally not be changed. Enter the IP address and the port number to use for the video stream in the required fields.

Only IP addresses within certain ranges can be used for multicasting. The camera has been pre-configured with an address from these ranges, and this does not normally need to be changed. Please contact your network administrator if you have special requirements.

Notes: •The viewers do not need to know this IP address or port number, only the main IP address or host name used for accessing the camera.

•Setting the video port number to 0 means a random port number will be used.

If IP packets (i.e. data) fail to be delivered to their destination within a reasonable length of time the number entered in the **Time to live** field tells the network routers when to discard the packet. The value is usually measured in 'hops', i.e. the number of network routers that can be passed before the packet arrives at its destination or is dropped.

Ports & Devices

I/O Ports

The two alarm inputs and one output on the AXIS 221 can be connected to various external devices, e.g. door sensors and alarm bells. The name given to the ports can be changed and state of the I/O ports can be set to **Open circuit** or **Closed circuit**.

The pinout, interface support and the control and monitoring functions provided by this connector are described in *The I/O Units Connectors*, on page 43.

COM Port RS232

It is possible to allow the RS-232 port to be controlled by TCP/IP applications. The TCP/IP parameters are described in the online help ❓.

COM Port RS485

The RS-485 port can also be configured to allow it to be controlled by TCP/IP applications. The TCP/IP parameters are described in the online help ❓.

LED Settings

The Status indicator LED on the front of the camera can be set to flash at a configurable interval (or to not light up at all) whenever the unit is accessed. For a listing of all LED behavior, see page 7, or the online help.

Note: The LED does not flash when the stream is retrieved using MPEG-4 multicast.

Maintenance

- **Restart** - The unit is restarted without changing any of the settings. Use this method if the unit is not behaving as expected.
- **Restore** - The unit is restarted and most current settings are reset to the factory default values. The only settings saved are:
  - the boot protocol (DHCP or static)
  - the static IP address
  - the default router
  - the subnet mask
  - the system time
- **Default** - The Default button should be used with caution. Pressing this will return **all** of the camera's settings, including the IP address, to the factory default values. The camera will then have to be re-installed.

Upgrade Server - See *Upgrading the Firmware*, on page 38.

Backup - To take a backup of all of the parameters, and any user-defined scripts, click the **Backup** button. If necessary, it is then possible to return to the previous settings if the settings are changed and there is unexpected behavior.

Restore - click the **Browse** button to locate the saved backup file (see above) and then click the **Restore** button. The settings will be restored to the previous configuration.

Note: **Backup** and **Restore** can only be used on the same unit running the same firmware. This feature is not intended for the configuration of multiple units or for firmware upgrades.

Support

The **support overview** page provides valuable information on troubleshooting and contact information, should you require technical assistance.

Logs & Reports - when contacting Axis support, please be sure to provide a valid Server Report with your query.

View Information - The **Log file**, the **Server Report** and the **Parameter List** all provide valuable information for troubleshooting and when contacting Axis support.

Configuration

Log Level for Log Files - from the drop-down list, select the level of information to be added to the Log file

Log Level for Email - from the drop-down list, select the level of information to send as email and enter the destination email address.

Resetting to the Factory Default Settings

To reset the camera to the original factory default settings, go to the **System Options** > **Maintenance** web page (as described in *Maintenance,* on page 35) or use the **Reset button** at the rear of the camera (see the illustration on page 6) as described below:

Using the Reset Button

To reset the camera to the factory default settings using the Reset Button:

1. Disconnect the power adapter, or the network cable if using PoE.
2. Press and hold the Reset button while reconnecting the power.
3. Keep the Reset button pressed until the **Status Indicator** color changes to amber (this may take up to 15 seconds).
4. Release the Reset button.
5. When the Status Indicator changes to Green (which may take up to 1 minute), the process is complete and the camera has been reset. The unit will now have the default IP address 192.168.0.90

Advanced

Scripting is an advanced function that provides the means for customizing and using scripts.

Caution!

The scripting function is a very powerful tool. Improper use may cause unexpected behavior or even loss of contact with the unit. If a script does cause problems, reset the unit to its factory default settings (in which case, a previously saved backup file will be useful for returning the unit to its latest configuration). **Axis strongly recommends that you do not use this function unless you fully understand the consequences.** Axis support provide no assistance for customized scripts.

For more information, please visit the Developer pages at www.axis.com/developer

Plain Config - this function is for the advanced user with previous experience of configuring Axis cameras. All parameters can be set and modified from this page, including the audio encoding format. Help is available via the links on the standard setup pages.

Troubleshooting

Checking the Firmware

One of your first actions when troubleshooting a problem should be to check the currently installed firmware version. The latest version may contain a correction that fixes your particular problem. The current firmware version in your camera can be seen on the page **Setup > Basic Configuration**.

Upgrading the Firmware

Firmware is software that determines the functionality of the camera. When you upgrade the firmware with a file from the Axis Web site, your Axis camera will receive the latest available functionality. Always read the upgrade instructions and release notes available with each new release, before updating the firmware.

Note: Preconfigured and customized settings will be saved when the firmware is upgraded (providing the features are available in the new firmware) although this is not guaranteed by Axis Communications. Always read the instructions and release notes available with each new release, before upgrading the firmware.

1. Save the firmware file to your computer. The latest version of the firmware is available free of charge from the Axis Web site at **www.axis.com/techsup**

2. Go to **Setup > System Options > Maintenance** in the camera's Web pages.

3. In the **Upgrade Server** section, browse to the desired firmware file on your computer. Click **Upgrade**.

Upgrade Server

Upgrade the AXIS 221 Network Camera with the latest firmware.

Specify the firmware to upgrade to: [   ] Browse... and click [Upgrade]

Note: Do not disconnect power to the unit during the upgrade. The unit restarts automatically after the upgrade has completed. (1-10 minutes.)

Notes: •After starting the upgrade process, always wait at least 5-10 minutes before restarting the camera, even if you suspect the upgrade has failed.

•Your dealer reserves the right to charge for any repair attributable to faulty upgrading by the user.

Emergency Recovery Procedure

If power or the network connection to the camera is lost during the upgrade, the process will fail and the unit will become unresponsive. A flashing red Status LED indicates a failed upgrade. To recover the unit, follow the steps below. The serial number is found on the label attached to the bottom of the camera.

1. **Unix/Linux** - From the command line, type the following:
   arp -s <IP address of camera> <Serial number> temp
   ping -s 408 <IP address of camera>

   Windows - From a command/DOS prompt, type the following:
   arp -s <IP address of camera> <Serial number>
   ping -l 408 -t <IP address of camera>

2. If the unit does not reply within a few seconds, restart it and wait for a reply. Press CTRL+C to stop Ping.

3. Open a browser and type in the camera's IP address. In the page that appears, use the **Browse** button to select the upgrade file to use, e.g. axis221.bin. Then click the Load button to restart the upgrade process.

4. After the upgrade has completed (1-10 minutes), the unit will automatically restart and show a steady green on the Power and Status LEDs and flashing green or amber on the Network LED.

5. Reinstall the camera starting.

If the emergency recovery procedure does not get the camera up and running again, please contact Axis support at www.axis.com/techsup/

Axis Support

If you contact Axis support, please help us to help you solve your problems, by providing the server report, the log file and a brief description of the problem.

Server Report - go to **Setup** > **System Options** > **Support Overview**. The server report contains important information about the server and its software, as well as a list of the current parameters.

The **Log file** is available from **Setup** > **System Options** > **Logs & Reports**. The Log file records events in the unit since the last system restart and can be a useful diagnostic tool when troubleshooting.

Symptoms, Possible Causes and Remedial Actions

Problems setting the IP address

When using ARP/Ping.	Try the installation again. The IP address must be set within two minutes after power has been applied to the camera. Ensure the Ping length is set to 408.
The camera is located on a different subnet.	If the IP address intended for the camera and the IP address of your computer are located on different subnets, you will not be able to set the IP address. Contact your network administrator to obtain an appropriate IP address.
The IP address is being used by another device.	Disconnect the camera from the network. Run the Ping command. (In a Command/DOS window, type **ping** and the **IP address** of the unit).
	If you receive: **Reply from <IP address>: bytes = 32; time = 10 ms.....** - this means that the IP address may already be in use by another device on your network. You must obtain a new IP address and reinstall the unit.
	If you see: **Request timed out** - this means that the IP address is available for use with your camera. In this case, check all cabling and reinstall the unit.
Possible IP address conflict with another device on the same subnet.	The static IP address in the camera is used before the DHCP server sets a a dynamic address. This means that if the same default static IP address is also used by another device, there may be problems accessing the camera. To avoid this, set the static IP address to 0.0.0.0.

The camera cannot be accessed from a Web browser

The IP address has been changed by DHCP.	1) Move the camera to an isolated network, or to one with no DHCP or BOOTP server. Set the IP address again, using the AXIS IP Utility (see the Installation Guide) or the ARP/Ping commands. 2) Access the unit and disable DHCP in the TCP/IP settings. Return the unit to the main network. The unit now has a fixed IP address that will not change. 3) As an alternative to 2), if dynamic IP address via DHCP or BOOTP is required, select the required service and then configure IP address change notification from the network settings. Return the unit to the main network. The unit will now have a dynamic IP address, but will notify you if the address changes.
Proxy server.	If using a proxy server, try disabling the proxy setting in your browser.
Other networking problems.	Test the network cable and connectors by connecting it to another network device, then Ping that device from your workstation. See the instructions above.
Incorrect protocol.	When HTTPS is enabled, ensure that the correct protocol (HTTP or HTTPS) is used when attempting to log in. You may need to manually type in http or https in the browser's address bar.
Host name.	Check that the host name and DNS server settings are correct. See the basic and advanced TCP/IP settings.

Cannot send notifications, uploads, alarms, etc, to a destination outside the local network

Firewall protection.	The camera can be configured to use a SOCKS server to reach networks on the other side of a firewall/proxy server.

Your camera is accessible locally, but not externally

Firewall protection.	Check the Internet firewall with your system administrator.
Default routers required.	Check if you need to configure the default router settings.

Poor or intermittent network connection.

Network switch.	If using a network switch, check that the port on that device uses the same setting for the network connection type (speed/duplex) as set in the advanced TCP/IP settings.
	The Auto-Negotiate setting is recommended.

MPEG-4 multicast is not displayed on the client

Multicast not enabled.	Check the network RTP settings, see *Network - RTP (multicast)*, on page 34.
Connection method not enabled.	Check that the relevant MPEG-4 connection methods are enabled in the AMC control panel applet (network tab).

Wrong multicast address.	Check with your network administrator what addresses are allowed.
Minimum client requirements not fulfilled.	Check the client computer specifications, see the Installation Guide.
Wrong network interface on client.	Check that correct network interface is selected in the AMC control panel applet (network tab).
AXIS provided MPEG-4 decoder is not used.	In the AMC control panel applet, select the MPEG-4 tab and press the button Set to default MPEG-4 decoder.
Firewall protection.	Check the Internet firewall with your system administrator.
Only accessible by local clients.	Check if your router supports multicast or if you need to configure the settings of the routers between the client and the server. It might be necessary to increase the TTL (time to live, see *Network - RTP (multicast)*, on page 34.

The test image does not display as expected.

Image settings.	Not all settings have an effect on the test image. For more information, see the help on Image Settings.

Poor rendering of MPEG-4 images

Wrong color depth enabled in client.	Check that 16 or 32-bit color depth is chosen in the client.
Blurry text overlay image or other problem with rendering.	Advanced Video Rendering may need to be enabled. Change this setting on the AMC control panel applet, MPEG-4 tab.
Graphics card driver.	Check that the driver used is the latest available.
Color saturation is different in MPEG-4 and Motion JPEG.	Modify the settings for your graphics adapter. Please see the adapter's documentation for more information.

The Power indicator is not constantly lit

Faulty power supply.	Check that you are using an AXIS PS-K power supply.

The Status and Network indicator LEDs are flashing red rapidly

Hardware failure.	Contact your Axis dealer.

The Status indicator LED is flashing red and the camera is inaccessible

A firmware upgrade has been interrupted or the firmware has otherwise been damaged.	See the *Emergency Recovery Procedure* above.

No images displayed on web page

Problem with AMC. (*Internet Explorer only*)	To enable the updating of video images in Microsoft Internet Explorer, set your browser to allow ActiveX controls. Also, make sure that AXIS Media Control (AMC) component is installed on your workstation.
Installation of additional ActiveX component restricted or prohibited.	Configure your camera to use a Java applet for updating the video images under Live View Config > Layout > Default Viewer for Internet Explorer. See the online help for more information.

Video/Image problems, general

Image too dark or too light.	Check the video image settings. See the online help on Video and Image Settings.
Missing images in uploads.	This can occur when trying to use a larger image buffer than is actually available. Try lowering the frame rate or the upload period.
Slow image update.	Configuring, e.g. pre-buffers, motion detection, high-resolution images, high frame rates, etc, will reduce the performance of the camera.
Poor performance.	Poor performance may be caused by e.g. heavy network traffic, multiple users accessing the unit, low performance clients, use of features such as Motion Detection, Event handling, Image rotation other than 180 degrees.
Image gradually gets darker or lighter.	When using the camera in locations lit by fluorescent lighting, check in the advanced image settings that the Exposure control is set to Flicker-free.
Color saturation discrepancy between Motion JPEG and MPEG-4.	Modify the settings on your graphics card.

Image loses focus often.	Disable the DC-Iris lens in the settings for **Video & Image** > **Advanced**. Focus the camera following the instructions on page 9, and then enable the DC-Iris lens.
Images only shown in black & white.	Check the color level setting.
	Check the setting for the IR cut filter. Images are shown in color only when this filter is enabled, i.e. when set to yes or auto.
Blurred images.	Refocus the camera. Check in the Video & Image > Advanced - Camera Settings that DC-Iris is set to Enabled. If the images are still blurred adjust the metal ring until the image is sharp, see *Removing and Attaching Lens,* on page 47.
Rolling dark bands or flickering in image.	Try adjusting the Flicker-free exposure setting under advanced image settings. Note that the 'Hold Current'/Manual setting may cause unwanted effects.

Lower frame rate than expected when viewing MPEG-4

CPU usage too large.	Reduce number of applications running on the client computer.
Not enough bandwidth available.	Check with system administrator. Adjust settings of MPEG-4 profile, see *Advanced Settings,* on page 17.
Only decoding I-frames.	Check settings in AMC control panel applet, MPEG-4 tab.
Large images.	Select lower imager resolution.
Too many event types.	Using multiple event types that use video streams (e.g. upload events, motion detection) will cause a drop in the frame rate seen in Live View.

Image degenerating when viewing MPEG-4

GOV length too long.	Decrease the GOV length, see *Advanced Settings*, on page 17.

Poor quality snapshot images

Screen incorrectly configured on your workstation.	In Display Properties, configure your screen to show at least 65000 colors, i.e. at least 16-bit. Using only 16 or 256 colors will produce dithering artifacts in the image.

Browser freezes

Netscape 7.x or Mozilla 1.4 (or later) can sometimes freeze on a slow computer.	Lower the image resolution.

Problems uploading files

Limited space.	There is only limited space available for the upload of your own files. Try deleting one or more existing files, to free up space.
Missing images in uploads.	This can occur when trying to use a larger image buffer than is actually available. Try lowering the frame rate or the upload period.

Overlay is not displayed

Incorrect size or location of overlay.	The overlay may have been positioned incorrectly. Refer to the online help for information on the limitations when using image overlays and privacy masks.

Motion Detection triggers unexpectedly

Changes in luminance.	Motion detection is based upon changes in luminance in the image. This means that if there are sudden changes in the lighting, motion detection may be mistakenly triggered. Lower the sensitivity setting to avoid problems with luminance.

For additional assistance, please contact your reseller or see the support pages on the Axis Website at www.axis.com/techsup

The I/O Units Connectors
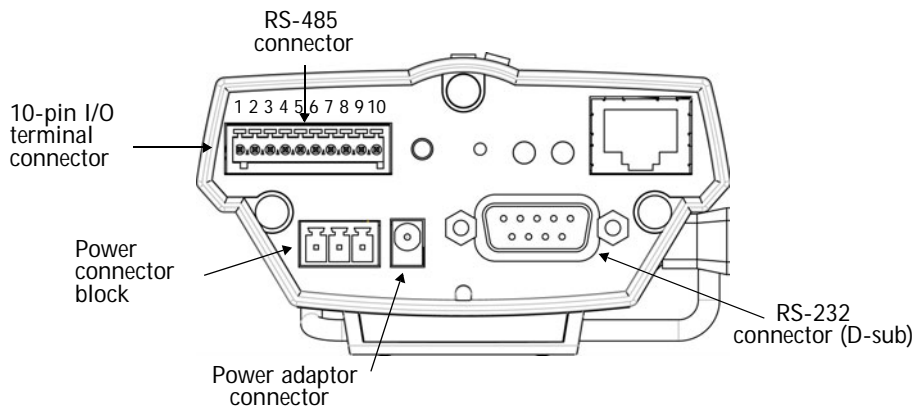
I/O Terminal Connector

Pinout and Interface

The 10-pin I/O terminal connector provides the interface to a solid state relay output, two digital photo-coupled inputs, RS-485, GND and auxiliary power.

The terminal connector is used in applications for e.g. motion detection, event triggering, time lapse recording, alarm notification via email, image storage to FTP locations, etc.

- **Input** - used for connecting external alarm devices and triggering images for specific alarm-based events. The input is typically connected to a motion detector or any other external security device, and images can be uploaded whenever the detector is activated. Maximum 18V DC is allowed on the input.

- **Output** - can drive a maximum load of 50V DC at 100mA directly or heavier loads by connecting additional relay circuitry. If the output is used with an external relay, a diode must be connected in parallel with the load for protection against any voltage transients.

Caution!
Connecting AC to the inputs/outputs will damage the unit.

Pin	Function	Description
1	Output A	The external device output terminals (A and B) there is no distinction between + and -. The terminals use a photocoupler and are electrically isolated from the other internal circuitry.
2	Output B	
		The maximum load should not exceed 100mA and the maximum voltage should be no higher than 50V DC. Note: Connecting AC to the output will damage the unit.
3	Digital Input 1- Photocoupler Anode (+)	Photocoupled Input 1: Electrically isolated from the chassis and connectors, this input can be supplied from an external DC voltage or the DC Power Input/Output on pins 9 (DC+) and 10 (GND).
4	Digital Input 1- Photocoupler Cathode (-)	
5	Digital Input 2- Photocoupler Anode (+)	Photocoupled Input 2. As above.
6	Digital Input 2- Photocoupler Cathode (-)	
7	RS-485 - A (non-inverting)	A half-duplex RS-485 interface for controlling auxiliary equipment.
8	RS-485 - B (inverting)	
9	DC + Power Output	DC Power Output: It can drive the photo coupler inputs or other equipment. The output voltage level is 3.0 V. A maximum current of 100mA can be sourced from the DC output.
10	GND	Ground.

Schematic Diagram - Terminal Connectors
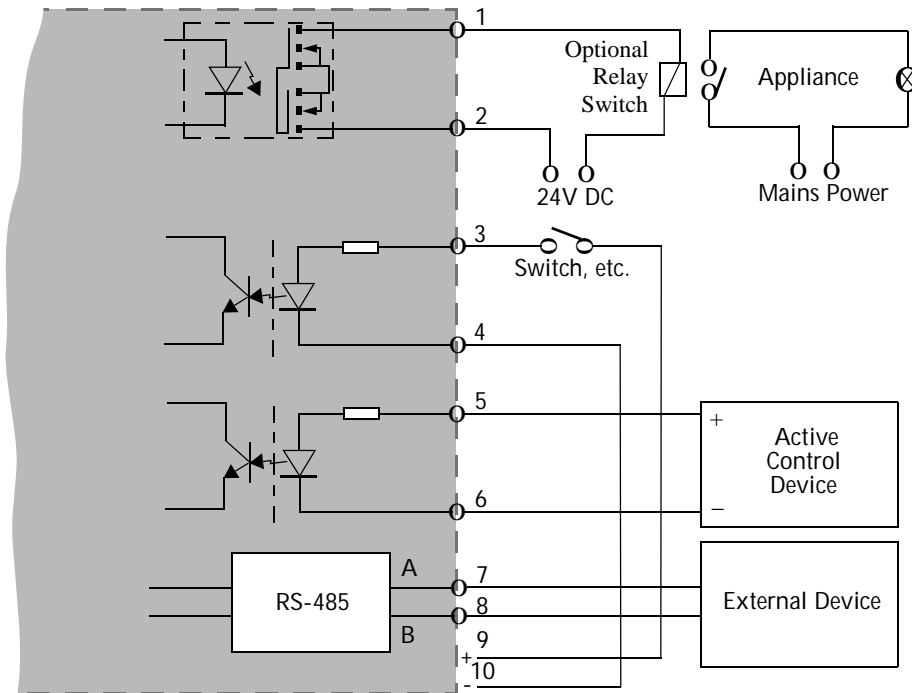
Example schematic diagram of the AXIS 221 Terminal Block Connector - showing possible applications.

Power

Power can be supplied to the camera through the following methods:

- the supplied power adaptor, PS-K, 9W. The center pin is positive (+).
- PoE (Power over Ethernet) with power classification, Class 2 via the network cable. This will automatically be detected if available via the network.
- the power connector block on the rear panel.
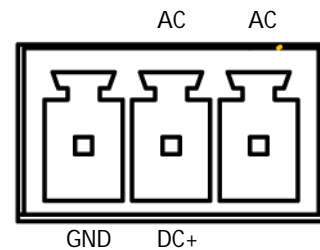
Power Connector Block

The power connector block can handle both AC and DC input power.

The DC supply is 7-24V, DC. Connect the negative pole to the GND pin and the positive pole to the DC+ pin.

The AC supply is 10-24V, AC. Connect the AC poles to the AC pins.

A diagram of the power connector block, complete with pin assignment table, is shown below.

| Pin	Function
GND	Ground/DC-
AC/DC+	AC and DC+, power input for mains power to unit
AC	AC power input for mains power to unit

Schematic Diagram - Power Terminal Block and Power Connectors
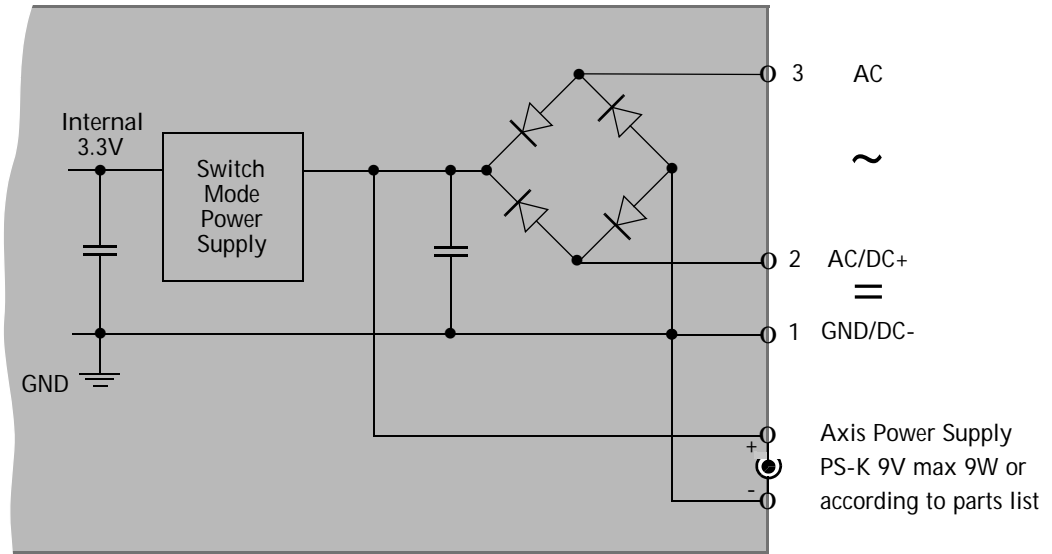
The D-Sub Connector

The AXIS 221 provides one 9-pin D-sub connector, providing the physical interface for an RS-232 port, used for connecting accessory equipment.

A diagram of the RS-232 connector, complete with pin assignment table, is shown below.

Pin	Function
1	CD
2	- RXD
3	- TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI
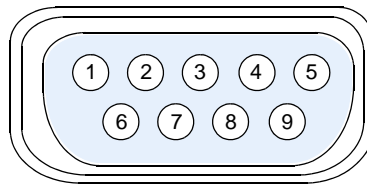
Replacing the Lens

If the lens on the AXIS 221 needs to be replaced or if the camera is sold without a lens, a new lens can be fitted quickly and easily. Since the AXIS 221 is designed with a CS-mount, the lens supplied with your product can be replaced with any standard C or CS lens.

Note: Although the lens supplied with your product can be directly replaced with any CS-type lens, a C-type lens must be installed with an adaptor for it to work with your AXIS 221. An adaptor effectively moves the lens 5mm farther from the camera.

Removing and Attaching Lens

1. Disconnect the power supply to the AXIS 221.

   2. Disconnect the DC-Iris cable.

   3. Unscrew the lens by turning it anti-clockwise.

   4. Screw on the new lens until it is tight against the metal ring at the back.

   5. Attach the DC-Iris cable to the camera and reconnect the power supply.

   6. To focus the new lens, see *Focusing,* on page 9.

Metal ring

Zoom puller (Tele/wide)

Focus puller

DC-Iris control cable
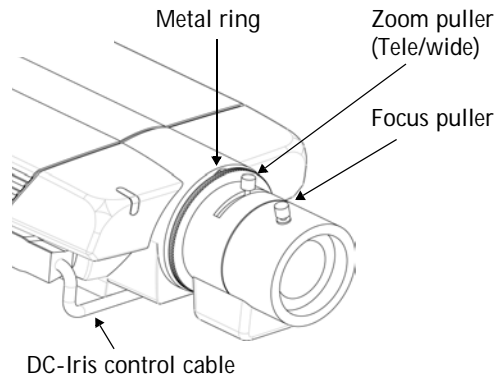
Note: In the unlikely case that the camera images are still blurred after focusing the lens, loosen the screw on the underside of the camera that holds the metal ring in place. Turn the metal ring in small increments until a sharp image is obtained. Tighten the screw on the underside of the camera.

Technical Specifications

Item	Specification	
Image sensor	1/3" Sony Wfine progressive scan RGB CCD	
Lens	Pentax TS3V310ED, F1.0 varifocal 3.0 - 8.0 mm, DC-iris, horizontal viewing angle: 35º-93º, focus range: 0.3 m to infinity. Note that the AXIS 221 is also available without a lens	
Lens Mount	CS	
Minimum illumination	Color: 0.65 lux, F1.0	IR mode: not measurable
Video compression	Motion JPEG Snapshot JPEG images available Eleven user-controlled compression levels	MPEG-4 Part 2 (ISO/IEC 14496-2) Profiles: ASP
Resolutions	640x480, 480x360, 320x240, 240x180, 160x120. Note that further resolutions may be available via the AXIS HTTP API. Scalable also to PAL/NTSC formats over HTTP API. For more information, please see www.axis.com/techsup	
Frame rate	Up to 45 frames per second in all resolutions Up to 60 frames per second in 480x360 or lower	
Video streaming	Simultaneous Motion JPEG and MPEG-4 Controllable frame rate and bandwidth Variable bit rate (MPEG-4)	
Image settings	Compression levels: 11 (Motion JPEG)/23 (MPEG-4) Rotation: 90º, 180º, 270º Configurable color level, brightness, sharpness, contrast, white balance, exposure control, exposure area, backlight compensation, fine tuning of behavior at low light Overlay capabilities: time, date, text, privacy mask, custom logo or image	
Shutter time	2 sec to 1/25000 sec	
Security	Multiple user access levels with password protection IP address filtering HTTPS encryption	
Users	20 simultaneous users Unlimited number of users using multicast (MPEG-4)	
Alarm and event management	Built-in multi-window motion detection, external I/O, triggered and scheduled events with several notification options, pre- and post alarm buffer 9 MB (approx 5 min of 320 x 240 video at 4 frames per sec)	
Connectors	Ethernet 10BaseT/100BaseTX, RJ-45 Terminal block for 2 digital photocouple inputs (max 18V DC) and 1 solid state relay output (max 50V, 100mA), RS-485/422 half duplex port and alternative power supply D-sub for RS-232 port	
Processors and memory	ARTPEC-2 compression chip ETRAX-100 LX (32-bit RISC, 100MIPS CPU)	32 MByte RAM 8 MByte FLASH
Watchdog	Watchdog with automatic unit or process reboot Can be monitored by other systems via digital output	

Item	Specification
Power	7-24 V DC, max 5.5 W (without I/O) 10-24 V AC, max 7.5 VA (without I/O) Power over Ethernet (IEEE 802.af) with power classification according to Class 2 (3.84 to 6.49W) connection via RJ-45 network cable
Operating conditions	5 - 50 ºC (41 – 122 ºF), humidity 20 - 80% RH
Temperature warning	Warning issued when temperature is below or above operating conditions (see above)
Management and maintenance	Support for configuration backup and restore Support for firmware upgrades over HTTP or FTP, firmware available at www.axis.com
Video access from web browser	Camera live view, sequence tour capability for up to 20 Axis cameras, customizable HTML pages
System requirements	Pentium III CPU 500 MHz or higher, or equivalent AMD, 128 MB RAM AGP graphic card, Direct Draw, 32 MB RAM DirectX 9.0 or later
Supported Operating Systems	Windows (XP, 2000) Linux, Mac OS X.
Supported Web Browsers	For Windows - Internet Explorer 5.x or later, Mozilla 1.4* or later. For Linux - Mozilla 1.4* or later. For Mac OSX - Mozilla 1.4* or later, Netscape 7.1* or later. * = limited functionality
Required protocol	Standard TCP/IP protocol suite
Supported protocols	HTTP, HTTPS, SSL/TLS*, SNMP-v1-2c-3 MIB-II, RTP, NTP, BOOTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS v.4.0/v.5.0. More information on protocol usage available at www.axis.com *This product includes software developed by the Open SSL Project for use in the Open SSL Tool kit (http://www.openssl.org/)
Complimentary software	AXIS Media Control (AMC) - ActiveX component software required for Microsoft Internet Explorer - installed automatically on first use Optional: AXIS IP Utility - for installation in Windows.
Available applications (not incl.)	AXIS Camera Station - Surveillance application for viewing, recording and archiving up to 25 cameras AXIS Camera Recorder - Surveillance application for viewing and recording up to 16 cameras AXIS Camera Explorer – Basic software for viewing and manual recording See www.axis.com/partner/adp_partners.htm for more software applications via partners
Included accessories	Power supply 9 V DC, stand, connector kit, Installation Guide, CD-ROM with installation tool, software, User's Manual, MPEG-4 licenses (1 encoder, 1 decoder), MPEG-4 decoder (Windows)
Available accessories (not incl.)	IP65-rated outdoor housings for installation outdoors or in adverse indoor environments Power over Ethernet midspans AXIS 292 Network Video Decoder AXIS MPEG-4 Decoder 10 user license pack

Item	Specification
Approvals	EMC: EN55024:1998 + A1 + A2 EN61000-6-1:2001 EN61000-6-2:2001 EN55022: 1998 + A1 Class B EN61000-3-2:2000 EN61000-3-3:1995 + A1 FCC Part 15 Subpart B Class B by compliance with EN55022:1998 Class B VCCI:2003 Class B ITE C-tick AS/NZS 3548 Canadian ICES-003 B by compliance with EN55022:1998 Class B
Approvals - Safety	EN60950 UL CSA
MTBF	100,000 hours
Dimensions (HxWxD) and weight	49 x 88 x 186 mm ($1^{15}/_{16}$" x $3^{15}/_{32}$" x $7^{5}/_{16}$") 550 g ($19^{13}/_{32}$ oz) excl. power supply

Glossary of Terms

ActiveX - A control (or set of rules) used by a browser. ActiveX controls are often downloaded and installed automatically as required.

ADPCM - Adaptive Differential Pulse Code Modulation. Predicts the analog signal digitally and the difference is coded.

AMC - AXIS Media Control. The control required for viewing video images in Internet Explorer. Installs automatically on first use.

API - Application Programming Interface. The Axis API can be used for integrating Axis products into other applications.

ARP - Address Resolution Protocol. A protocol used to associate an IP address to a hardware MAC address. A request is broadcast on the local network to find out what the MAC address is for the IP address.

ARTPEC - Axis Real Time Picture Encoder - used for video image compression.

CCD - Charge Coupled Device. CCD is one of the two main types of image sensors used in digital cameras. When a picture is taken, the CCD is struck by light coming through the camera's lens. Each of the thousands or millions of tiny pixels that make up the CCD convert this light into electrons.

CGI - Common Gateway Interface. A set of rules (or a program) that allows a Web Server to communicate with other programs.

Client/Server - Describes the network relationship between two computer programs in which one, the client, makes a service request from another - the server.

DC-Iris - This special type of iris is electrically controlled by the Axis camera, to automatically regulate the amount of light allowed to enter.

DNS - The Domain Name System (DNS) locates and translates Internet domain names into IP (Internet Protocol) addresses.

Ethernet - A widely used networking standard.

ETRAX - Axis' own microprocessor.

Firewall - A virtual barrier between a LAN (Local Area Network) and other networks, e.g. the Internet.

FTP - File Transfer Protocol. Used for the simple transfer of files to and from an FTP-server.

HTML - Hypertext Mark-up Language. Used widely for authoring documents viewed in web browsers.

HTTP - Hypertext Transfer Protocol. The set of rules for exchanging files (text, images, sound, video, and other files) on the World Wide Web.

HTTPS - Hypertext Transfer Protocol over Secure Socket Layer. A web protocol that provides encryption for page requests from users and for the pages returned by the web server.

Intranet - A private network limited to an organization or corporation. Usually closed to external traffic.

IP - Internet-Protocol. See TCP/IP.

IP address - A unique number used by a network device, to allow it to be identified and found on the network. The 32-bit IP address is made up of four groups (or quads) of decimal digits separated by periods. An example of an IP address is: 192.168.0.1

ISMA - Internet Streaming Media Alliance

JPEG - A standard image format, used widely for photographs. Also known as JPG.

LAN - A local area network (LAN) is a group of computers and associated devices that typically share common resources within a limited geographical area.

Linux - A popular operating system, which is "open source" and practically free of charge.

Lux - A standard unit for the measurement of light, where 1 Lux equals the light emitted from a single candle at a distance of one meter.

Mbit/s - Megabits per second. A unit for measuring speeds in networks. A LAN might run at 10 or 100 Mbit/s.

MPEG-4 - A video compression standard that makes good use of bandwidth, and which can provide DVD-quality video streams at less than 1 Mbit/s.

Multicast - A bandwidth-conserving technology that reduces bandwidth usage by simultaneously delivering a single stream of information to multiple network recipients.

NTSC - National Television Standards Committee. NTSC is the standard format used for televisions in most of North and Central America, and Japan.

NWAY - A network protocol that automatically negotiates the highest possible common transmission speed between two devices.

PAL - Phase Altering Line. PAL is the standard format used for televisions in most of the world (other than the US, Canada, and Japan).

PCM - Pulse Code Modulation. Analog signal converted directly to a digital.

Ping - A small utility used for sending data packets to network resources to check that they are working and that the network is intact.

Pre/post alarm image - The images from immediately before and after an alarm.

Privacy mask - An image or specified area used to block out certain parts of the video image.

Protocol - A special set of rules governing how two entities will communicate. Protocols are found at many levels of communication, and there are hardware protocols and software protocols.

Router - A device that determines the next network point to which a packet should be forwarded on its way to its final destination. A router is often included as part of a network switch (see below).

RTP - Real-Time Transfer Protocol. A transfer protocol designed for delivery of live contents, e.g. MPEG-4.

SMTP - A common e-mail protocol.

SNMP - Simple Network Management Protocol. An application layer protocol that facilitates the exchange of management information between network devices. It is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.

Subnet Mask - An IP address consists of two components: the network address and the host address. "Subnetting' enables a network administrator to further divide the host part of the address into two or more subnets. The subnet mask identifies the subnet to which an IP address belongs.

Switch - Whilst a simple hub transmits all data to all devices connected to it, a switch only transmits the data to the device it is specifically intended for.

TCP/IP - Transmission Control Protocol/Internet Protocol. A suite of network protocols that determine how data is transmitted. TCP/IP is used on many networks, including the Internet. TCP keeps track of the individual packets of information and IP contains the rules for how the packets are actually sent and received.

Unicast - Communication that takes place over a network between a single sender and a single receiver.

UPnP[TM] - An "address" on the network. UPnP is an architecture for pervasive peer-to-peer network connectivity of intelligent appliances, wireless devices, and PCs of all form factors.

URL - Uniform Resource Locator. An "address" on the network.

Varifocal - A varifocal lens provides a wide range of focal lengths, as opposed to a lens with a fixed focal length, which only provides one.

WAN - Wide-Area-Network. Similar to a LAN, but on a larger geographical scale.

Web server - A program on a computer (server) providing the resources (e.g. web pages) requested by the user (client).

Index