



Configuration

This chapter describes the IP camera settings options. It includes the following topics

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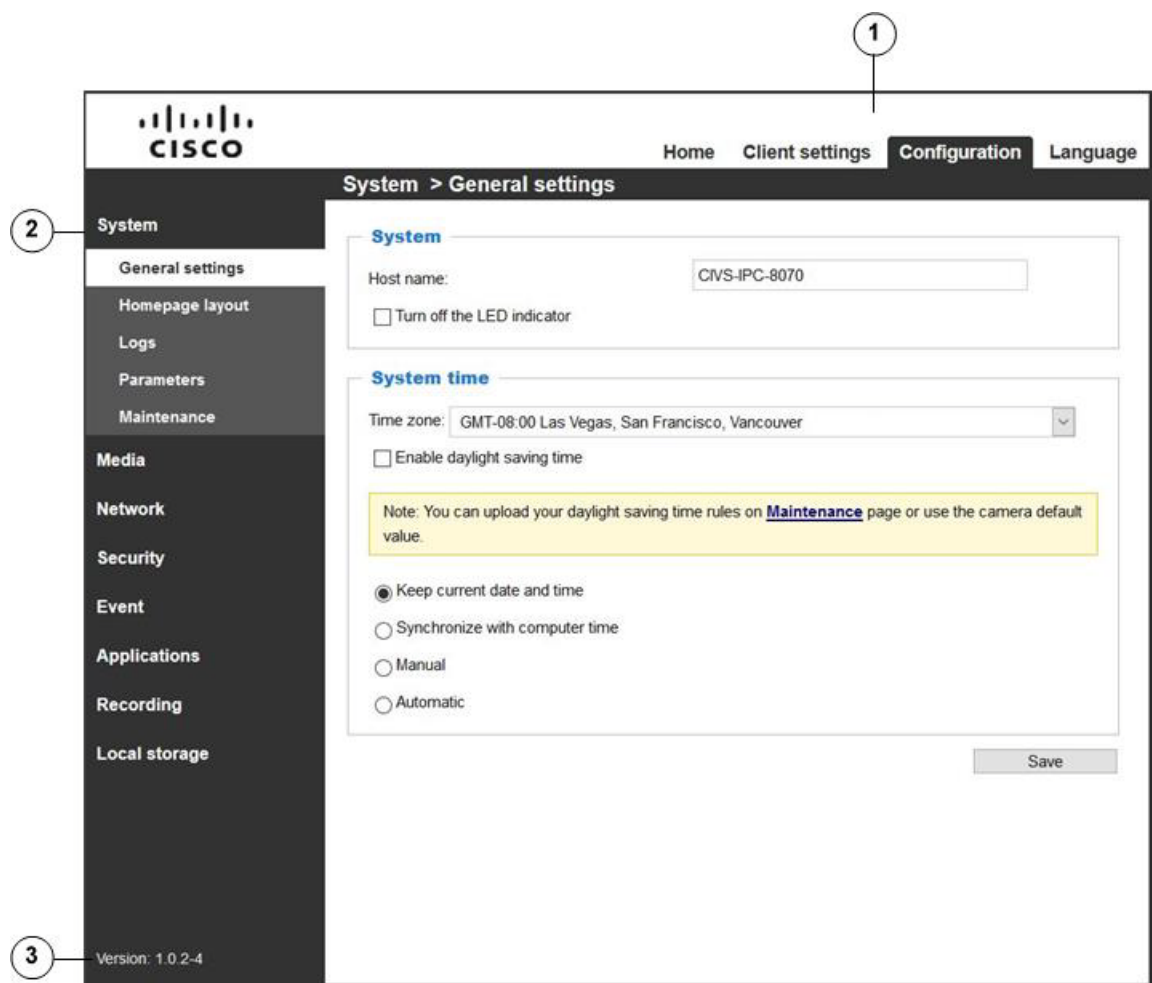
Accessing the Settings Pages

To access the settings pages, click **Configuration** on the main page. Only Administrators can access the configuration page.

The camera provides an easy-to-use user interface that helps you set up the camera with minimal effort. In order to simplify the user interface, detailed information will be hidden unless you click on the function item. When you click on the first sub-item, the detailed information for the first sub-item will be displayed; when you click on the second sub-item, the detailed information for the second sub-item will be displayed and that of the first sub-item will be hidden.

Figure 5-1 illustrates the configuration main page.

Figure 5-1 Configuration Main Page



1	Navigation area—Provides access to all different views from the Home page (for live viewing), Configuration page, and multi-language selection
2	Configuration list—Provides access to configuration pages
3	Firmware version

Each function on the configuration list will be explained in the following sections.

The Navigation Area provides access to all different views from the Home page (for live viewing), Configuration page, and multi-language selection.

System > General settings

This section explains how to configure the basic settings for the camera, such as the host name and system time. It is composed of the following two columns: System, and System Time. When finished with the settings on this page, click **Save** at the bottom of the page to enable the settings.

- Host name—Enter a desired name for the camera. The text will be displayed at the top of the main page.
- Turn off the LED indicator—Click to disable the onboard LEDs.
- Time Zone—Select the appropriate time zone from the list. If you want to upload Daylight Saving Time rules, please see the [“Import/Export files” section on page 5-7](#).
- Enable daylight saving time—Select this options to cause the time of the camera to adjust automatically for the start and end of daylight saving time.
- Keep current date and time—Select this option to preserve the current date and time of the camera. The camera internal real-time clock maintains the date and time even when the power of the system is turned off.
- Synchronize with computer time—Select this option to synchronize the date and time of the camera with the local computer. The read-only date and time of the PC is displayed as updated.
- Manual—You can enter the date and time manually. The date and time format are [yyyy/mm/dd] and [hh:mm:ss].
- Automatic—The Network Time Protocol is a protocol that synchronizes computer clocks by periodically querying an NTP server.
 - NTP server—Assign the IP address or domain name of the time-server. Leaving the text box blank connects the camera to the default time servers.
 - Updating interval—Select to update the time using the NTP server on an hourly, daily, weekly, or monthly basis.

System > Homepage layout

This section explains how to set up your own customized homepage layout.

General settings

This column shows the settings of your home page layout. You can manually select the background and font colors in Theme Options (the second tab on this page). The settings will be displayed automatically in this Preview field.

- Logo graph—Here you can change the logo that is placed at the top of your homepage. To to upload a new logo, follow these steps:
 1. Click **Custom** and the Browse field will appear.
 2. Select a logo from your files.

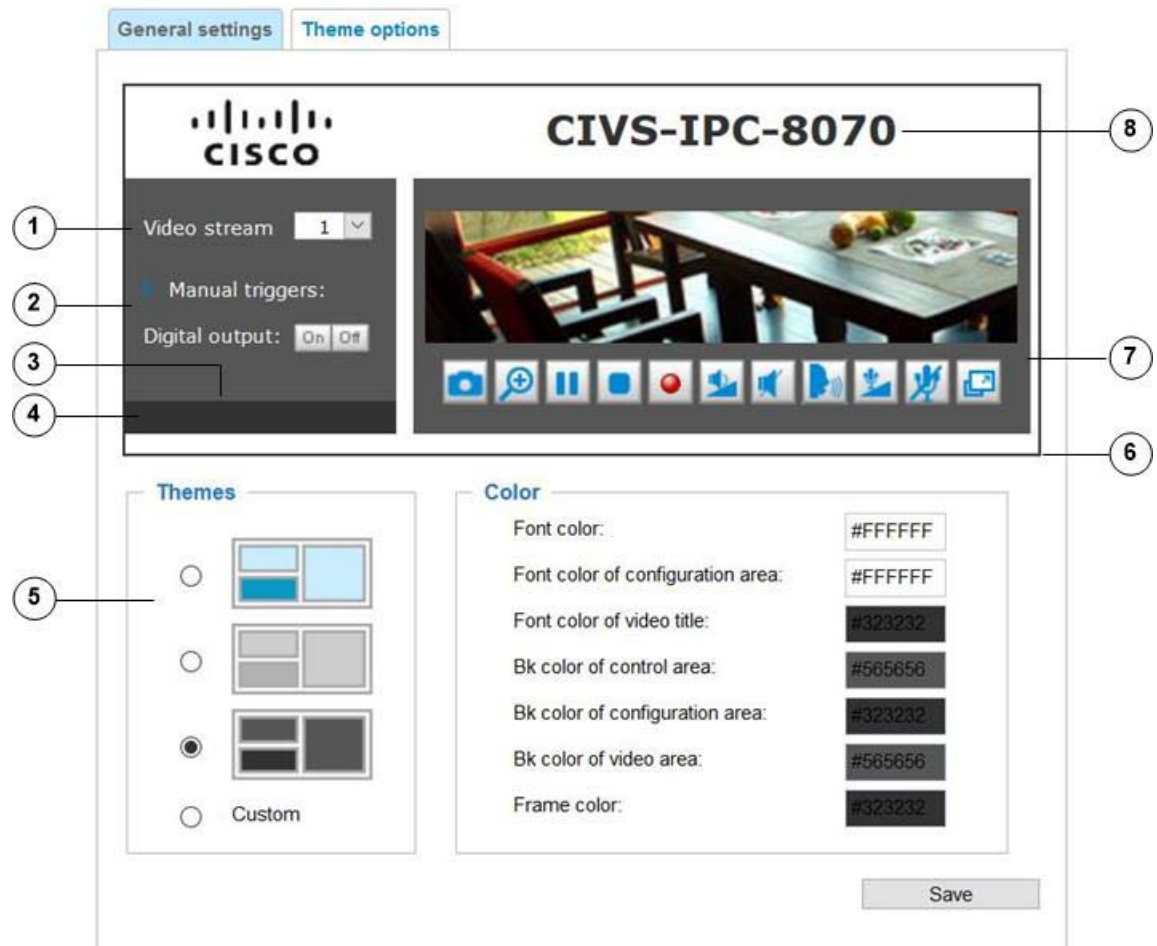
3. Click **Upload** to replace the existing logo with a new one.
 4. Enter a website link if necessary.
 5. Click **Save** to enable the settings.
- Customized button—If you want to hide manual trigger buttons on the homepage, uncheck this item. This item is checked by default.

Theme Options

Here you can change the color of your homepage layout. There are three types of preset patterns for you to choose from. The new layout will simultaneously appear in the Preview filed. Click **Save** to enable the settings.

Figure 5-2 illustrates theme options.

Figure 5-2 Theme Options



1	Font color.
2	Background color of the control area.

3	Font color of the configuration area.
4	Background color of the configuration area.
5	Preset patterns.
6	Frame color.
7	Background color of the video area.
8	Font color of the video title.

To set up the custom home page, follow these steps:

-
- Step 1** Click **Custom** on the left column.
 - Step 2** Click the field where you want to change the color on the right column.
The palette window will pop up.
 - Step 3** Drag the slider bar and click on the left square to select a desired color.
The selected color will be displayed in the corresponding fields and in the Preview column.
 - Step 4** Click **Save** to enable the settings.
-

System > Logs

This section explains how to configure the camera to send the system log to a remote server as backup.

Log server settings

To set up the remote log, follow these steps:

-
- Step 1** Select **Enable remote log**.
 - Step 2** In the IP address text box, enter the IP address of the remote server.
 - Step 3** In the port text box, enter the port number of the remote server.
 - Step 4** When completed, click **Save** to enable the setting.
-

You can configure the camera to send the system log file to a remote server as a log backup. Before utilizing this feature, we suggest that you install a log-recording tool to receive system log messages from the camera. An example is Kiwi Syslog Daemon.

System log

The system log displays the system log in a chronological order. The system log is stored in the camera buffer and dated events will be overwritten when the number of events reaches a limit.

Access log

Access log displays the access time and IP address of all viewers (including operators and administrators) in a chronological order. The access log is stored in the camera buffer area and will be overwritten when the number of events reaches a limit.

System > Parameters

The View Parameters page lists the entire system parameters. If you need technical assistance, use a text-editor program to copy and save the parameters listed on this page. This text file can be provided to your Cisco support representative.

System > Maintenance

This section explains how to restore the camera to factory default, upgrade firmware version, and so on.

General settings > Upgrade firmware

This feature allows you to upgrade the firmware of your camera. It takes a few minutes to complete the process.



Note

Do not power off the camera during the upgrade.

To upgrade the firmware, follow these steps:

Step 1 Download the latest firmware file from the Cisco website at this link:
<https://software.cisco.com/download/navigator.html>.

The file is in .pkg file format.

Step 2 Click **Browse...** and locate the firmware file.

Step 3 Click **Upgrade**.

The camera starts to upgrade and will reboot automatically when the upgrade completes.

If the upgrade is successful, you will see “Reboot system now!! This connection will close”. After that, access the camera again.

The following message displays when the upgrade has succeeded:

```
Reboot system now!!
This connection will close.
```

The following message is displayed when you have selected an incorrect firmware file:

```
Starting firmware upgrade...
Do not power down the server during the upgrade.
The server will restart automatically after the upgrade is
completed.
This will take about 1 - 5 minutes.
Wrong PKG file format
Unpack fail
```

General settings > Reboot

This feature allows you to reboot the camera, which takes about 1 minute to complete. When completed, the live video page will be displayed in your browser. During the reboot process, the system displays an information message and a progress bar shows the status of the process.

If the connection fails after rebooting, manually enter the IP address of the camera in the address field to resume the connection.

General settings > Restore

This feature allows you to restore the camera to factory default settings.

- **Network**—Select this option to retain the Network Type settings (see the “[Network > General settings](#)” section on page 5-24).
- **Daylight saving time**—Select this option to retain the Daylight Saving Time settings (see the “[Import/Export files](#)” section on page 5-7).
- **Custom language**—Select this option to retain the Custom Language settings.
- **VADP**—Retain the VADP modules (third-party software stored on the SD card) and related settings.

If none of the options is selected, all settings will be restored to factory default. A status message and progress bar is displayed during the restoring process.

Import/Export files

This feature allows you to Export / Update daylight saving time rules, custom language file, configuration file, and server status report.

- **Export daylight saving time configuration file**—Click to set the start and end time of DST (Daylight Saving Time).

To export, follow these steps:

1. In the Export files column, click **Export** to export the daylight saving time configuration file from the camera.
2. In the File Download dialog box that pops up, click **Open** to review the XML file or click **Save** to store the file for editing.
3. Open the file with a text editor such as Microsoft Notepad and locate your time zone; set the start and end time of DST.
4. When completed, save the file.

- **Update daylight saving time rules**—Click **Browse...** and specify the XML file to update.

If the incorrect date and time are assigned, you will see a warning message when uploading the file to the camera.

The message “The file must have a .xml filename suffix” displays when attempting to upload an incorrect file format.

- **Export language file**—Click to export language strings.
- **Update custom language file**—Click **Browse...** and specify your own custom language file to upload.
- **Export configuration file**—Click to export all parameters for the device and user-defined scripts.

- Export daylight saving time configuration file—Click **Browse...** to update a configuration file. The model and firmware version of the device should be the same as the configuration file. If you have set up a fixed IP or other special settings for your device, it is not suggested to update a configuration file.
- Export server status report—Click to export the current server status report, such as time, logs, parameters, process status, memory status, file system status, network status, kernel message, and so on.

**Tip**

If a firmware upgrade is accidentally disrupted, for example, by a power outage, you still have a last resort method to restore normal operation. See the following for how to bring the camera back to work:

Applicable scenario:

- Power disconnected during firmware upgrade.
- Unknown reason causing abnormal LED status, and a Restore cannot recover normal working condition.

You can use the following methods to activate the camera with its backup firmware:

1. Press and hold down the reset button for at least 1 minute.
2. Power on the camera until the red LED blinks rapidly.
3. After boot up, the firmware should return to the previous version before the camera hung. (The procedure should take 5 to 10 minutes, longer than the normal boot-up process.) When this process is completed, the LED status should return to normal.

Media > Image

This section explains how to configure the image settings of the camera. It includes the following tabs: General settings, IR Control, Image Settings, Exposure, Privacy mask, and Pixel calculator.

General settings

Video settings

- Video title—Enter a name that will be displayed on the title bar of the live video.
- Show timestamp and video title in video and snapshots—Enter a name that will be displayed on the title bar of the live video.
- Position of timestamp and video title on image—Select to display time stamp and video title on the top or at the bottom of the video stream.
- Timestamp and video title font size—Select the font size for the time stamp and title.
- Video font (.ttf)—You can select a True Type font file for the display of textual messages on video.
- Mount type:
 - Ceiling—Automatically delivers upside-down images. The Ceiling mode supports the following Display modes - 1O, 1P, 1R, 2P, 1O3R, 4R, 4R PRO, and 1O8R.

- Wall—Applies to the monitoring of long, side-to-side surveillance areas, such as when mounted on a wall facing a corridor. Different Mount types have different options with the Display mode settings. For example, the 1P2R (1 Panoramic and 2 Regional) and 1P3R (1 Panoramic & 3 Regional) display modes are only available when the “all Mount type is applied.
- Floor—The Display modes with the Floor mount type are identical to those for the Ceiling mount except that the images are not vertically flipped.
- Color—Select to display color or black/white video streams.
- Power line frequency—Set the power line frequency consistent with local utility settings to eliminate image flickering associated with fluorescent lights.
- Video orientation:
 - Flip—Vertically reflect the display of the live video
 - Mirror—Horizontally reflect the display of the live video. Select both options if the camera is installed upside-down (for example, on the ceiling) to correct the image orientation. If you have preset locations, those locations will be cleared after flip/mirror setting.

Day/Night settings

- Switch to B/W in night mode—Select this to enable the camera to automatically switch to Black & White display during the night mode.
- IR cut filter—With a removable IR-cut filter, this camera can automatically remove the filter to let infrared light pass into the sensor during low light conditions.
 - Auto mode—The camera automatically removes the filter by judging the level of ambient light. The Day/Night Exposure Profile will not be available if Auto mode is selected.
 - Day mode—The camera switches on the IR cut filter at all times to block infrared light from reaching the sensor so that the colors will not be distorted.
 - Night mode—The camera switches off the IR cut filter at all times for the sensor to accept infrared light, thus helping to improve low light sensitivity.
 - Synchronize with digital input—The camera automatically removes the IR cut filter when a digital input is triggered, for example, when the camera is accompanied by an external IR light that comes with its own sensor and provides a signal to the camera. Some camera housings come with such mechanism.
 - Schedule mode—The camera switches between day mode and night mode based on a specified schedule. Enter the start and end time for day mode. Note that the time format is [hh:mm] and is expressed in 24-hour clock time. By default, the start and end time of a day mode are set to 07:00 and 18:00.
- Sensitivity of IR cut filter—Tune the responsiveness of the IR filter to lighting conditions as Low, Normal, or High.

When completed with the settings on this page, click **Save** to enable the settings.

IR Control

IR Illuminators

- Turn on built-in IR illuminator in night mode—Select this to turn on the camera onboard IR illuminator when the camera detects low light condition and enters the night mode.

- Turn on external IR illuminator in night mode—If your camera is installed with an IR illuminator and the digital output signals are connected to it, you can let system firmware turn on the supplementary illuminator during low-light conditions.
- Anti-overexposure—When enabled, the camera automatically adjusts the IR projection to adjacent objects in order to avoid over-exposure in the night mode.

The function is more beneficial when the spot of intrusions or an object of your interest is close to the lens and the IR lights. For example, if an intruder has a chance of getting near the range of 3 meters, Smart IR can effectively reduce the over-exposure. For a surveillance area at a greater distance, for example, 5 meters or farther away, the Smart IR function may not bring as significant benefits as in close range.

The following figure shows these examples:

1—Smart IR disabled; distance: 5M

2—Smart IR enabled; distance: 5M

3—Smart IR disabled; distance: 3M

4—Smart IR enabled; distance: 3M

**Tip**

If there is an object in close proximity, the IR lights reflected back from it can mislead the Smart IR calculation of light level. To solve this problem, you can place an Exposure Exclude window on an unavoidable object in the Exposure setting window. See the [“Exposure” section on page 5-13](#).

You can also configure the Exposure Exclude window in a night mode Profile setting so that your day time setting is not affected.

Smart IR

Smart IR is designed for applications where the IR fisheye camera is installed at a less-than-ideal position. For example, the fisheye can be installed next to a wall or column, which in turn may reflect the IR lights at night, causing over-exposure and blurring part of the image.

The Smart IR adjustment must be made in the night mode.

- IR zone adjustment—The IR zone adjustment divides image planes to multiple sections, each single section is equipped with an independent IR control lighting devices for local region illumination. This keeps the comprehensive details of an approaching subject and preserves visibility for the background.

For an installation site with an unavoidable limitation, say, a wall that causes IR reflection, you can manually reduce the light level on specific area(s). This can apply when an IR fisheye camera is installed on a wall with a part of its field of view covering a wall.

Zone 2 is the default front, indicated by the Cisco camera logo on the dome cover.

- IR adjustment:
 - Auto IR adjust—Lets camera firmware automatically calculate and adjust light levels and come up with the best balance for all illumination zones.
 - Manual IR adjust:
 - One time adjust—Before you manually tune the IR light levels for different zones, press this button for the camera to begin the initial calculation. After you manually adjust the light levels for zones, the lighting levels will no longer be adjusted by the camera unless an object approaches near the camera.

Observe the imaging results on the live view and pull the adjustment tabs to increase or decrease the light levels in different zones. For example, when some unavoidable objects stand in one area, and you observe signs of overexposure, you can lower the lighting level for it.

Image settings

On this page, you can make various image adjustments.

Normal light mode is for normal situations and Profile mode is for special situations.

- Enable to apply these settings at—Appears on the **Profile mode** tab only. Select the mode this profile is to apply to: Day mode or Schedule mode. Manually enter a range of time if you choose Schedule mode.
- White balance—Adjust the value for the best color temperature.
 - Auto—This will automatically adjust the color temperature of the light in response to different light sources.
 - To adjust the white balance to the best color temperature, follow these steps:
 1. Set the White balance to **Auto**.
 2. Place a sheet of paper of white or cool-color temperature color, such as blue, in front of the lens, then allow the camera to automatically adjust the color temperature.
 3. Click **Fix current value** to confirm the setting when the camera automatically measured and adjusted the white balance.
 - Manual:—This item allows you to manually input the R gain & B gain ratios.
- Image Adjustment:
 - Brightness—Adjust the image brightness level, which ranges from 0% to 100%.
 - Contrast—Adjust the image contrast level, which ranges from 0% to 100%.
 - Saturation—Adjust the image saturation level, which ranges from 0% to 100%. You can also select **Customize** and manually enter a value.
 - Sharpness—Adjust the image sharpness level, which ranges from 0% to 100%.

- Gamma curve—Adjust the image sharpness level, which ranges from 0.45 to 1, from Detailed to Contrast. You may let firmware Optimize your display or select the Manual mode, and pull the slide bar pointer to change the preferred level of Gamma correction towards higher contrast or towards the higher luminance for detailed expression for both dark and lighted areas of an image.

This option is disabled when the WDR feature is enabled.

- Defog—Helps improve the visibility quality of captured image in poor weather conditions such as smog, fog, or smoke.

- 3d Noise reduction—Adjust the 3D noise reduction strength, which ranges from Low to High.

This applies to the onboard 3D Noise Reduction feature. Use the slider to adjust the reduction strength. Applying this function to the video channel will consume system computing power.

3D Noise Reduction is mostly applied in low-light conditions. When enabled in a low-light condition with fast moving objects, trails of after-images may occur. You may then select a lower strength level or disable the function.

- Scene mode: deblur—When enabled, shutter time will be fixed to 1/120 second to reduce image smear. This feature is designed to apply with human movement at the pace of 1.4~2.2m/s. The deblur function is related to Motion detection where motion-alerted pixels need to be suppressed in order to increase the accuracy of motion detection. In certain conditions, shadows or light changes can all cause false alarms in motion detection. The deblur function uses the same detection window as that of the Motion detection.

You can click **Restore** to recall the original settings without incorporating the changes. When completed with the settings on this page, click **Save** to enable the setting. You can also click **Profile mode** to adjust the settings described above in a tabbed window for special lighting conditions.

Exposure

On this page, you can configure the Exposure measurement window, Exposure level, Exposure mode, Exposure time, Gain control, and Day/Night mode settings. You can configure two sets of Exposure settings: on the **Normal light mode** tab for normal situations, or on the **Profile mode** for special situations, such as the day/night/ schedule mode.

Normal light mode

- Measurement Window—This function allows you to set measurement window(s) for low light compensation. For example, where low-light objects are posed against an extremely bright background. You may want to exclude the bright sunlight shining through a building's corridor.
 - Full view—Calculate the full range of view and offer appropriate light compensation.
 - Custom—This option allows you to manually add customized windows as inclusive or exclusive regions. A total of 10 windows can be configured.



Note The Profile mode setting in the Exposure window will be disabled when the IR cut filter is set to the Auto mode (Media > Image > General settings window).

In the Custom mode, the title bar area is not included as the effective measurement area.

The inclusive window refers to the “weighed window”; the exclusive window refers to “ignored window.” It adopts the weighed averages method to calculate the value. The inclusive windows have a higher priority. You can overlap these windows, and, if you place an exclusive window

within a larger inclusive window, the exclusive part of the overlapped windows will be deducted from the inclusive window. An exposure value will then be calculated out of the remaining of the inclusive window.

- BLC (Back Light Compensation)—This option will automatically add a “weighted region” in the middle of the window and give the necessary light compensation.
- Exposure control:
 - Exposure level—You can manually set the Exposure level, which ranges from -0.7 to $+0.7$ (dark to bright).
 - Flickerless—Under some circumstances when there is a difference between the video capture frequency and local AC power frequency (NTSC or PAL), the mismatch causes color shifts or flickering images. If the above mismatch occurs, select the Flickerless checkbox, and the range of Exposure time (the shutter time) will be limited to a range in order to match the AC power frequency. When selected, the exposure time will be forced to stay longer than 1/120 second. For cameras that come with fixed iris lens, setting the exposure time to longer than 1/120 second may introduce too much lights to the lens. Users can use this option to observe whether the result of long exposure time is satisfactory.

You can click and drag the semi-circular pointers on the Exposure time and Gain control slide bars to specify a range of shutter time and Gain control values within which the camera can automatically tune to an optimal imaging result. For example, you may prefer a shorter shutter time to better capture moving objects, while a faster shutter reduces light and needs to be compensated by electrical brightness gains.

- Exposure time—This option is not available when WDR Pro is enabled. You can split the round pointers on the Exposure time and Gain control slide bars into two halves and drag them on the bars to designate a range of values in which firmware can automatically adapt to. Note that Firmware will then automatically tune the Gain, Exposure time, and Iris opening within the ranges you specified. For example, in low-light condition, you may prefer a longer exposure time and more electronic gains. However, the noises in the image will also increase.
- Gain control—Tune the slide bar to set the Gain Control to the best image quality. Higher gain control value will generate a certain amount of noises, and that the gain control, lighting levels, and picture performance are closely related. Click the **Save** button to preserve your configuration.



Note When the WDR function is enabled, the exposure time and gain control are not available.

- Enable AE speed adjustment—This function applies when you need to monitor fast changing lighting conditions. For example, the camera may need to monitor a highway lane or entrance of a parking area at night where cars passing by with their lights on can bring fast changes in light levels. The same applies if the camera is installed on a vehicle, and when it needs to adapt to fast changes of light when entering and leaving a tunnel.
- Enable WDR enhanced—This function allows users to identify more image details with an extreme contrast from an object of interest with one shadowed side against a bright background, for example, an entrance. You may select the Enable WDR enhanced check box, and then adjust the strength (low, medium, high) to reach the best image quality.

You can click **Restore** to recall the original settings without incorporating the changes. When completed with the settings on this page, click **Save** to enable the settings.

If you want to configure another sensor setting for a specific lighting condition for a specific period of time in a day, click Profile mode to open the Profile of exposure settings page.

Profile mode

To set up a profile, perform the following steps.

**Note**

Profile mode is not available if the IR cut filter option is set to Auto on the Media > Image > General tab.

-
- Step 1** Select the Profile mode tab.
- Step 2** Select the applicable mode: **Night mode** or **Schedule mode**. Manually enter a range of time if you choose the Schedule mode. These options appear only if you first enable **Enable to apply these settings at**.
- Step 3** Configure other settings in the tab. See the previous discussions for detailed information.
- Step 4** Click **Save** to enable the setting and click **Close** to exit the page.
-

Privacy Mask

Click **Privacy Mask** to open the settings page. On this page, you can block out sensitive zones to address privacy concerns.

To set the privacy mask windows, follow these:

-
- Step 1** Click **New** to add a new window. A text box will appear allowing you to enter a name for the mask.
- Step 2** Use four mouse clicks to mark a square area, which is recommended to be at least twice the size of the object (height and width) you want to cover.
- Step 3** Enter a Window Name and click **Save** to enable the setting.
- Step 4** Click the **Enable privacy mask** check box to enable this function.
-

Up to five privacy mask windows can be configured on the same screen.

If you want to delete the privacy mask window, click the **x** mark on the side of window name.

Pixel Calculator

Click the **Add** button at the lower screen to create a pixel calculator window. Place your cursor on the window to move it to an area of your interest, and change the size of window to fit the area of interest.

Once they are drawn, the numbers of pixels on the sides of windows will appear. This allows you to calculate if your current configuration fulfills a requirement, for instance, for recognizing the faces of persons passing through a location. A facial recognition usually requires around 130 pixels per meter or higher.

The pixels thus calculated are listed at the lower screen on a per-stream basis depending on the frame size you configured for each video stream.

Take the following into consideration when using this feature:

- Operational requirement: Identify a human or a human face.

- Why human face? There are less variances in the size of a face than that for limbs and body. Human face is normally 16cm wide.
- The recommended pixel number is, 40 to 80 for facial identification; or 100 pixels per foot (30.48cm)
 - One example is a human face in retail.
 - Another example is a doorway:

If the requirement is 100 pixels per foot, to detect a person passing through a door, the camera will have to cover 700 pixels throughout the length of a doorway. This application aims to identify a subject passing through a specific area.
- Other factors may include that a person will move in your area of interest: The face may not always face the camera.
- Details can be affected by weak lighting or the view angle. Therefore, higher the pixels, higher the chance you can identify the subject.

With the visual tool, you can estimate a coverage area, the distance from the subject, and place a ruler or an object of known size. You can then draw a calculator frame to cover the subject of your interest.

The calculated numbers will be listed at the lower screen. You will then understand if the current setting fulfills your requests for the number of pixels.

Media > Video

Stream settings

To set up settings for a stream, follow these steps:

1. Select a stream to configure its viewing region.
1. Choose a proper Frame Size from the drop-down list according to the size of monitored device.
2. Select the Maximum frame rate.

The parameters of the multiple streams are as follows:

	Region of Interest
Stream 1	3000 X 3000 ~ 256 x 256
Stream 2	2560 X 2560 (default) ~ 256 x 256
Stream 3	512 X 512 (default) ~ 256 x 256
Stream 4	3000 X 3000 ~ 256 x 256

To begin the configuration, first select a video channel.

To change the frame size, frame rate, and other related settings, click on video settings for a video stream to its individual configuration panel.

**Note**

When operating with a fluorescent light in the field of view, which is rare for a fisheye installation, and the power line frequency is set to 50Hz, the edges of such light may appear flickering. In the event of this occurrence, you can turn on the flickerless mode (Configuration > Media > Image > Exposure), and the frame rate will be automatically configured to 16.6fps. This will get around the flickering issue.

Click the stream item to display the detailed information.

This camera offers real-time H.265, H.264 and MJPEG compression standards (triple Codec) for real-time viewing.

If the H.265 or H.264 mode is selected, the video is streamed via RTSP protocol. There are several parameters for you to adjust the video performance:

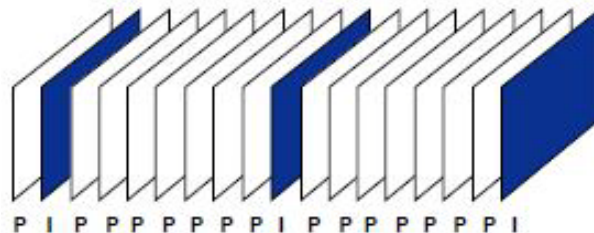
- **Frame size**—You can set up different video resolutions for different viewing devices. For example, set a smaller frame size and lower bit rate for remote viewing on mobile phones and a larger video size and a higher bit rate for live viewing on web browsers. Note that a larger frame size takes up more bandwidth.
- **Maximum frame rate**—This limits the maximum refresh frame rate per second. Set the frame rate higher for smoother video quality and for recognizing moving objects in the field of view. If the power line frequency is set to 50Hz, the frame rates are selectable at 1fps, 2fps, 3fps, 5fps, 8fps, 10fps, 15fps, and 20fps. If the power line frequency is set to 60Hz, the frame rates are selectable at 1fps, 2fps, 3fps, 5fps, 8fps, 10fps, 15fps, and 20fps. You can also select Customize and manually enter a value.
- **Intra frame period**—Determine how often for firmware to plant an I frame. The shorter the duration, the more likely you will get better video quality, but at the cost of higher network bandwidth consumption. Select the intra frame period from the following durations: 1/4 second, 1/2 second, 1 second, 2 seconds, 3 seconds, and 4 seconds.

Smart Stream III

- **Dynamic Intra frame period**—High quality motion codecs, such as H.265, utilize the redundancies between video frames to deliver video streams at a balance of quality and bit rate.

The encoding parameters for H.264 frame types are summarized and illustrated in [Figure 5-3](#). The I-frames are completely self-referential and they are largest in size. The P-frames are predicted frames. The encoder refers to the previous I- or P-frames for redundant image information.

Figure 5-3 H.264/H.265 Frame Types



By dynamically prolonging the intervals for I-frames insertion to up to 10 seconds, the bit rates required for streaming a video can be tremendously reduced. When streaming a video of a static scene, the Dynamic Intra frame feature can save up to 53% of bandwidth. The amount of bandwidth thus saved is also determined by the activities in the field of view. If activities occur in the scene,

firmware automatically shortens the I-frame insertion intervals in order to maintain image quality. In the low light or night conditions, the sizes of P-frames tend to be enlarged due to the noises, and hence the bandwidth saving effect is also reduced.

Streaming a typical 2MP scene normally requires 3~4Mb/s of bandwidth. With the Dynamic Intra frame function, the bandwidth for streaming a medium-traffic scene can be reduced to 2~3Mb/s, and during the no-traffic period of time, down to 500kb/s.

Figure 5-4 shows dynamic intra frame with static scenes. Figure 5-5 dynamic intra frame shows activities in scenes

Figure 5-4 *Dynamic Intra Frame with Static Scenes*

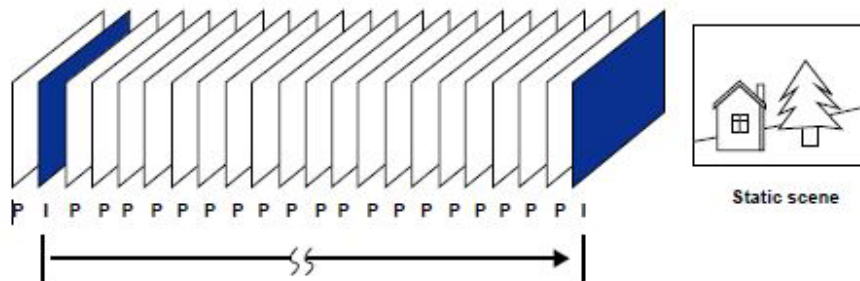
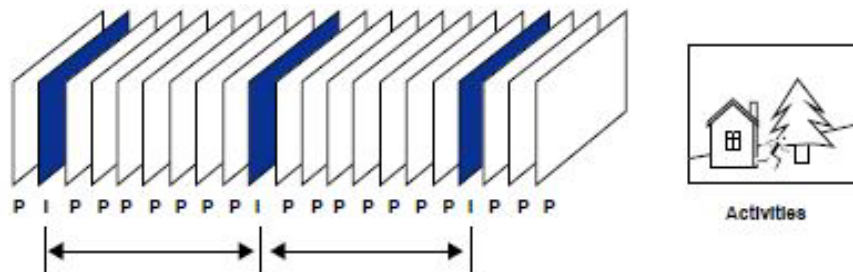


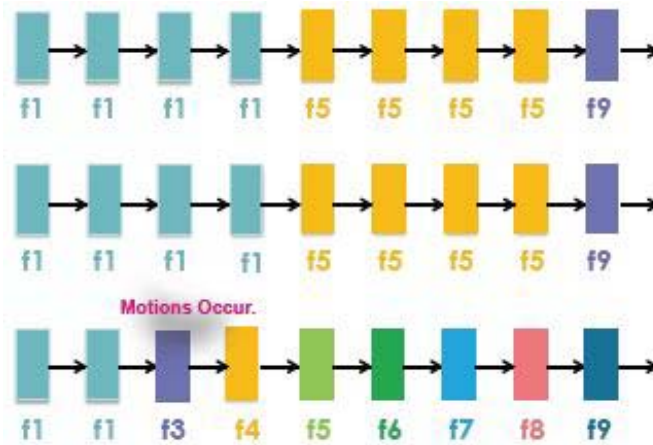
Figure 5-5 *Dynamic Intra Frame with Activities in Scenes*



With the H.265 codec in an optimal scenario and when Dynamic Intra frame is combined with the Smart Stream function, an 80% of bandwidth saving can be achieved compared with using H.264 without enabling these bandwidth-saving features.

- Smart FPS—In a static scene, the algorithm re-encodes old frames when no motions occur in scene. When motions occur, the encoding returns to normal to deliver real-time streaming.

Figure 5-6 Smart FPS



By queuing and re-encoding the old frames from a static scene, both the computing efforts and the size of P frames are reduced. It is beneficial for keeping up with the frame rate requirements.

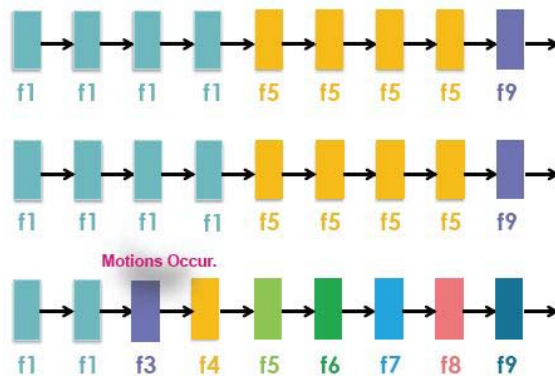
A default frame difference threshold, 2%, is embedded in firmware for returning from Smart FPS to normal encoding when motions occur.



Note Compared with Smart Stream II, Smart Stream III has two more configurable options: Smart Q, and Smart FPS

- In a static scene, the algorithm re-encodes old frames when no motions occur in scene. When motions occur, the encoding returns to normal to deliver real-time streaming.

Figure 5-7 Smart FPS



By queuing and re-encoding the old frames from a static scene, both the computing efforts and the size of P frames are reduced. It is beneficial for keeping up with the frame rate requirements.

A default frame difference threshold, 2%, is embedded in firmware for returning from Smart FPS to normal encoding when motions occur.

- Smart codec—Smart codec effectively reduces the quality of the whole or the non-interested areas on a screen and therefore reduces the bandwidth consumed.

You can manually specify the video quality for the foreground and the background areas: slide the Quality priority bar to the right for higher quality in the ROI areas. Slide this bar to the left for higher quality in the non- ROI areas.

Select an operation mode if Smart codec is preferred:

- Auto tracking—The Auto mode configures the whole screen into the non-interested area. The video quality of part of the screen returns to normal when one or more objects move in that area. The remainder of the screen where there are no moving objects (no pixel changes) will still be transmitted in low-quality format.
- Manual—The Manual mode allows you to configure 3 ROI windows (Region of Interest, with Foreground quality) on the screen. Areas not included in any ROI windows will be considered as the non-interested areas. The details in the ROI areas will be transmitted in a higher-quality video format.

As shown in [Figure 5-8](#), the upper screen may contain little details of your interest, while the sidewalk on the lower screen is included in an ROI window.

As the result, the lower screen is constantly displayed in high details, while the upper half is transmitted using a lower-quality format. Although the upper half is transmitted using a lower quality format, you still have an awareness of what is happening on the whole screen.

Figure 5-8 ROI Window



- Hybrid—The major difference between the “Manual” mode and the “Hybrid” mode is that in the “Hybrid” mode, any objects entering the non-interested area will restore the video quality of the moving objects and the area around them. The video quality of the associated non-interested area is immediately restored to normal to cover the moving objects. In the “Manual” mode, the non-interested area is always transmitted using a low quality format regardless of the activities inside.

Use the Quality priority slide bar to tune the quality contrast between the ROI and non-interested areas.

The farther the slide bar button is to the right, the higher the image quality of the ROI areas. The farther the slide bar button to the left, the higher the image quality of the non-interested area.

In this way, you may set up an ROI window as a privacy mask by covering a protected area using an ROI window, while the remaining screen become the non-interested area. You may then configure the non-interested area to have a high image quality, or vice versa.

You should also select the highest value from the Maximum bit rate pull-down menu as the threshold to contain the bandwidth consumption for both the high- and low-quality video sections in a smart stream.

Bit rate control

- **Constrained bit rate**—A complex scene generally produces a larger file size, meaning that higher bandwidth will be needed for data transmission. The bandwidth utilization is configurable to match a selected level, resulting in mutable video quality performance. The bit rates are selectable at the following rates: 20Kbps, 30Kbps, 40Kbps, 50Kbps, 64Kbps, 128Kbps, 256Kbps, 512Kbps, 768Kbps, 1Mbps, 2Mbps, 3Mbps, 4Mbps, 6Mbps, 8Mbps, 10Mbps, 12Mbps, 14Mbps, ~ to 40Mbps. You can also select Customize and manually enter a value up to 40Mbps.
 - **Target quality**—Select a desired quality ranging from Medium to Excellent.
 - **Maximum bit rate**—select a bit rate from the pull-down menu. The bit rate ranges from 20kbps to a maximum of 40Mbps. The bit rate then becomes the Average or Upper bound bit rate number. The camera will strive to deliver video streams around or within the bit rate limitation you impose.
 - **Policy**—If Frame Rate Priority is selected, the camera will try to maintain the frame rate per second performance, while the image quality will be compromised. If Image quality priority is selected, the camera may drop some video frames in order to maintain image quality.
- **Smart Q**—Select ON or OFF to enable or disable the feature. Smart Q is scene-aware. The Smart Q reduces frame size and bit rate consumption through the following:
 - Dynamically adjusting the image quality for scenes in different luminosities, and hence reduces the occurrence of noises in low light frames. Less noises means less of the bandwidth consumed.
 - Endorsing different qualities for the I frames and P frames, and hence reduces the frame size. The higher the quality of the I frame, the larger the GOP (Group of Pictures). More block skips will occur and more P frames will be included in the GOP, and therefore the bit rate consumption is reduced.
 - Dividing a single frame into different sections, and giving these sections different quality values. For example, a highly complex image section (high frequency area), such as an area with dense vegetation, screen windows, or repeated patterns (wall paper), can be given a lower quality value. For a highly complex area, having a lower quality value actually poses little effects on human eyes. High quality is unnecessary in no motion area, especially in low light, high noises, and high frequency scenes. Unnecessary quality is unrecognized by human eyes.
High quality is unnecessary in no motion area, especially in low light, high noises, and high frequency scenes. Unnecessary quality is unrecognized by human eyes and wastes the bit rate. The quality areas in a scene are determined by the SoC encoder.

The Smart Q streaming can save up to 50% to 80% of bandwidth in different illumination conditions while keeping the same imaging quality. These numbers come from the comparison between Smart Stream II and Smart Stream III streaming.

- **Fixed quality:**

If Fixed quality is selected, all frames are transmitted with the same quality; bandwidth utilization is therefore unpredictable.

 - **Quality**—The video quality can be adjusted to the following settings: Medium, Standard, Good, Detailed, and Excellent. You can also select Customize and manually enter a value.

- Maximum bit rate—With the guaranteed image quality, you might still want to place a bit rate limitation to control the size of video streams for bandwidth and storage concerns. The configurable bit rate starts from 1Mbps to 40Mbps.

The Maximum bit rate setting in the Fixed quality configuration can ensure a reasonable and limited use of network bandwidth. For example, in low light conditions where a Fixed quality setting is applied, video packet sizes can tremendously increase when noises are produced with electrical gains.

You may also manually enter a bit rate number by selecting the Customized option.

If JPEG mode is selected, the camera sends consecutive JPEG images to the client, producing a moving effect similar to a filmstrip. Every single JPEG image transmitted guarantees the same image quality, which in turn comes at the expense of variable bandwidth usage. Because the media contents are a combination of JPEG images, no audio data is transmitted to the client. There are three parameters provided in MJPEG mode to control the video performance:

- Frame size—You can set up different video resolution for different viewing devices. For example, set a smaller frame size and lower bit rate for remote viewing on mobile phones and a larger video size and a higher bit rate for live viewing on web browsers. A larger frame size takes up more bandwidth.
- Maximum frame rate—Limits the maximum refresh frame rate per second. Set the frame rate higher for smoother video quality.

If the power line frequency is set to 50Hz, the frame rates are selectable at 1fps, 2fps, 3fps, 5fps, 8fps, 10fps, 15fps, and 20fps. If the power line frequency is set to 60Hz, the frame rates are selectable at 1fps, 2fps, 3fps, 5fps, 8fps, 10fps, 15fps, and 20fps. You can also select Customize and manually enter a value.

- Video quality—Refer to the previous page setting for an average or upper bound threshold for controlling the bandwidth consumed for transmitting motion jpegs. The configuration method is identical to that for H.264/5.



Note

Video quality and fixed quality refers to the compression rate, so a lower compression rate value will produce higher quality.

Converting high-quality video may significantly increase the CPU load, and you may encounter streaming disconnection or video loss while capturing a complicated scene. In the event of occurrence, we suggest you customize a lower video resolution or reduce the frame rate to obtain smooth video.

Media > Audio

This section explains how to configure the audio options for the camera.

Audio Settings

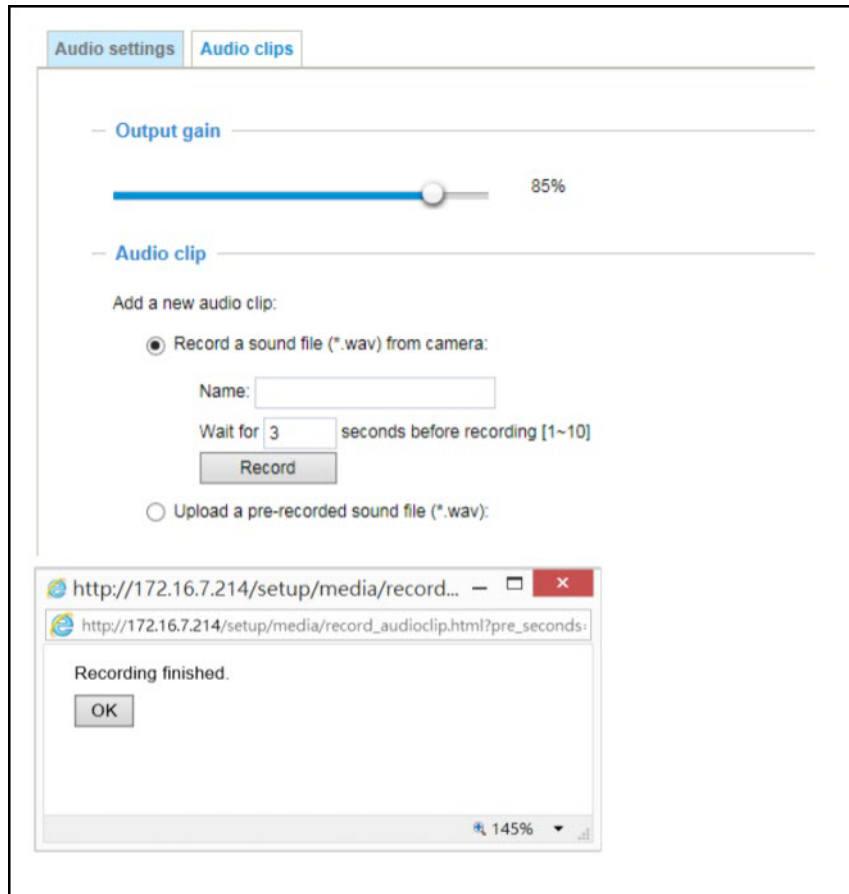
- Mute—Select this option to disable audio transmission from the camera to all clients. If muted, no audio data will be transmitted even if audio transmission is enabled on the Client Settings page. In that case, this message is displayed: “The media type has been changed to video only because the media from server contains no audio.”

- Microphone source—Select to stream the video with either the audio input from the internal or an external microphone.
- Internal microphone input gain—Select the gain of the internal audio input according to ambient conditions. Adjust the gain from 0% (least) to 100% (most).
- External microphone input—Select the gain of the external audio input according to ambient conditions. Adjust the gain from 0% (least) to 100% (most).
- Audio type—Select audio codec as G.711 or G.726 and the bit rate.
 - G.711 also provides good sound quality and requires about 64Kbps. Select pcmu (u-Law) or pcma (A-Law) mode.
 - G.726 is a speech codec standard covering voice transmission at rates of 16, 24, 32, and 40kbit/s.

Audio Clips

- Output gain: Use the slide bar to change the audio output gains value.
- Audio clip: When the camera's audio input is connected to a microphone, you can record a short period of audio (1 to 10 seconds). You can also use the camera's embedded microphone to record an audio clip, if available. Because the memory space is limited, a recording count down will be available on screen. You can also upload an audio file to the camera's flash memory. With amplified speakers, you can playback the audio, e.g., to deter an intruder. A maximum of 2 audio clips are supported. The maximum size of the audio file to be uploaded is 2,000 Kbytes. The voice alert is enabled in **Event settings > action > Play Audio Clip**. The action can be associated with triggering conditions.

Figure 5-9 Audio Clip Settings



When completed with the settings on this page, click **Save** to enable the settings.

Network > General settings

This section explains how to configure a wired network connection for the camera.

Network Type

- LAN—Select this option when the camera is deployed on a local area network (LAN) and is intended to be accessed by local computers. The default setting for the Network Type is LAN. Remember to click on the **Save** button when you complete the Network setting.
 - Get IP address automatically—Select this option to obtain an available dynamic IP address assigned by the DHCP server each time the camera is connected to the LAN.
 - Use fixed IP address—Select this option to manually assign a static IP address to the camera. Enter the Static IP, Subnet mask, Default router, and Primary DNS provided by your ISP or network administrator.

- Subnet mask—This is used to determine if the destination is in the same subnet. The default value is “255.255.255.0”.
- Default router—This is the gateway used to forward frames to destinations in a different subnet. Invalid router setting will disable the transmission to destinations across different subnets.
- Primary DNS—The primary domain name server that translates host names into IP addresses.
- Secondary DNS—Secondary domain name server that backups the Primary DNS.
- Primary WINS server—The primary WINS server that maintains the database of computer names and IP addresses.
- Secondary WINS server—The secondary WINS server that maintains the database of computer names and IP addresses.
- Enable UPnP presentation—Select this option to enable UPnP presentation for your camera so that whenever a camera is presented to the LAN, the shortcuts to connected cameras will be listed in My Network Places. You can click the shortcut to link to the web browser. To utilize this feature, make sure the UPnP component is installed on your computer.
- Enable UPnP port forwarding—To access the camera from the Internet, select this option to allow the camera to open ports automatically on the router so that video streams can be sent out from a LAN. To utilize of this feature, make sure that your router supports UPnP and it is activated.
- PPPoE (Point-to-point over Ethernet)—Select this option to configure your camera to make it accessible from anywhere as long as there is an Internet connection. To utilize this feature, it requires an account provided by your ISP.

To acquire your camera’s public IP address, follow these steps:

1. Set up the camera on the LAN.
2. Go to **Configuration > Event > Event settings > Add server** (see the “[Add server](#)” section on page 5-41) to add a new email or FTP server.
3. Go to **Configuration > Event > Event settings > Add media** (see the “[Add media](#)” section on page 5-43).

Select System log so that you will receive the system log in TXT file format that contains the camera public IP address in your email or on the FTP server.

4. Go to **Configuration > Network > General settings > Network type**. Select **PPPoE** and enter the user name and password provided by your ISP. Click **Save** to enable the setting.

The camera will reboot.

5. Disconnect the power to the camera; remove it from the LAN environment.

If the default ports are already used by other devices connected to the same router, the camera will select other ports for the camera.

If UPnP is not supported by your router, you will see the following message: “Error: Router does not support UPnP port forwarding.”

To enable the UPnP user interface on your computer, follow these steps (you must log on to the computer as a system administrator to install the UPn components):

1. From the Start menu, click **Control Panel**, then click **Add or Remove Programs**.
2. In the Add or Remove Programs dialog box, click **Add/Remove Windows Components**.
3. In the Windows Components Wizard dialog box, select Networking Services and click **Details**.

4. In the Networking Services dialog box, select **Universal Plug and Play** and click **OK**.
5. Click **Next** in the following window
6. Click **Finish**. UPnP is enabled.

UPnP networking technology provides automatic IP configuration and dynamic discovery of devices added to a network. Services and capabilities offered by networked devices, such as printing and file sharing, are available among each other without the need for cumbersome network configuration. In the case of cameras, you will see camera shortcuts under My Network Places.

Enabling UPnP port forwarding allows the camera to open a secondary HTTP port on the router—not HTTP port—meaning that you have to add the secondary HTTP port number to the camera’s public address in order to access the camera from the Internet. For example, when the HTTP port is set to 80 and the secondary HTTP port is set to 8080, the following table shows the camera’s IP address

From the Internet	In LAN
http://203.67.124.123:8080	http://192.168.4.160 or http://192.168.4.160:8080

If the PPPoE settings are incorrectly configured or the Internet access is not working, restore the camera to factory default; see the “[General settings > Restore](#)” section on page 5-7 for details. After the camera is reset to factory default, it will be accessible on the LAN.

- Enable IPv6—Select this option and click **Save** to enable IPv6 settings. This only works if your network environment and hardware equipment that support IPv6. The browser should be Microsoft Internet Explorer or Mozilla Firefox.

When IPv6 is enabled, by default, the camera will listen to router advertisements and be assigned with a link-local IPv6 address accordingly.

- IPv6 Information—Click this button to obtain the IPv6 information. If your IPv6 settings are successful, the IPv6 address list will be listed in the pop-up window.

To link to an IPv6 address, follow these steps:

1. Open your web browser.
2. Enter the link-global or link-local IPv6 address in the address bar of your web browser.
3. Press **Enter** on the keyboard or click **Refresh** button to refresh the web page.

If you have a secondary HTTP port (the default value is 8080), you can also link to the web page using the following address format (see the “[HTTP streaming](#)” section on page 5-27 for detailed information):

http://[2001:0c08:2500:0002:0202:d1ff:fe04:65f4]/:8080

If you choose PPPoE as the Network Type, the [PPP0 address] will be displayed in the IPv6 information column.

- Manually setup the IP address: Select this option to manually set up IPv6 settings if your network environment does not have DHCPv6 server and router advertisements-enabled routers. If you check this item, the following fields will be displayed for you to enter the corresponding information:
 - Optional IP address / Prefix length
 - Optional Default Router

- Optional primary DNS

Network > Streaming protocols

HTTP streaming

To utilize HTTP authentication, make sure that you have set a password for the camera first; see the “[Security > User accounts](#)” section on page 5-32 for details.

- Authentication—Depending on your network security requirements, the camera provides two types of security settings for an HTTP transaction: basic and digest. If basic authentication is selected, the password is sent in plain text format and there can be potential risks of it being intercepted. If digest authentication is selected, user credentials are encrypted using MD5 algorithm and thus provide better protection against unauthorized accesses.
- HTTP port / Secondary HTTP port—By default, the HTTP port is set to 80 and the secondary HTTP port is set to 8080. They can also be assigned to another port number between 1025 and 65535. If the ports are incorrectly assigned, warning messages will be displayed.

To access the camera on the LAN, both the HTTP port and secondary HTTP port can be used to access the camera. For example, when the HTTP port is set to 80 and the secondary HTTP port is set to 8080, the camera IP address on the LAN is `http://192.168.4.160` or `http://192.168.4.160:8080`.

- Access name for Channel # and stream #—The camera supports multiple streams simultaneously. The access name is used to differentiate the streaming source. Users can click **Media > Video > Stream settings** to set up the video quality of linked streams. For more information about how to set up the video quality, see the “[Stream settings](#)” section on page 5-16.

When using Mozilla Firefox to access the camera and the video mode is set to JPEG, you will receive video composed of continuous JPEG images. This technology, known as “server push,” allows the camera to feed live pictures to Mozilla Firefox.

URL command: `http://ip address:http port/access name for stream 1, 2, 3, 4`

For example, when the Access name for stream 2 is set to `video2.mjpg`:

1. Launch Mozilla Firefox.
2. Type the above URL command in the address bar. Press **Enter**.
3. The JPEG images will be displayed in your web browser.

**Note**

Microsoft Internet Explorer does not support server push technology; therefore, you will not be able to access a video stream using `http://ip address:http port/access name for stream 1, 2, 3, 4`.

RTSP Streaming

To utilize RTSP streaming authentication, make sure that you have set a password for controlling the access to video stream first. See the “[Security > User accounts](#)” section on page 5-32 for details.

- Authentication—Depending on your network security requirements, the camera provides three types of security settings for streaming via RTSP protocol: disable, basic, and digest. If basic authentication is selected, the password is sent in plain text format, but there can be potential risks of it being intercepted. If digest authentication is selected, user credentials are encrypted using MD5 algorithm, thus providing better protection against unauthorized access.

The availability of the RTSP streaming for the three authentication modes is listed in the following table:

	QuickTime Player	VLC Player
Disable	Yes	Yes
Basic	Yes	Yes
Digest	Yes	No

- Access name for Channel # and stream #—This camera supports multiple streams simultaneously. The access name is used to differentiate the streaming source. If you want to use an RTSP player to access the camera, you have to set the video mode to H.264 or H.265 and use the following RTSP URL command to request transmission of the streaming data.

rtsp://ip address:rtsp port/access name for stream 1 to 4

For example, when the access name for stream 1 is set to live.sdp:

1. Launch an RTSP player.
 2. Choose **File > Open URL**. A URL dialog box will pop up.
 3. Type the above URL command in the text box.
 4. The live video will be displayed in your player.
- RTSP port; RTP port for video, metadata, audio; RTCP port for video, metadata, audio:
 - RTSP (Real-Time Streaming Protocol) controls the delivery of streaming media. By default, the port number is set to 554.
 - The RTP (Real-time Transport Protocol) is used to deliver video and audio data to the clients. By default, the RTP port for video is set to 5556 and the RTP port for audio is set to 5558.
 - The RTCP (Real-time Transport Control Protocol) allows the camera to transmit the data by monitoring the Internet traffic volume. By default, the RTCP port for video is set to 5557 and the RTCP port for audio is set to 5559.

The ports can be changed to values between 1025 and 65535. The RTP port must be an even number and the RTCP port is the RTP port number plus one, and thus is always an odd number. When the RTP port changes, the RTCP port will change accordingly. If the RTP ports are incorrectly assigned, the following warning message will be displayed.

Invalid port number. RTP video port must be an even number.

- Multicast settings for stream #1 ~ #4—Click the items to display the detailed configuration information. Select the Always multicast option to enable multicast for streams #1 ~ #4.

Unicast video transmission delivers a stream through point-to-point transmission; multicast, on the other hand, sends a stream to the multicast group address and allows multiple clients to acquire the stream at the same time by requesting a copy from the multicast group address. Therefore, enabling multicast can effectively save Internet bandwidth.

The ports can be changed to values between 1025 and 65535. The multicast RTP port must be an even number and the multicast RTCP port number is the multicast RTP port number plus one, and thus is always odd. When the multicast RTP port changes, the multicast RTCP port will change accordingly.

If the multicast RTP video ports are incorrectly assigned, the following warning message will be displayed:

```
Invalid port number. Multicast stream 1 video port must be an even number.
```

- **Multicast TTL [1~255]**—The multicast TTL (Time To Live) is the value that tells the router the range a packet can be forwarded.

Initial TTL	Scope
0	Restricted to the same host
1	Restricted to the same subnetwork
32	Restricted to the same site
64	Restricted to the same region
128	Restricted to the same continent
255	Unrestricted in scope

The Multicast metadata port is utilized by Cisco VADP (Video Audio development platform) modules to transfer video analytics results, PTZ stream, textual data, and event messages between the camera and the client side running and observing the video analysis. If your client side computer is located outside the local network, you may need to open the associated TCP port on routers and firewall.

SIP

SIP is short for Session Initiation Protocol. If necessary, you can change the default port number, 5060, to one between 1025 and 65535.

- **Two way audio port**—By default, the two way audio port is set to 5060. Also, it can also be assigned to another port number between 1025 and 65535.

The camera supports two way audio communication so that operators can transmit and receive audio simultaneously. By using the camera built-in or external microphone and an external speaker, you can communicate with people around the camera.

As JPEG transmits only a series of JPEG images to the client, to enable the two-way audio function, make sure the video mode is set to H.264 on the Media > Video > Stream settings page and the media option is set to Media > Video > Stream settings on the Client Settings page. See [Chapter 4, “Client Settings,”](#) and see the [“Stream settings” section on page 5-16.](#)

When audio is being to the camera, “AV” appears at the end of the video title at the top of the Live Video window. In this window, click the Talk button to enable audio transmission to the camera; click to adjust Mic Volume button to adjust the volume of the microphone; click the Mute button to turn off the audio. To stop talking, click the Talk button again. (See [Figure 3-9 on page 3-12](#) for an illustration of these buttons.)

Network > QoS (Quality of Service)

Quality of Service refers to a resource reservation control mechanism, which guarantees a certain quality to different services on the network. Quality of service guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications. Quality can be defined as, for instance, a maintained level of bit rate, low latency, no packet dropping, and so on.

The following are the main benefits of a QoS-aware network:

- The ability to prioritize traffic and guarantee a certain level of performance to the data flow
- The ability to control the amount of bandwidth each application may use, and thus provide higher reliability and stability on the network

Requirements for QoS

To utilize QoS in a network environment, the following requirements must be met:

- All network switches and routers in the network must include support for QoS
- The network video devices used in the network must be QoS-enabled

QoS models

CoS (the VLAN 802.1p model)

IEEE802.1p defines a QoS model at OSI Layer 2 (Data Link Layer), which is called CoS, Class of Service. It adds a 3-bit value to the VLAN MAC header, which indicates the frame priority level from 0 (lowest) to 7 (highest). The priority is set up on the network switches, which then use different queuing disciplines to forward the packets.

In the setting column for CoS, enter the VLAN ID of your switch (0~4095) and choose the priority for each application (0~7).

If you assign Video the highest level, the switch will handle video packets first.



Note

- A VLAN Switch (802.1p) is required. Web browsing may fail if the CoS setting is incorrect.
- The Class of Service technologies do not guarantee a level of service in terms of bandwidth and delivery time; they offer a “best-effort.” You can think of CoS as “coarsely-grained” traffic control and QoS as “finely-grained” traffic control.
- Although CoS is simple to manage, it lacks scalability and does not offer end-to-end guarantees since it is based on L2 protocol.

QoS/DSCP (the DiffServ model)

DSCP-ECN defines QoS at Layer 3 (Network Layer). The Differentiated Services (DiffServ) model is based on packet marking and router queuing disciplines. The marking is done by adding a field to the IP header, called the DSCP (Differentiated Services Codepoint). This is a 6-bit field that provides 64 different class IDs. It gives an indication of how a given packet is to be forwarded, known as the Per Hop Behavior (PHB). The PHB describes a particular service level in terms of bandwidth, queueing theory,

and dropping (discarding the packet) decisions. Routers at each network node classify packets according to their DSCP value and give them a particular forwarding treatment; for example, how much bandwidth to reserve for it.

Use the setting options of DSCP (DiffServ Codepoint) to specify the DSCP value for each application (0~63).

**Note**

Different vendors of network devices might have different methodologies and unique implementations. You should enter a DSCP tag value according to the information provided by the network devices.

The following table shows QoS Baseline/Technical Marketing Classification and Marking recommendations.

Application	Layer3 Classification			Layer 2 CoS/MPLS EXP	
	IPP	PHB	DSCP		
IP Routing	6	CS6	48	6	
Voice	5	EF	46	5	
Interactive video	4	AF41	34	4	QoS B
Streaming video	4	CS4	32	4	
Locally-defined mission-critical data	3	—	25	3	
Call signaling	3	AF31/CS3	26/24	3	
Transactional data	2	AF21	18	2	
Network management	2	CS2	16	2	
Bulk data	1	AF11	10	1	

Network > SNMP (Simple Network Management Protocol)

This section explains how to use the SNMP on the camera. The Simple Network Management Protocol is an application layer protocol that facilitates the exchange of management information between network devices. It helps network administrators to remotely manage network devices and find, solve network problems with ease.

The SNMP consists of the following key components:

- **Manager**—Network-management station (NMS), a server that executes applications that monitor and control managed devices.
- **Agent**—A network-management software module on a managed device that transfers the status of managed devices to the NMS.
- **Managed device**—A network node on a managed network. For example, routers, switches, bridges, hubs, computer hosts, printers, IP telephones, cameras, web server, and database.

Before configuring SNMP settings on this page, enable your NMS.

SNMP Configuration

- Enable SNMPv1, SNMPv2c—Select this option and enter the names of Read/Write community and Read Only community according to your NMS settings.
- Enable SNMPv3—This option contains cryptographic security, a higher security level, that allows you to set the Authentication password and the Encryption password.
 - Security name—According to your NMS settings, choose Read/Write or Read Only and enter the community name.
 - Authentication type—Select MD5 or SHA as the authentication method.
 - Authentication password—Enter the password for authentication (at least 8 characters).
 - Encryption password—Enter a password for encryption (at least 8 characters).

Security > User accounts

This section explains how to enable password protection and create multiple accounts.

Account Management

The administrator account name is “root”, which is permanent and can not be deleted. If you want to add more accounts in the Account management window, apply the password for the root account first.

Administrators can create up to 20 user accounts.

To create a new user, follow these steps:

-
- Step 1** Click to unfold the pull-down menu. Select **New user**.
- Step 2** Enter the new user name and password. Type the password identically in both text boxes.
- Some, but not all special ASCII characters are supported: !, \$, %, -, ., @, ^, _, and ~. You can use them in the password combination.
- The strength of your password combination is shown on the right, use the combination of alphabetic, numeric, upper case, and lower case characters until the password strength is good enough.
- Step 3** Select the privilege level for the new user account. Click **Add** to enable the setting.
- The privilege levels are:
- Administrator—Full control
 - Operator—Control DO, white-light illuminator, snapshot, and PTZ; unable to enter the camera Configuration page
 - Viewer—Control DO, white-light illuminator, view, listen, PTZ, and talk through the camera interface
-

Access rights are sorted by user privilege (Administrator, Operator, and Viewer). Viewers can only access the main page for live viewing.

Here you also can change a user's access rights or delete user accounts.

1. Select an existing account to modify.
2. Make necessary changes and click Update or Delete to enable the setting.

Privilege Management

- Allow anonymous viewing—If you check this item, any client can access the live stream without entering a User ID and Password.
- Digital Output & PTZ control: You can modify the management privilege as operators or viewers. Select or deselect the check boxes, and then click **Save** to enable the settings. If you give Viewers the privilege, Operators will also have the ability to control the camera through the main page.

Security > HTTPS (Hypertext Transfer Protocol over SSL)

This section explains how to enable authentication and encrypted communication. It helps protect streaming data transmission over the Internet on higher security level.

Create and Install Certificate Method

Before using HTTPS for communication with the camera, a Certificate must be created. There are two ways to create and install a certificate:

Method 1: Create and Install Certificate

- Step 1** Select the first option.
 - Step 2** Check **Enable HTTPS secure connection**, then select a connection option: **HTTP & HTTPS** or **HTTPS only**.
 - Step 3** Click **Create certificate** to generate a certificate.
The Certificate Information will automatically be displayed in the lower screen. You can click **Certificate properties** to view detailed information about the certificate.
 - Step 4** Click **Save** to preserve your configuration, and your current session with the camera will change to the encrypted connection.
 - Step 5** If your web session does not automatically change to an encrypted HTTPS session, click **Home** to return to the main page. Change the URL address from “http://” to “https://” in the address bar and press **Enter** on your keyboard. Some Security Alert dialogs will pop up. Click **OK** or **Yes** to enable HTTPS.
-

Method 2: Create Certificate Request and Install

- Step 1** Select the option from the Method pull-down menu.
- Step 2** Click **Create certificate** to proceed.
- Step 3** Certificate information will show up in a pop-up window after clicking Create. Then click **Save** to generate the certificate request.

- Step 4** The Certificate request displays. If you see a “pop-up blocked” message in the bar, click **OK** and click on the Information bar at the top of the page to allow pop-ups.
- Step 5** Look for a trusted certificate authority, such as Symantec VeriSign Authentication Services, that issues digital certificates. Sign in and purchase the SSL certification service. Copy the certificate request from your request prompt and paste it in the signing request window of the CA. Proceed with the rest of the process as CA instructions on their web page.
- Step 6** Once completed, your SSL certificate should be delivered to you via an email or other means. Copy the contents of the certificate in the email and paste it in a text/HTML/hex editor/converter, such as IDM Computer Solution UltraEdit.
- Step 7** Open a new edit, paste the certificate contents, and press **ENTER** at the end of the contents to add an empty line.
- Step 8** Convert file format from DOS to UNIX. Open **File** menu > **Conversions** > **DOS to Unix**.
- Step 9** Save the edit using the “.crt” extension, using a file name like “CAcert.crt.”
- Step 10** Return to the original firmware session, use the **Browse** button to locate the crt certificate file, and click **Upload** to enable the certification.
- Step 11** When the certificate file is successfully loaded, its status will be stated as Active. A certificate must have been created and installed before you can click the **Save** button for the configuration to take effect.
- Step 12** To begin an encrypted HTTPS session, click **Home** to return to the main page. Change the URL address from “http://” to “https://” in the address bar and press Enter on your keyboard. Some Security Alert dialogs will pop up. Click **OK** or **Yes** to enable HTTPS.
-

Security > Access List

This section explains how to control access permission by verifying the client PC IP address.

General Settings

- Maximum number of concurrent streaming connection(s) limited to—Simultaneous live viewing for 1~10 clients (including stream #1, #2, and #3). The default value is 10. If you modify the value and click **Save**, all current connections will be disconnected and automatically attempt to re-link (IE Explorer or QuickTime Player).
- Connection management—Click this button to display the connection status window showing a list of the current connections.
 - IP address—Current connections to the camera.
 - Elapsed time—How much time the client has been at the web page.
 - User ID—If the administrator has set a password for the web page, the clients have to enter a user name and password to access the live video. The user name will be displayed in the User ID column. If the administrator allows clients to link to the web page without a user name and password, the User ID column will be empty.

There are some situations which allow clients access to the live video without a user name and password:

- The administrator does not set up a root password. For more information about how to set up a root password and manage user accounts, see the [“Security > User accounts” section on page 5-32](#).
- The administrator has set up a root password, but set RTSP Authentication to “disable”. For more information about RTSP Authentication, see the [“RTSP Streaming” section on page 5-27](#).
- The administrator has set up a root password, but allows anonymous viewing. For more information, see the [“Security > User accounts” section on page 5-32](#).
- Refresh—Click this button to refresh all current connections.
- Add to deny list—You can select entries from the Connection Status list and add them to the Deny List to deny access. Those checked connections will only be disconnected temporarily and will automatically try to re-link again (IE Explore or Quick Time Player). If you want to enable the denied list, check **Enable access list filtering** and click **Save** in the first column.
- Disconnect—If you want to break off the current connections, please select them and click this button. Those checked connections will only be disconnected temporarily and will automatically try to re-link again (IE Explorer or QuickTime Player)

Filter

- Enable access list filtering—Check this item and click **Save** if you want to enable the access list filtering function.
- Filter type—Select **Allow** or **Deny** as the filter type. If you choose Allow, only those clients whose IP addresses are on the Access List below can access the camera, and the others cannot access. If you choose Deny, those clients whose IP addresses are on the Access List will not be allowed to access the camera, and the others can access.

Then you can Add a rule to the following Access List. Please note that the IPv6 access list column will not be displayed unless you enable IPv6 on the Network page. For more information about IPv6 Settings, see the [“Network Type” section on page 5-24](#).

There are three types of rules:

- Single—This rule allows the user to add an IP address to the Allowed/Denied List.
- Network—This rule allows the user to assign a network address and corresponding subnet mask to the Allow/Deny list. The routing prefix is written in CIDR (Classless Inter-Domain Routing) notation.

For example:

- 192.168.100.14/24 represents the IPv4 address 192.168.100.14 and its associated routing prefix 192.168.100.0, or equivalently, its subnet mask 255.255.255.0 has 24 leading 1-bits
- The IPv4 block 192.168.100.0/22 represents the 1024 IPv4 addresses from 192.168.100.0 to 192.168.103.255
- Range—This rule allows the user to assign a range of IP addresses to the Allow/Deny List. This rule is only applied to IPv4

Administrator IP address

- Always allow the IP address to access this device—You can check this item and add the Administrator IP address in this field to make sure the Administrator can always connect to the device.

Security > IEEE 802.1X

Enable this function if your network environment uses IEEE 802.1x, which is a port-based network access control. The network devices, intermediary switch/access point/hub, and RADIUS server must support and enable 802.1x settings.

The 802.1x standard is designed to enhance the security of local area networks, which provides authentication to network devices (clients) attached to a network port (wired or wireless). If all certificates between client and server are verified, a point-to-point connection will be enabled; if authentication fails, access on that port will be prohibited. 802.1x utilizes an existing protocol, the Extensible Authentication Protocol (EAP), to facilitate communication.

The components of a protected network with 802.1x authentication include the following:

- **Supplicant**—A client end user (camera), which requests authentication
- **Authenticator** (an access point or a switch)—A “go between” that restricts unauthorized end users from communicating with the authentication server
- **Authentication server** (usually a RADIUS server)—Checks the client certificate and decides whether to accept the end user access request.

Cameras support two types of EAP methods to perform authentication: EAP-PEAP and EAP-TLS.

To enable 802.1x settings, follow these steps:

-
- Step 1** Before connecting the camera to the protected network with 802.1x, apply a digital certificate from a Certificate Authority (such as your network administrator) that can be validated by a RADIUS server.
- Step 2** Connect the camera to a PC or notebook outside of the protected LAN. Open the configuration page of the camera. Select EAP-PEAP or EAP-TLS as the EAP method. In the field, enter your ID and password issued by the CA, then upload related certificate(s).
- Step 3** When all settings are complete, move the camera to the protected LAN by connecting it to an 802.1x enabled switch. The devices will then start the authentication automatically.
-



Note

The authentication process for 802.1x:

1. The Certificate Authority (CA) provides the required signed certificates to the camera (the supplicant) and the RADIUS server (the authentication server).
 2. A camera requests access to the protected LAN using 802.1X via a switch (the authenticator). The client offers its identity and client certificate, which is then forwarded by the switch to the RADIUS server, which uses an algorithm to authenticate the camera and returns an acceptance or rejection to the switch.
 3. The switch also forwards the RADIUS server certificate to the camera.
 4. Assuming all certificates are validated, the switch then changes the camera state to authorized and is allowed access to the protected network via a preconfigured port.
-

Security > SSH

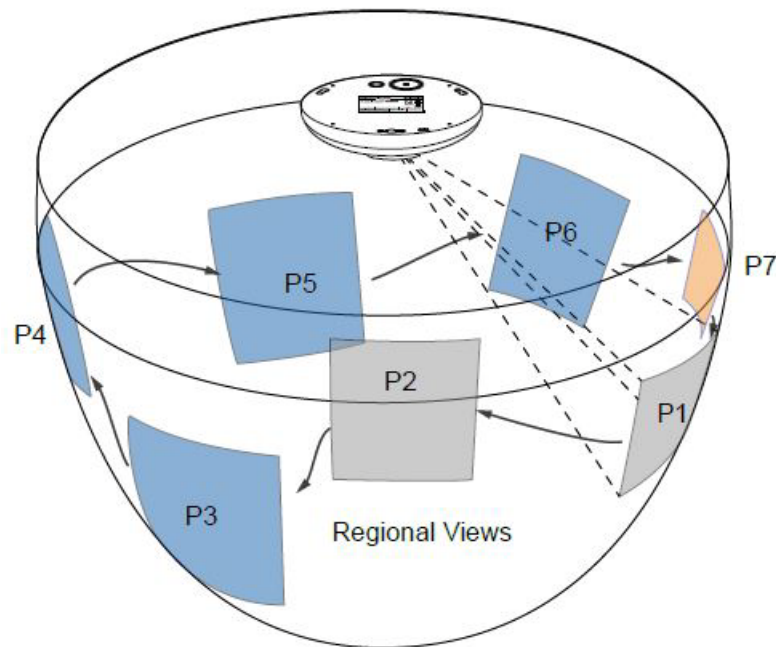
- Enable SSH server—Check this check box if you want to allow access to the camera through an SSH connection.
- SSH port—Enter the SSH port that is used to access the IP camera. Valid port numbers are 22 and 1024 through 65535. The default port is 22.

Click **Save** to enable the settings.

PTZ > PTZ settings

This section explains how to control the camera digital e-PTZ (Pan/Tilt/Zoom) operation.

The fisheye PTZ function allows users to move among regional views for close-up viewing. The PTZ view takes effect when the current field of view is not the circular Original view or the Panoramic view. Users can then move the view in different directions or zoom in or zoom out on the screen.




PTZ Settings

The screenshot shows the PTZ settings interface. At the top, there's a 'Select stream' dropdown set to '1'. Below it are two video windows: the left one shows a zoomed-in view of a camera lens with 'Zoom In' and 'Zoom Out' buttons, and the right one shows a wide-angle fisheye view of a room. Below the video windows are navigation buttons: 'Home', 'Zoom', and directional arrows. To the right are speed settings for Pan, Tilt, Zoom, and Panoramic, each with a dropdown menu. The 'Preset and rotate settings' section includes a 'Name' field, an 'Add' button, and a 'Rotate speed' dropdown. There are two lists: 'User preset locations' and 'Rotate locations', each with a 'Remove' button and a 'More' button. A 'Misc settings' section has a checked 'Zoom factor display' option. At the bottom right is a 'Save' button.

Preset positions and rotation settings—In the PTZ settings page, you can create preset positions in the hemisphere covered by the fisheye lens. A total of 20 preset positions can be configured.



To configure preset positions and arrange them in a rotational tour through different positions, follow these steps:

1. Select a video stream on which the PTZ settings will take place.
2. Adjust the shooting area to the desired position using the PTZ keypad, the FOV indicators, or mouse clicks on the live screen. To begin the mouse control, click on the two interactive windows. Due to the highly-sensitive mouse control, the PTZ control buttons can help fine-tune to an optimal location.

3. After you selected an area of interest, enter a name for the new position, which can contain up to 40 alphabetic and numeric characters.
4. Click **Add** to enable the settings. The preset positions will be listed on the User preset locations. (To add more positions you wish, repeat Step 1 through Step 3.)
5. Select the preset positions by their checkboxes.
6. Click on the move button  to move positions to the Patrol locations window.
7. You may select some or all of the imported positions as the stop points during the tour.
8. Select a preset position when you need to move to a specific place on screen.

Select a preferred Rotate speed or move the preset positions for consecutively displaying views of multiple positions. The speeds for rotating through each position on a Regional view window are shown below.

9. Click on the **Save** button to preserve your configuration.

To remove a preset position from the list, select it and click Remove. You can re-arrange the order of the position hop on the list using the   buttons.

Event > Event settings

This section explains how to configure the camera to respond to particular situations (events). A typical application is that when a motion is detected, the camera sends buffered images to an FTP server or e-mail address as notifications. Click **Help**, there is an illustration shown in the pop-up window explaining that an event can be triggered by many sources, such as motion detection or external digital input devices. When an event is triggered, you can specify what type of action that will be performed. You can configure the camera to send snapshots or videos to your email address or FTP site.

Event

An event is an action initiated by a user-defined trigger source. In the Event column, click **Add** to open the event settings window. Here you can configure three elements—Schedule, Trigger, and Action—to set an event.

- Event name—Enter a name for the event setting.
- Enable this event—Select this checkbox to enable the event setting.
- Priority—Select the relative importance of this event (High, Normal, or Low). Events with a higher priority setting will be executed first.
- Detect next motion detection or digital input after x seconds—Enter the duration in seconds to pause motion detection after a motion is detected. This prevents too many events to be triggered within a short time.

Schedule

Specify the period for the event. Select the days of the week and the time in a day (in 24-hr time format) to specify when will the event-triggering conditions take effect.

Trigger

This is the cause or stimulus that defines what will trigger the event. The trigger source can be configured to use the camera built-in motion detection mechanism or external digital input devices.

There are several choices of trigger sources. Select the item to display the detailed configuration options.

- Video motion detection—This option makes use of the built-in motion detection mechanism as a trigger source. To enable this function, you need to configure a Motion Detection Window first. For more information, see the [“Applications > Motion detection” section on page 5-45](#).
- Periodically—This option allows the camera to trigger periodically for every other defined minute. Up to 999 minutes are allowed.
- Digital input—This option allows the camera to use an external digital input device or sensor as a trigger source. Depending on your application, there are many choices with digital input devices on the market which help detect changes in temperature, vibration, sound, light, and so on.
- System boot—This option triggers the camera when the power to the camera is disconnected and reconnected.
- Recording notify—This option allows the camera to trigger when the recording disk is full or when recording starts to overwrite older data.
- Audio detection—A preset threshold can be configured with an external microphone as the trigger to system event. The triggering condition can be an input exceeding or falling below a threshold. Audio detection can take place as a complement to motion detection or as a method to detect activities not covered by the camera view.
- Camera tampering detection— This option allows the camera to trigger when the camera detects that is being tampered with. To enable this function, you need to configure the Tampering Detection option first. See the [“Applications > Tampering detection” section on page 5-47](#) for detailed information.
- Manual Triggers—This option allows you to enable event triggers manually by clicking the on/off button on the homepage. Configure one to three associated events before using this function.
- VADP—It is presumed that you already uploaded and enabled the Cisco APP Package modules before you can associate Cisco APP Package triggers with an Event setting.

Click on the **Set VADP Trigger** button to open the VADP triggers menu. The triggering conditions available with third-party software modules known as Cisco APP Packages will be listed. Use the arrow buttons to select these triggers. You may implant these modules for different purposes such as triggering motion detection, or applications related to video analysis, etc. See the [“Applications > Package management” section on page 5-49](#) for the configuration options with Cisco App Package modules.

Once the triggers are configured, they will be listed under the VADP option.

Action

Define the actions to be performed by the camera when a trigger is activated.

- Trigger digital output for x seconds—Select this option to turn on the digital output signals (via the DO connectors on the main assembly) when a trigger is activated. Specify the length of the trigger interval in the text box.
- SD—Select this option to back up media files on an SD card if the network is disconnected. This function will only be displayed after you set up a network storage (NAS). The media to back up can include snapshot images, video, or system logs depending on your event settings.

To configure an event with video recording or snapshots, it is necessary to configure/provide servers and storage media settings so that the camera will know where to send the media files to when a trigger is activated.

Add server

Click **Add server** in the Action display to open the server setting window. You can specify how the notification messages are delivered when a trigger is activated. A total of five server settings can be configured.

There are four choices of server types available: Email, FTP, HTTP, and Network storage. Select the item to display the detailed configuration options. You can configure either one or all of them.

Server type: Email

Select to send the media files via email when a trigger is activated.

- Server name—Enter a name for the server setting.
- Sender email address—Enter a valid email address as the sender ad.
- Recipient email address—Enter a valid email address as the recipient address.
- Server address—Enter the domain name or IP address of the email server.
- User name—Enter the user name of the email account if necessary.
- Password—Enter the password of the email account if necessary.
- Server port—The default mail server port is set to 25. You can also manually set another port.

If your SMTP server requires a secure connection (SSL), select **This server requires a secure connection (SSL)**.

To verify if the email settings are correctly configured, click **Test**. The result will be shown in a pop-up window. If successful, you will also receive an email indicating the result.

Click **Save server** to enable the settings, then click **Close** to exit the Add server page.

After you configure the first event server, the new event server will automatically display on the Server list. If you wish to add other server options, click **Add server**.

Server type: FTP

Select to send the media files to an FTP server when a trigger is activated.

- Server name—Enter a name for the server setting.
- Server address—Enter the domain name or IP address of the FTP server.
- Server port—By default, the FTP server port is set to 21. It can also be assigned to another port number between 1025 and 65535.
- User name—Enter the login name of the FTP account.
- Password—Enter the password of the FTP account.
- FTP folder name—Enter the folder where the media files will be placed. If the folder name does not exist, the camera will automatically create one on the FTP server.
- Passive mode—Most firewalls do not accept new connections initiated from external requests. If the FTP server supports passive mode, select this option to enable passive mode FTP and allow data transmission to pass through the firewall.

To verify if the FTP settings are correctly configured, click **Test**. The result will be shown in a pop-up window. If successful, you will also receive a test.txt file on the FTP server.

Click **Save server** to enable the settings.

Server type: HTTP

Select to send the media files to an HTTP server when a trigger is activated.

- Server name—Enter a name for the server setting.
- URL—Enter the URL of the HTTP server.
- User name—Enter the user name if necessary.
- Password—Enter the password if necessary.

To verify if the HTTP settings are correctly configured, click **Test**. The result will be shown in a pop-up window. If successful, you will receive a test.txt file on the HTTP server.

Click **Save server** to enable the settings.

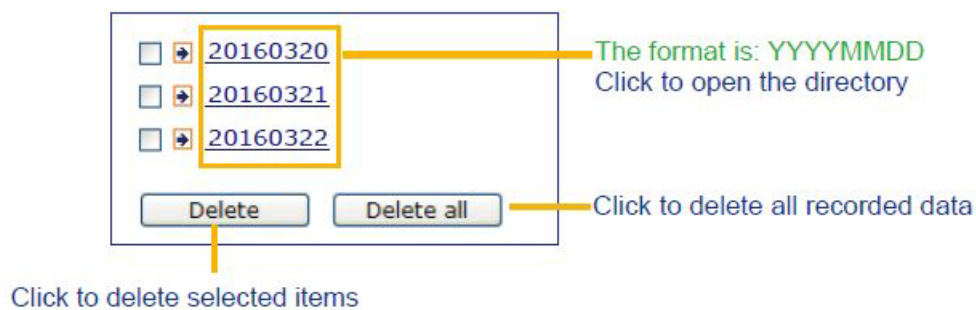
Network storage

Select to send the media files to a networked storage when a trigger is activated. See the “[Recording > Recording settings](#)” section on page 50 for details. Click **Save server** to enable the settings, then click **Close** to exit the Add server page.

Additional Actions

- SD Test—Click to test your SD card. The system will display a message indicating the result as a success or a failure. If you want to use your SD card for local storage, format it before use.
- View—Click this button to open a file list window. This function is only for SD card and Network Storage. If you click the View button for an SD card, a Local storage page will prompt so that you can manage the recorded files on SD card. For more information about Local storage, see the “[Local storage > SD card management](#)” section on page 5-52. If you click the View button for a Network storage, a file directory window will prompt for you to view recorded data on Network storage.
- Create folders by date, time, and hour automatically—If you select this item, the system will automatically create folders by the date when video footages are stored onto the networked storage.

The following is an example of a file destination with video clips:



Click 20160320 to open the directory:

The format is: HH (24r)

Click to open the file list for that hour

< 07 08 09 10 11 12 13 14 15 16 17 >				
	file name	size	date	time
<input type="checkbox"/>	Video Clip_58.mp4	2526004	2016/03/20	07:58:28
<input type="checkbox"/>	Video Clip_59.mp4	2563536	2016/03/20	07:59:28

Buttons: Delete, Delete all, Back

Click to delete selected items

Click to delete all recorded data

Click to go back to the previous level of the directory

< 07 08 09 10 11 12 13 14 15 16 17 >				
	file name	size	date	time
<input type="checkbox"/>	Video Clip_58.mp4	2526004	2016/03/20	07:58:28
<input type="checkbox"/>	Video Clip_59.mp4	2563536	2016/03/20	07:59:28

Buttons: Delete, Delete all, Back

The format is: File name prefix + Minute (mm)

You can set up the file name prefix on Add media page.

Add media

Click **Add media** in the Action display to open the media setting window. You can specify the type of media that will be sent when a trigger is activated. A total of five media settings can be configured. There are three choices of media types available: Snapshot, Video Clip, and System log. Select the item to display the detailed configuration options. You can configure either one or all of them.

Media type: Snapshot

Select to send snapshots when a trigger is activated.

- Media name—Enter a name for the media setting.
- Source—Select to take snapshots from any of the video streams.
- Send *x* pre-event images—The camera has a buffer area; it temporarily holds data up to a certain limit. Enter a number to decide how many images to capture before a trigger is activated. Up to 7 images can be generated.

- Send x post-event images—Enter a number to decide how many images to capture after a trigger is activated. Up to seven images can be generated. For example, if both the Send pre-event images and Send post-event images are set to 7, a total of 15 images can be generated after a trigger is activated.
- File name prefix—Enter the text that will be appended to the front of the file name.
- Add date and time suffix to the file name—Select this option to add a date/time suffix to the file name. The date and time suffix format is YYYYMMDD_HHMMSS.

Click **Save media** to enable the settings.

After you set up the first media server, a new column for media server will automatically display on the Media list. If you wish to add more media options, click **Add media**.

Media type: Video clip

Select to send video clips when a trigger is activated.

- Media name—Enter a name for the media setting.
- Source—Select a video stream as the source of video clip.
- Pre-event recording—The camera has a buffer area; it temporarily holds data up to a certain limit. Enter a number to decide the duration of recording before a trigger is activated. Up to 9 seconds of video can be recorded.
- Maximum duration—Specify the maximum recording duration in seconds. Up to 10 seconds of video can be recorded. For example, if pre-event recording is set to 5 seconds and the maximum duration is set to 10 seconds, the camera continues to record for another 4 seconds after a trigger is activated.
- Maximum file size—Specify the maximum file size allowed.
- File name prefix—Enter the text that will be appended to the front of the file name.

Click **Save media** to enable the settings.

Media type: System log

Select to send a system log when a trigger is activated.

Click **Save media** to enable the settings, then click **Close** to exit the Add Media page.

- View—Click this button to open a file list window. This function is only for SD card and Network Storage. If you click the View button on an SD card, For more information about Local storage, see the “[Local storage > SD card management](#)” section on page 5-52. If you click the View button of Network storage, a file directory window will prompt for you to view recorded data on Network storage.
- Create folders by date, time, and hour automatically—If you select this item, the system will automatically create folders by the date.

When completed the settings with steps 1~3 to arrange Schedule, Trigger, and Action of an event, click **Save event** to enable the settings and click **Close** to exit the page.

When the Event Status is ON, once an event is triggered by motion detection, the camera will automatically send snapshots via e-mail.

If you want to stop the event trigger, you can click on the **ON** button to turn it to OFF status or click the **Delete** button to remove the event setting.

To remove a server setting from the list, select a server name from the drop-down list and click **Delete**. You can delete a server setting only when it is not applied in an event setting.

To remove a media setting from the list, select a media name from the drop-down list and click **Delete**. You can delete a media setting only when it is not applied in an event setting.

Customized Script

This function allows you to upload a sample script (.xml file) to the camera, which will save you time on configuring the settings. There is a limited number of customized scripts you can upload; if the current amount of customized scripts has reached the limit, an alert message will prompt.

Click **Add** to upload a file. Click in the script display to modify the script online.

Applications > Motion detection

This section explains how to configure the camera to enable motion detection. A total of five motion detection windows can be configured.

Motion detection setting 1, Normal light mode, is for normal situations. Motion detection setting 2, Profile mode, is for special situations.

To enable motion detection, follow these steps:

-
- Step 1** Click **New** to add a new motion detection window.
 - Step 2** In the Window Name text box, enter a name for the motion detection window.
Use four mouse clicks to designate a detection window. You can change the window shape by dragging the corner marks to a preferred location.
Drag the item size tab to change the minimum size of item to trigger an alarm. An item size box will appear in the center of screen for your reference (in semi-transparent red). An intruding object must be larger than the Item size to trigger an alarm. Change the item size according to the live view.
To delete a window, click the X mark on the right of the window name.
 - Step 3** Define the sensitivity to moving objects by moving the Sensitivity slide bar.
A high sensitivity is prone to produce false alarms such as the fast changes of light (such as day/night mode switch, turning lights on/off). A movement must persist longer than 0.3 second for the motion to be detected.
 - Step 4** Click **Save** to enable the settings.
 - Step 5** Select **Enable motion detection** to enable this function.
-

The Percentage Indicator will rise or fall depending on the variation between sequential images. When motions are detected by the camera and are considered to exceed the preset threshold, the red bar rises. Meanwhile, the motion detection window will be outlined in red.

Photos or videos can be captured instantly and configured to be sent to a remote server (via an email or FTP server). For more information about how to configure an event setting, see the [“Event > Event settings”](#) section on page 5-39.

A green bar indicates that even though motions have been detected, the event has not been triggered because the image variations still fall under the preset threshold.

If you want to configure other motion detection settings for day/night/schedule mode (for example, for a different lighting condition during a specific period of time), click **Profile** to open the Motion Detection Profile Settings page. Another three motion detection windows can be configured on this page.

To set up a profile, follow these steps:

-
- Step 1** Create a new motion detection window by clicking the **New** button at the bottom of the page and then clicking in the image, and configure the minimum item size. For more information about creating a motion detection window, see the [“Applications > Motion detection”](#) section on page 5-45.
 - Step 2** Click the **Profile mode** tab.
 - Step 3** Select the applicable Schedule mode. Manually enter a time range.
 - Step 4** Click **Save** to enable the settings and click **Close** to exit the page.
-

This motion detection window will also be displayed on the Event Settings page. You can go to **Event > Event settings > Trigger** to select it as a trigger source. See the [“Event > Event settings”](#) procedure on page 5-39 for detailed information.

How Does Motion Detection Work?

There are two motion detection parameters: Sensitivity and Min. Item Size. Sensitivity is a value that expresses the sensitivity to moving objects. A higher sensitivity setting allows camera to detect slight movements while a lower sensitivity setting will neglect them.

The minimum item size is a threshold value that determines how many “alerted pixels” can trigger an event. When the size of an intruding object is larger than the minimum size, and its movement persist for 0.3 second, the motion is judged to exceed the defined threshold; and the motion window will be outlined in red. With a large minimum item size, the size of moving object is considered as smaller than the minimum item size, no motion alarm is triggered. With a smaller minimum item size, the same moving object triggers the alarm.

For applications that require a high level of security management, it is suggested to use higher sensitivity settings. However, a higher sensitivity level can also produce false alarms due to fast light changes when switching between the day and night modes, AE switch, turning the light on or off, and so on.

Applications > DI and DO

- Digital input—Select **High** or **Low** as the Normal status for the digital input. Connect the digital input pin of the camera to an external device to detect the current connection status.
- Digital output—Select **Grounded** or **Open** to define the normal status for the digital output. Connect the digital output pin of the camera to an external device to determine the current status.

Set up the event source as DI on Event > Event settings Add Event > Trigger. See the [“Event > Event settings”](#) section on page 5-39 for detailed information.

Applications > Tampering detection

This section explains how to set up camera tamper detection. With tamper detection, the camera is capable of detecting incidents such as redirection, blocking or defocusing, or even spray paint.

To set up the camera tamper detection function, follow these steps:

-
- Step 1** Click to select the check box before tampering conditions: Tampering detection, Image too dark, Image too bright, and Image too blurry, then enter the tamper trigger duration (10 sec. ~ 10 min.). The duration specifies the set of time before the tampering is considered as a real alarm. This helps avoid false alarms by short-lived changes.

The tamper alarm will be triggered only when the tampering factor (the difference between current frame and pre-saved background) exceeds the trigger threshold. Conditions such as image too dark, too bright, or too blurry (defocused) can also be configured as tampering conditions. The Trigger threshold determines how sensitive your is tamper detection setting. Lower the threshold number, easier to trigger.

- Too bright—Shining a flashlight. The average lighting level of the scene is taken into consideration.
- Too dark—Covering the objective or spraying paint.
- Too blurry—Blurry scene can be the result of strong interference on the device, such as EMI interference.

- Step 2** You can configure Tampering Detection as a trigger element to the proactive event configurations in Event > Event settings > Trigger.

For example, when the camera is tampered with, the camera can be configured to send the pre- and post-event video clips to a networked storage device. See the [“Event > Event settings” section on page 5-39](#) for detailed information.

Applications > Audio detection

Audio detection, along with video motion detection, is applicable in the following scenarios:

- Detection of activities not covered by camera view, for example, a loud input by gun shots or breaking a door/window
- A usually noisy environment, such as a factory, suddenly becomes quiet due to a breakdown of machines
- A PTZ camera can be directed to turn to a preset point by the occurrence of audio events
- Dark environments where video motion detection may not function well

In the example shown in [Figure 5-10](#), the red circles indicate where the audio alarms can be triggered when breaching or falling below the preset threshold.

Figure 5-10 Audio Detection



To configure audio detection, follow these steps:

-
- Step 1** Once the Audio detection window is opened, the current sound input will be interactively indicated by a fluctuating yellow wave diagram.
- Step 2** Use a mouse click to drag the Alarm level tab to a preferred location on the slide bar.
- Step 3** Select the **Enable audio detection** check box and click **Save** to enable the feature.
-

**Note**

- The volume numbers (0~100) on the side of wave diagram do not represent decibel (dB). Sound intensity level has already been mapped to preset values. You can, however, use the real-world inputs at your installation site that are shown on the wave diagram to configure an alarm level.
 - To configure this feature, you must not mute the audio in Configuration > Media > Audio. The default of the camera can be muted due to the lack of an internal microphone. An external microphone is provided by users.
-

You can use the Profile window to configure a different Audio detection setting. For example, a place can be noisy in the day time and become very quiet in the night. To make this configuration, follow these steps:

-
- Step 1** Click on the **Enable this profile** check box.
- Once the Audio detection window is opened, the current sound input will be interactively indicated by a fluctuating yellow wave diagram.

- Step 2** Use a mouse click to drag the Alarm level tab to a preferred location on the slide bar.
- Step 3** Select the Day, Night, or Schedule mode check circles.
You may also manually configure a period of time during which this profile will take effect.
- Step 4** Click **Save** and then click **Close** to complete your configuration.
-

If the Alarm level and the received volume are set within a range of 20% on the wave diagram, frequent alarms will be triggered. It is recommended to set the Alarm level farther apart from the detected sound level.

To configure and enable this feature, you must not configure video stream #1 into Motion JPEG. If an external microphone input is connected and recording of audio stream is preferred, audio stream is transmitted between camera and viewer/recording station along with stream #1.

See the “[Media > Audio](#)” section on page 5-22 for audio settings and the “[Media > Video](#)” section on page 5-16 for video streaming settings.

Applications > Package management

You can store and execute Cisco software modules onto the camera's flash memory or SD card. These software modules can apply in video analysis for intelligent video applications such as license plate recognition, object counting, or as an agent for edge recording, and so on.

- Once the software package is successfully uploaded, the module configuration (vadvp.xml) information is displayed. When uploading a module, the camera will examine whether the module fits the predefined Cisco APP package requirements. Contact Cisco or the vendor of your third-party module for the parameters contained within.
- You can also run Cisco APP package packages as a means to access updated functionality instead of replacing the entire firmware.
- For some cameras the flash is too small to hold Cisco APP package packages. These cameras will have their Save to SD card check boxes selected and grayed-out for all time.
- The file system of SD card (FAT32) does not support soft (symbolic) link. It will return failure if your module tries to create soft links on SD card.

To utilize a software module, acquire the software package and click **Browse** and **Upload** buttons.

To start a module, select the radio button in front, and click the **Start** button.

If you need to remove a module, select the radio button in front and then click the **Stop** button. By then the module status will become OFF, and the X button will appear at the end of the row. Click on the **X** button to remove an existing module.

To set a time that a module starts and stops each day, click the **Schedule** button, and then use the From and To fields that appear to set the times.

When prompted by a confirm message, click **Yes** to proceed.

That the actual memory consumed while operating the module will be indicated on the Memory status field. This helps determine whether a running module has consumed too much of system resources.

Recording > Recording settings

This section explains how to configure the recording settings for the camera.

Recording Settings

Insert your SD card and click **SD test** to test



Note

- Each Recording setting records a video stream from one channel, that is, from a single lens module
- Remember to format your SD card via the camera web console (in the Local storage SD card management page) when using it for the first time. See the [“Local storage > SD card management”](#) section on page 5-52 for detailed information.

Click **Add** to open the recording setting window. On this page, you can define the adaptive recording, recording source, recording schedule, and recording capacity. A total of two recording settings can be configured.

- Recording name—Enter a name for the recording setting.
- Enable this recording—Select this option to enable video recording.
- With adaptive recording—Selecting this option will activate the frame rate control according to alarm trigger. The frame control means that when there is a triggered alarm, the frame rate will raise to the value you configured on the Stream setting page. See the [“Media > Video”](#) section on page 5-16 for more information.

If you enable adaptive recording on Camera A, only when an event is triggered on Camera A will the server record the full frame rate streaming data; otherwise, it will only request the I frame data during normal monitoring, thus effectively saves bandwidths and storage space.



Note

To enable adaptive recording, make sure you have set up the trigger source such as Motion Detection, DI Device, or Manual Trigger.

When there is no alarm trigger:

- JPEG mode: record 1 frame per second
- H.264 or H.265 mode: record the I frame only

When the I frame period is >1s on Video settings page, firmware will force decrease the I frame period to 1s when adaptive recording is enabled.

The alarm trigger includes motion detection and DI detection. See the [“Event > Event settings”](#) section on page 5-39.

- Pre-event recording and post-event recording—Available when you enable **With adaptive recording**. The camera has a buffer that temporarily holds data up to a certain limit. Enter a number to define the duration of recording before and after a trigger is activated.
- Priority—Select the relative importance of this recording (High, Normal, or Low). Recording with a higher priority setting will be executed first.
- Source—Select a video stream as the recording source.

To enable recording notification configure Event settings first. See the “[Event > Event settings](#)” section on page 5-39.

**Note**

- To enable adaptive recording, please also enable time shift caching stream and select a caching stream on Media > Video > Stream settings. See the “[Media > Video](#)” section on page 5-16 for detailed instructions.
- To enable recording notification, first configure Event settings. See the “[Event > Event settings](#)” section on page 5-39.

Follow these steps to set up recording:

1. **Trigger:** Select a trigger source.
 - **Schedule**—The server will start to record files on the local storage or network storage (NAS).
 - **Network fail**—Since network fail, the server will start to record files on the local storage (SD card).
2. **Destination:** You can select the SD card or network storage (NAS) for the recorded video files. If you have not configured a NAS server, see the following steps.

NAS server

1. Click **Add NAS server** to open the server setting window.
2. Fill in the information for your server.
 - In the Server name field, enter the name of the NAS server.
 - In the Network storage location field, enter the network storage path in the format `\\server_name` or `IP_address\folder_name`
 - In the Workgroup field, enter the workgroup of the NAS server.
 - In the Username and password field, enter information for your server
3. Click **Test** to check the setting. The result will be shown in a pop-up window. If successful, you will receive a test.txt file on the network storage server.
4. Click **Save** to complete the settings and click **Close** to exit the page.

The following options appear when you add a NAS server:

- **Capacity**—You can choose either the entire free space available or limit the reserved space. The recording size limitation must be larger than the reserved amount for cyclic recording. The reserved space is a small amount of space used only for the transaction stage when the capacity is about to be used up or recycled.
- **Enable cyclic recording**—If you check this item, when the maximum capacity is reached, the oldest file will be overwritten by the latest one. The reserved amount is reserved for the transaction stage when the storage space is about to be full and new data arrives. The minimum for the Reserved space must be larger than 15 MB.
- **Recording file management**—You can manually assign the Maximum duration and the Maximum file size for each recording footage. You may need to stitch individual files together under some circumstances. You may also designate a file name prefix by filling in the responsive text field.
- **File name prefix**—Enter the text that will be appended to the front of the file name.

If you want to enable recording notification, click Event to set up. See the “[Event > Event settings](#)” section on page 5-39 for more details.

When completed, select **Enable this recording**. Click **Save** to enable the setting and click **Close** to exit this page. When the system begins recording, it will send the recorded files to the network storage or SD card. The new recording name will appear on the recording page.

To remove an existing recording setting from the list, single-click to select it and click **Delete**.

- **Video (Name)**—Click to open the Recording Settings page to modify.
- **ON (Status)**—Click to manually adjust the Status. (ON: start recording; OFF: stop recording.)
- **NAS or SD (Destination)**: Click to open the file list of recordings. For more information about folder naming rules, see the [“Add media” section on page 5-43](#).

Local storage > SD card management

This section explains how to manage the local storage on the camera. Here you can view SD card status, and implement SD card control.



Note

- It is recommended to turn OFF the recording activity before you remove an SD card from the camera.
- The lifespan of an SD card is limited. Regular replacement of the SD card can be necessary.
- Camera file system takes up several megabytes of memory space. The storage space cannot be used for recording.
- An SD card that already contains data recorded by another device should not be used in this camera.
- Do not modify or change the folder names in the SD card. That may result in camera malfunctions.

SD card status

This column shows the status, file system, size, and usage information for your SD card. Remember to format the SD card when using for the first time. If the SD card status field shows “Detached,” there is no SD card.

SD card format

The Linux kernel EXT4 file system format applies to SD card larger than 32GB. However, if EXT4 is applied, computers running Windows will not be able to access the contents on the SD card unless using some third-party software. If the SD card capacity is larger than 8GB, you should format the card using the Ext4 standard.

SD card control

- **Enable cyclic storage**—Check this item if you want to enable cyclic recording. When the maximum capacity is reached, the oldest file will be overwritten by the latest one.
- **Enable automatic disk cleanup**—Check this item and enter the number of days you wish to retain a file. For example, if you enter “7 days,” the recorded files will be stored on the SD card for 7 days.

Click **Save** to enable your settings.

Local storage > Content management

This section explains how to manage the content of recorded videos on the camera. Here you can search and view the records and view the searched results.

Searching and Viewing the Records

To set up search criteria for recorded data, use the following options. If you do not select any criteria and click **Search** button, all recorded data will be listed in the Search results area.

- **Trigger types**—Select one or more trigger types.
- **Media type**—Select the media type (Video clip, Snapshot, or text).
- **Time**—Use the options to search the last x minutes, hours, day, or weeks, to search designated from and to dated and times.

Click **Search** and the recorded data corresponding to the search criteria will be listed in Search results area.

Search Results

The Search results window includes four columns: Name, Trigger time, Starting Time, and Ending time.

From the drop-down list at the bottom left, choose the number of entries to be displayed on one page.

You can sort the search results by any column by clicking the column title. Click as needed choose ascending or descending order.

- **Play**—Click on a search result which will highlight the selected item. A Play window will appear on top for immediate review of the selected file.
- **Download**—Click on a search result to highlight the selected item in purple. Then click the Download button and a file download window will pop up for you to save the file.
- **Lock/Unlock**—Select the check box in front of a desired search result, then click this button. The selected items will become Locked, which will not be deleted during cyclic recording. You can click again to unlock the selections.
- **JPEGs to AVI**—This functions only applies to JPEG format files such as snapshots. You can select several snapshots from the list, then click this button. Those snapshots will be converted into an AVI file.
- **Remove**—Select the desired search results, then click this button to delete the files.

