Hikrobot Machine Vision Software

User Manual

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The Manual includes instructions for using and managing the Product. Pictures, charts, images and all other information hereinafter are for description and explanation only. The information contained in the Manual is subject to change, without notice, due to firmware updates or other reasons. Please find the latest version of this Manual at the Hikrobot website (*https://en.hikrobotics.com*).
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Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
Danger	Indicates a hazardous situation which, if not avoided, will or could result in death or serious injury.
Caution	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
Note	Provides additional information to emphasize or supplement important points of the main text.

Contents

Chapter 1 Overview

This chapter mainly introduce the Software, including the key features, system requirements, revision history, and main interface.

1.1 Introduction

The Software is designed by Hikrobot for controlling and managing the machine vision cameras (including GigE Vision cameras, USB3 Vision cameras, Camera Link cameras, 10GigE cameras, and CoaXPress cameras) in your Vision system.
The Software allows you to batch export and import features of different cameras via multiple methods, providing great convenience for camera feature configuration in different usage scenarios. Not just a controller, it also receives image data and allows you to view the live videos streamed from cameras. While viewing the live videos, you can adjust the image quality, save captured pictures and recorded videos, and adjust camera parameters.
With the Software, you can determine the optimal settings for your Vision system.

1.2 Key Features

- Easy to Install: Install the software easily without installing driver separately.
- Wide Compatibility: Supports multiple operation systems including Windows XP (32-bit), Windows 7/10 (32/64-bit).
- Interface for Better User Experience: Provides clear and simple user interfaces.
- Multiple-Camera Live View: Supports setting window division and viewing the live view of multiple cameras simultaneously.

1.3 System Requirements

Make sure the computer on which you install the client software at least meets the minimum requirements.

Note

- This software has integrated all the required drivers. As a result, you can install the software easily without installing driver separately.
- We recommend adding the software to the whitelist of the antivirus software, in case of being recognized as virus.

Recommended

- Operating System: Microsoft Windows 7/10 (32/64-bit) or Microsoft Windows XP

(32-bit)
- CPU: Intel Pentium IV 3.0 GHz and above
- Memory: 4GB and above
- Display Resolution: 640 × 480 or above
- Network Adapter: Intel Pro1000, I210, I350 series
- USB 3.0: Industrial personal computer or PC needs to support USB 3.0 interface

Minimum

- Operating System: Microsoft Windows 7/10 (32/64-bit) or Microsoft Windows XP (32-bit)
- CPU: Intel Pentium IV 2.0 GHz
- Memory: 1GB
- Display Resolution: 640 × 480 or above
- Network Adapter: Intel Pro1000, I210, I350 series
- USB 3.0: Industrial personal computer or PC needs to support USB 3.0 interface

1.4 Revision History

The following table shows the revision history of the Software.

Table 1-1 Revision History

Version	Date	Changes
V4.0.0	22nd Dec. 2022	● In ***General Settings***, added descriptions of temperature screening settings and bayer interpolation. ● Updated the selecting mode of event in ***Event Monitor***. ● In ***Add a Virtual Camera***, added the descriptions of changing online mode. ● Added ***Dead Pixel Correction***. ● On the Camera Feature Configuration pane, added ***Temperature Window***. ● Added ***Temperature Screening Configuration***. ● In ***Firmware Updater***, added descriptions of frame grabber and batch upgrading firmwares of cameras under a frame grabber. ● In ***NIC Configurator***, added descriptions of batch modifying IP, Speed, and Duplex. ● Added ***Customize Frame Grabber's Port***. ● Supports viewing and configuring RGBD SDK logs. See ***View SDK Logs*** and ***Configure Logs***.
3.4.2	25th May. 2022	● Added the following functions.

Version	Date	Changes
		○ Opening a frame grabber as a virtual camera. ○ Displaying frame grabber status. ○ Upgrading the firmware of a camera connected to the frame grabber. See ***GenTL Management***. ● Supports importing and exporting features of a single frame grabber. See ***Import/Export Features of a Single Device***. ● Supports upgrading firmwares of multiple frame grabbers in a batch. See ***Firmware Updater***. ● Added ***Error Code List***.
3.4.1	18thFeb. 2022	● Added the functions of enumerating frame grabbers, upgrading frame grabbers, and configuring frame grabber attributes based on GenTL. See ***GenTL Management*** for details. ● Added the function of adding virtual cameras. See ***Add a Virtual Camera*** for details.
3.4.0	17th Dec. 2021	● Added ACK mode of devices Discovery in General Settings page, which helps avoid the failure of enumerating cameras in broadcast mode. See ***General Settings***. ● The Image Processing tab changes to Advanced Features. Added and edited some parameters on this tab. See ***Camera Feature Configuration***. ● Setting crossing line is supported in multi-window mode.
3.3.0	28th Sept. 2020	● Supports setting encoding type for the character strings. For details, see ***General Settings***. ● Supports setting default saving path for cti file. For details, see ***General Settings***. ● Supports exporting information of all the cameras connected to the Software. For details, see ***Tool***. ● Supports setting timeout period for GVSP protocol. For details, see ***Other Features***. ● Supports setting **Line Debouncer Time** to filter out unwanted short signals (contact bounce) from hardware trigger signals. For details, see ***IO Output***. ● Supports setting Color Correction Matrix (CCM) to

Version	Date	Changes
		enhance color fidelity. For details, see ***Color Correction Matrix Settings***. ● Supports zooming in or out the LUT graph by scrolling the mouse wheel. For details, see ***Configure LUT***. ● Supports setting **Gamma** and **Contrast** when LUT line type is set to **Adaptive**. For details, see ***Configure LUT***. ● Edited ***User Set Control*** due to UI optimization. ● Supports dragging live images to adjust the position of live images. For details, see ***Acquisition and Live View***. ● Supports sharpness indicator (only available when image format is mono8). For details, see ***Acquisition and Live View in 1-Window Mode***. ● Supports exporting RGB values of each pixel. For details, see ***Acquisition and Live View in 1-Window Mode***.
3.2.1	8th Apr. 2020	Fixed bugs.
3.2.0	20th Dec. 2019	● Optimized the user manual. ○ Restructured the document and changed the user interface style of the document. ○ Added more details for feature descriptions. For details, see ***Common Features***, ***Trigger***, and ***Advanced Features***. ○ Added sample use case in ***GigE Vision Action Command***. ● Supports new file formats for the captured pictures and recorded video files. For details, see ***Capture and Recording***. ● Supports enable the PC to respond to the keyboard shortcut request from the Software in priority if a same keyboard shortcut of another software or program exists. For details, see ***Shortcut***. ● Supports fast accessing the folder containing the SDK development documents and demos. For details, see ***Help***. ● Supports sticking a GigE Vision camera to the top and its GVCP configuration. For details, see ***Other Features***.

Version	Date	Changes
		● Supports sticking a USB3 Vision camera to the top. For details, see *Other Features*. ● Supports GenTL, which allows you to connect CoaXPress cameras . For details, see *GenTL Management*. ● Supports use Event Monitor to monitor USB3 Vision cameras. ● Updated the UI for configuring white balance under Bayer format. For details, see *Configure White Balance (Bayer)*. ● Adjusted the procedures for drawing ROI and AOI. For details, see *Draw ROI*. ● Supports displaying feature difference when importing features to a single camera. For details see *Import/Export Features of a Single Device*. ● Supports opening local images and video files. For details, see *View Local Image and Video*. ● Supports more configurations for the cross line. For details, see *Set Cross Line*. ● Supports setting grids on images. For details, see *Configure Grid*. ● Supports using histogram for evaluating image quality. For details, see *View Histogram*. ● Supports selecting the information item(s) which need to be displayed on IP Configurator. For details see *IP Configurator*. ● Supports selecting the information item(s) which need to be displayed on Firmware Updater. For details, see *Firmware Updater*. ● Supports selecting information item(s) which need to be displayed on Bandwidth Manager and connecting cameras on Bandwidth Manager. For details, see *Bandwidth Manager*. ● Added mutual exclusion feature for the **Periodically Send** parameter and **Request Acknowledge** parameter of Action Command. For details, see *GigE Vision Action Command*. ● Supports selecting information item(s) which need to be displayed on Embedded Information window. For details, see *View Embedded Information*. ● Supports batch settings in NIC Configurator. For details, see *NIC Configurator*

Version	Date	Changes
		● Supports manually refreshing logs on Log Viewer, viewing process name and process ID in the log information, and adding DLL(s) to display their logs. For details, see ***Log Viewer Tool***.
3.1.0	11th Oct. 2018	● Added the *Add Camera Link Camera* chapter to introduce how to add Camera Link cameras to the client and the camera status. ● Added the *Bandwidth Manager* chapter to introduce how to optimize bandwidth of the connected cameras via Bandwidth Manager. ● Added the *Environment Diagnostics* chapter to introduce how to diagnose and optimize the running environment and the secondary development environment. ● Added the *GigE Vision Action Command* chapter to introduce GigE Vision action command, which can be used to trigger actions in multiple cameras in a network simultaneously. ● Added the *Keyboard Shortcut Settings* chapter to introduce how to configure keyboard shortcuts for some frequently-used operations. ● Edited the *Configure Image Processing Features* to introduce changes in the operations of drawing ROI. ● Edited the *Log Viewer* chapter to introduce how to configure SDK log service.
3.0.0	6th Jul. 2018	● Restructured the whole user manual due to UI changes. ● Added the *Log Viewer* chapter to introduce the tool in which you can view and filter logs from different DLLs. ● Added the *View live View in Full Screen* chapter to introduce how to view live view in full screen mode when the window division is set to 1-window mode and multiple-window mode. ● Added *Window Division* to introduce how to set window division and customize window division. ● Added the *View Embedded Information* chapter to introduce how to view the embedded image information of multiple cameras simultaneously.

Version	Date	Changes
2.4.0	6th Feb. 2018	● Updated the *Interface Introduction* chapter to describe updates in the menu (added buttons and moved camera feature settings to **Camera** → **Basic Features**). ● Added the *Import/Export Camera Feature via File Access* chapter to describe how to import and export camera features via the tool called File Access, which can import and export different files. ● Added the *Batch Import and Export Features* chapter to describe how to import and export features for multiple cameras. ● Added the *Event Monitor* chapter to describe the tool called Event Monitor, on which the messaging channel events can be displayed to help you find the causes of issues that may occur during the use of your camera. ● Added the *Multicast Configuration* chapter to describe how to set multicast. ● Updated the *Configure Camera IP Address* chapter to describe how to configure IP addresses of multiple cameras simultaneously. ● Updated the *Update Camera Firmware via Firmware Updater* chapter to describe how to update firmwares of multiple cameras simultaneously.
2.3.1	25th Nov. 2017	Updated the *View Status* chapter to show real time bandwidth, errors, packet lost in Status page is supported.
2.3.0	29th Aug. 2017	● Restructured the whole manual to make the manual more user-friendly. ● Updated the *Running Environment* chapter to update the PC system requirements. ● Added the *Packet Resending Settings* chapter to describe the packet resending settings. ● Added the *Live View* chapter to describe live view for single camera and live view for multiple cameras, as well as other operations during live view, such as configuring cross line to help adjusting the position of the object in the live view

Version	Date	Changes
		image.

1.5 Main Window Introduction

After installation, you can run the Software.
The main window of the Software is shown as follows:

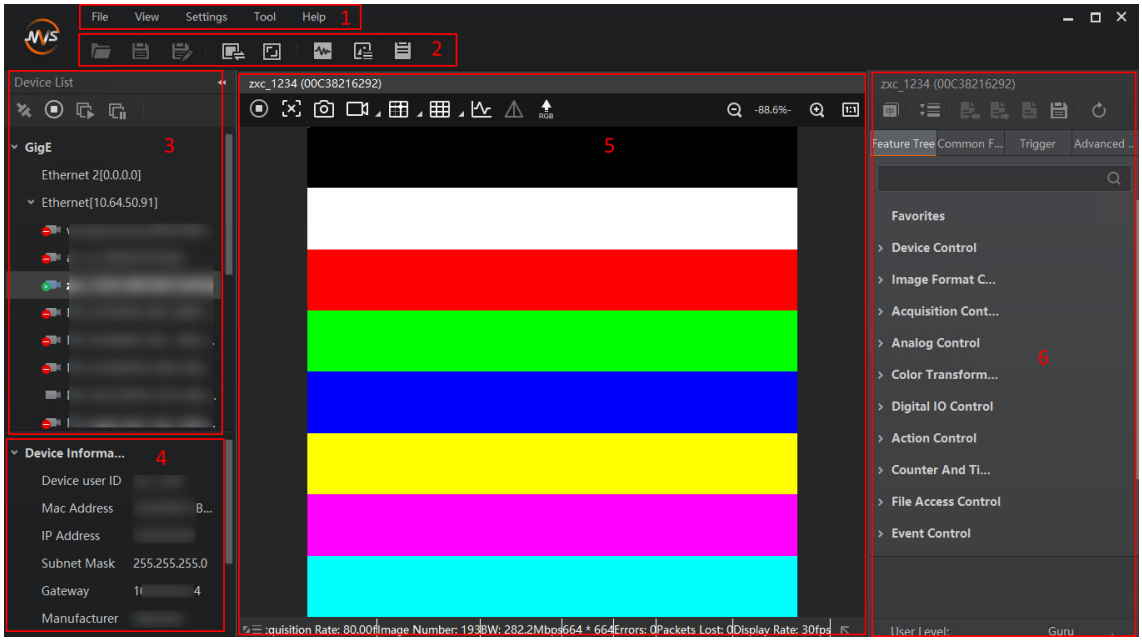


Figure 1-1 Main Window

The following table shows the description of each part of the main window.

Table 1-2 Main Window Description

No.	Area Name	Description
1	Menu Bar	Function modules including File, View, Settings, Tool, and Help.
2	Control Toolbar	Offer buttons for file control, division settings of the display window, acquisition status, etc.
3	Device List Panel	• Display the GigE Vision cameras, USB3 Vision cameras, and Camera Link cameras and the cameras connected via GenTL. • Provide icons for connecting/disconnecting camera, start/stop acquisition, and refreshing device list.

No.	Area Name	Description
4	Interface and Device Information Panel	Display the information of the network interface or USB interface and the device information.
5	Display Window	View the live videos of the selected camera or local images and videos.
6	Feature Panel	View and configure features of the selected camera, and perform other operations such as importing, exporting, and User Set control.

Chapter 2 Environment Configuration

Before further operations such as camera feature configuration and image data acquisition, you should configure the running environment for the Software to ensure stability and fluency of Software running and data transmission.

2.1 Configurations before Using GigE Vision Cameras

Before using GigE Vision cameras, you should make sure that the cameras and the PC are on the same subnet, and that the Jumbo Frame functionality has been enabled in the Windows system.

Before You Start

Make sure that the cameras are powered on and connected to network.

Steps

1. Run NIC Configurator.
   - Go to **Start** → **All Programs** → **MVS** → **Tools** in the Windows system, and then click **NIC_Configurator**.
   - Go to **Applications** → **NIC_Configurator** in the Software's installation folder, and then click NIC_Configurator. exe.

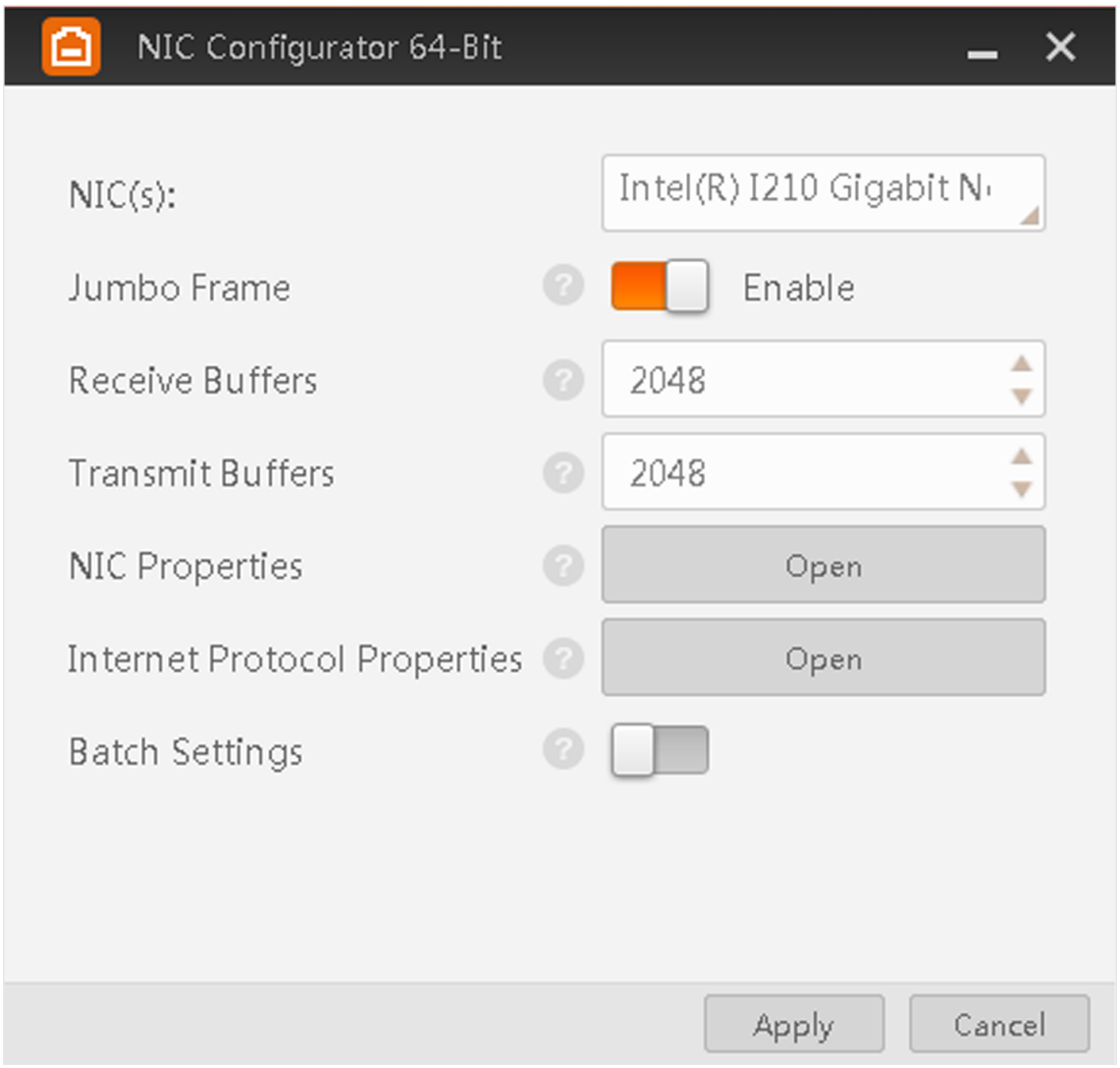


Figure 2-1 NIC Configurator

2. Select the PC's network interface card (here after simplified as NIC) from the drop-down list.
3. Set the network adapter parameters.

Jumbo Frame

Check the **Enable** checkbox to enable the Jumbo Frame functionality of the NIC. Jumbo Frame functionality can reduce the CPU usage and improve the data transmission efficiency. After enabling the Jumbo Frame functionality, the Jumbo Frame value will be set to 9 KB or 9014 Bytes automatically.

Receive Buffers

Set the size of Receive Buffers. Increasing the Receive Buffer size improves receiving performance while costs more system memory.

Transmit Buffers

Set the size of Transmit Buffers. Increasing the Transmit Buffer size improves data

transmission performance while costs more system memory.

NIC Properties

Click **Open** to open the properties window of the selected NIC.

Internal Protocol Properties

Click **Open** to open the Internet Protocol Properties window, and then double-click the TCP protocol and select **Obtain an IP address automatically**.
You can also select **Use the following IP address** and then set the IP address to the subnet on which the camera runs.

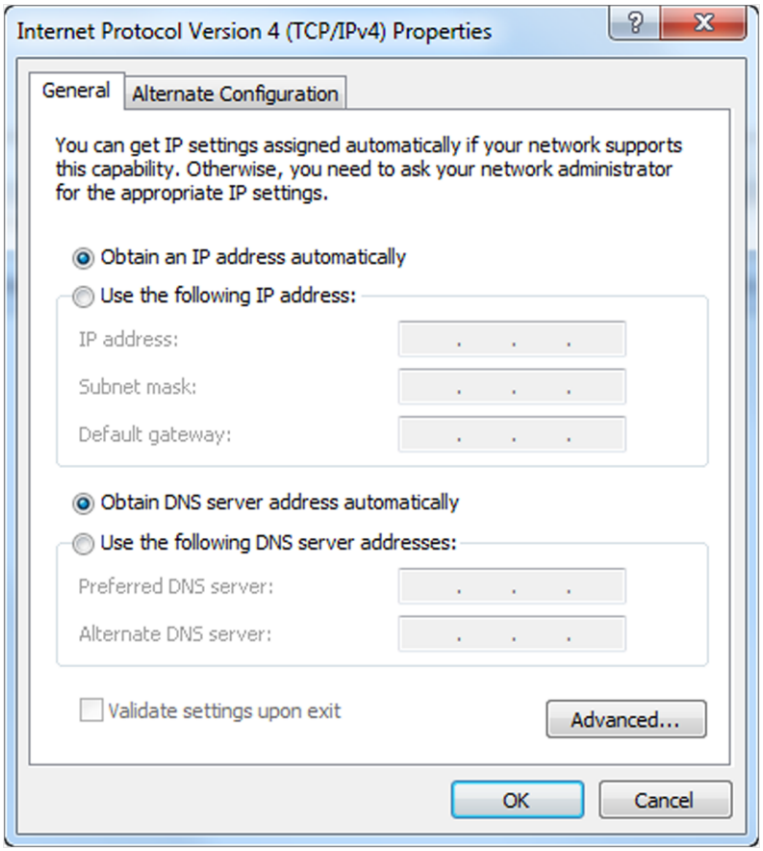


Figure 2-2 Internet Protocol Properties Window

Note

The Internet Protocol Properties window vary with different Windows systems. The picture above is only for reference, the actual Internet Protocol Properties window shall prevail.

4. Click **Apply** to save the settings.

Note

- You can enable the Jumbo Frame functionality for all the NICs of the PC when installing the Software.

- Some NICs may not support Jumbo Frame. In such cases, you should update the NIC driver or change the NIC.

2.2 Configurations before Using USB3 Vision Cameras

Before using USB3 Vision cameras, you should make sure that the PC on which the Software runs have installed USB driver, otherwise the Software will fail to enumerate the camera, or the status of the enumerated camera will be Unreachable.
When you connect a USB3 Vision camera to the PC's USB interface, the camera will be automatically detected by the Windows system and the USB driver will be installed automatically.
When the installation completes, USB3 Vision camera will be displayed on the Device Manger of the Windows system. You can right-click the camera to open the USB3 Machine Vision Camera Properties window (as shown below) to view if the device works properly (i.e., the driver is properly installed).

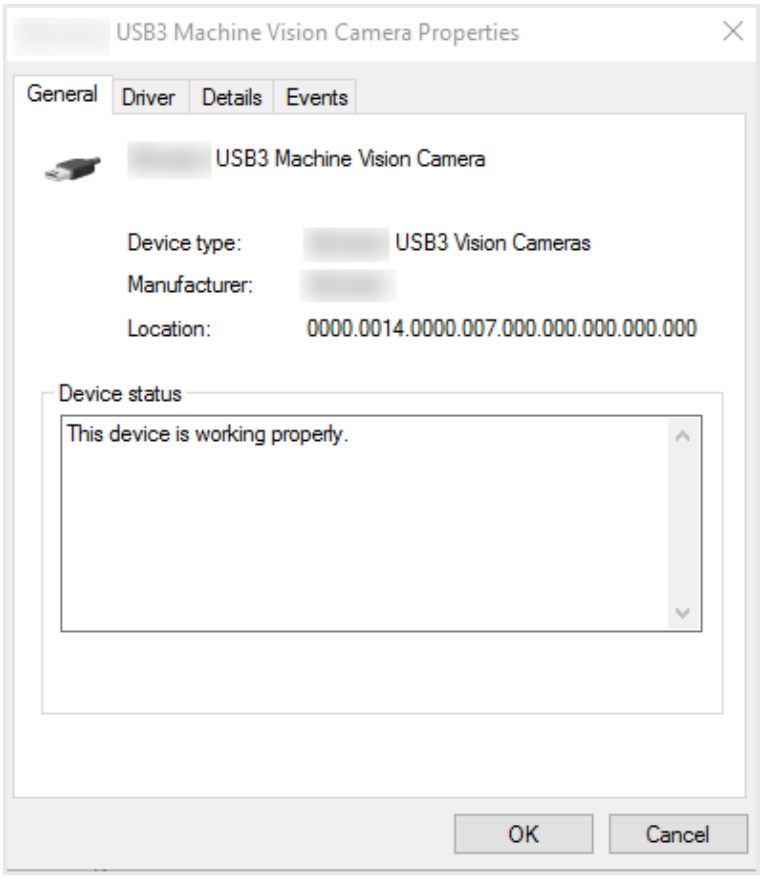


Figure 2-3 USB3 Machine Vision Camera Properties Window

If the driver fails to be installed, you can use the Driver Manager to reinstall the driver.

Note

For details about the Driver Manager, see *Driver Manager*.

2.3 Configurations before Using Camera Link Cameras

Before using Camera Link cameras, make sure that the Camera Link frame grabber and the driver for the frame grabber are properly installed on the PC on which the Software runs.

Without the driver, the Software will fail to enumerate the Camera Link cameras; without the frame grabber, the live view and acquisition functionality will not be available for the Camera Link cameras.

If the driver is properly installed, you can use Device Manager of the PC system to view the information of the driver and related serial port. If installation exception occurs, it is recommended to reinstall the driver and related software, or contact the manufacturer of the frame grabber for support.

Chapter 3 Menu Bar

The menu bar provides functionality such as saving and opening project file, setting display mode, software settings, tools (e.g., IP configurator and firmware updater), language settings, as well information of the Software and the user manual.

3.1 File

The File sub-menu provides functionality related to project file, functionality for opening local files, as well as the functionality for exiting from the Software. Project file is useful if you need to switch global camera settings in different scenarios. You can save the current settings of all the connected cameras as a project file (format: mcfg) to the local PC, after which you can fast restore the settings of the same connected cameras by opening the saved project file.

Note

- When you save cameras' settings as a project file, the serial No. of the cameras are saved as well.
- Network exception, GenICam error, or failure of exporting features will cause saving failure.
- Only the feature settings of the CONNECTED cameras can be saved.

Save Project File for the First Time

For the first time saving, you need to select a saving path as the default saving path for project file, so next time you can skip the step for selecting saving path and save the project file in the default path directly.

Click on the control toolbar or click **File** → **Save** to open the Save Project File window, and then select a saving path as the default saving path for project files, and finally click **Save**.

Note

You can click **View** on the prompt popped up when saving completes to go to the saving path of the project file.

Save Project File in Custom Saving Path

After the first project file being saved in the default saving path, the function of saving in custom path will be available.

Click on the control toolbar or click **File** → **Save as** to open the Save Project File window, and then select a custom saving path, and finally click **Save**.

Note

You can click **View** on the prompt popped up when saving completes to go to the saving path of the project file.

Open Project File

You can open a project file to restore the saved feature settings to the cameras with matched serial numbers. Two scenarios are involved in the opening of a project file.
Scenario 1: The Software Has been Running
When the Software has been running, you can perform one of the operations in the following list to open a project file.

- Click **File** → **Open Recent** and then select a recently saved project file to open it.
- Click on the control toolbar or click **File** → **Open** to open the Selected Project File window, and then select a project file from the PC, and finally click **Open**.

Scenario 2: The Software is Not Running
Double-click the project file, and then the Software will run and the cameras with the matched serial numbers will be connected automatically, and the feature settings information contained in the file will be imported to the cameras as well.

Open Local File

You can open local images and video files to view them on the display window of the Software. For details, see *View Local Image and Video*.

3.2 View

You can adjust the image quality of the live video by setting the display mode, filtering mode, vertical synchronization mode, and rendering engine.

Note

The settings will be effective for all cameras on the Software.

Set Display Mode

You can click **View** → **Display Mode** and then select **30 fps** or **60 fps** to set the image frame rate to 30 frames per second or 60 frames per second respectively.

Note

The larger the image frame rate, the better the image quality.

Set Rendering Engine

You can click **View** → **Rendering Engine** to set the rendering engine mode to D3D or GDI.

Note

- By default, the rendering engine mode is set to GDI, which is applicable to all PCs for it doesn't have requirements for the performance of the graphics card.
- The image quality of D3D mode is better than that of GDI mode, but D3D mode is only applicable to the PC which has been installed with graphics driver (and the available memory of the graphics card should be more than 1 GB).

Set Filtering Mode

During live view, you can click **View** → **Filtering Mode** to select the filtering mode so as to change the image quality level.
The image quality levels of different filtering modes: Disabled < Nearest Filtering < Bilinear Filtering< Anisotropic Filtering.

Note

- You should have set the rendering engine to D3D before setting filtering mode.
- The better the image quality, the more system resources will be occupied.
- For details about live view, see ***Acquisition and Live View***.

Set Vertical Synchronization

By enabling vertical synchronization, screen tearing on images will be prevented.
You can click **View** → **Vertical Synchronization** to enable vertical synchronization.

Note

You should have set the rendering engine to D3D before setting vertical synchronization.

3.3 Settings

You can configure settings for the Software, including general parameters, recording and capture parameters, buffer size, and packet resending parameters via the Settings sub-menu.

3.3.1 General Settings

You can set the general parameters, including user level, auto-refresh settings of the device list, character encoding type, and cti default path.
Go to **Settings** → **General** to configure the following parameters.

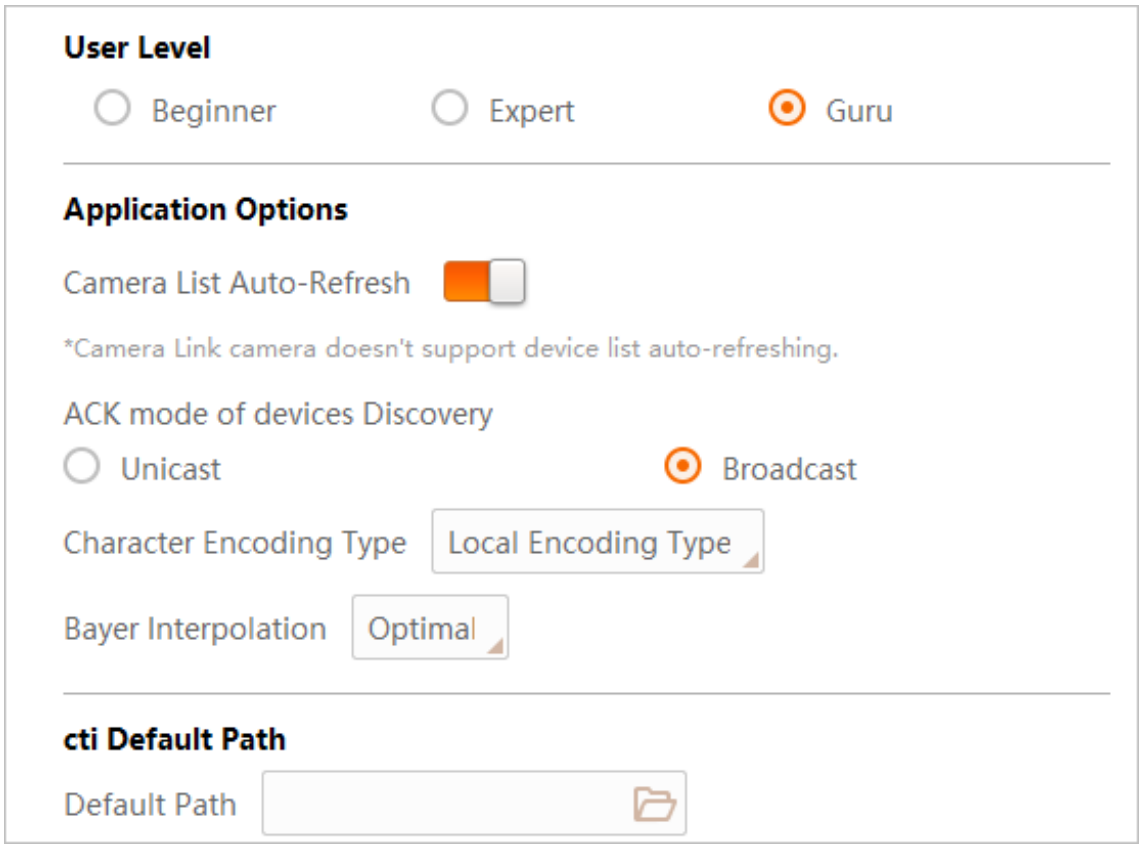


Figure 3-1 General Settings

User Level

You can select **Beginner**, **Expert**, or **Guru** as the user level, which determines the visibility of features for users of different professional knowledge levels. The higher the user level, the more camera features will be displayed on the feature panel.

Application Options

You can turn on **Camera List Auto-Refresh** to refresh the camera list (device list) automatically.

Note

Camera Link camera doesn't support device list auto-refreshing.

ACK mode of devices Discovery

The communication mode between the Software and the detected IP addresses in the same network segment with the PC where the Software runs. By default, the ACK mode is **Broadcast**. If the Software fails to enumerate a camera, you can switch it to **Unicast** and try again.

Character Encoding Type

The encoding type of characters displayed on the Software interface. If you find a character on the interface unreadable, change the character encoding type and try again.

Local encoding type refers to the encoding type of the current PC where the Software runs. UTF-8 is a method for encoding Unicode characters using 8-bit sequences.

Bayer Interpolation

The interpolating modes for transferring an image of bayer format to RGB format.

cti Default Path

cti file is used for GenTL management. You can set a default path for cti file. If you have configured and enabled the default path of cti file, the Software will load it automatically once you start the Software. See *GenTL Management* for details about GenTL management.

Temperature Screening Settings

Normal Region Color

The color or regions with normal temperature.

Alarm Region Color 1/2

The two colors of regions with an alarm triggered by abnormal temperatures.

Note

- If the alarm of screening region is not acknowledged after 200 seconds, the two colors will flash by turns.
- To display the colors of screening regions, you need to finish the following operations beforehand.
  - Draw a temperature screening region. See *Temperature Screening Configuration*.
  - Set alarm rules of temperature screening regions. See *Configure Temperature Screening Parameters*.
  - Select **Region Information Overlap** as **Client**.

Output Logs

Logs about temperature screening can be output if you enable this.

3.3.2 Capture and Recording Settings

You can set the recording parameters and capture parameters as required.

Note

For details about capture and recording, see *Capture and Recording*.

Go to **Settings** → **Recording/Capture** to configure the following parameters.

Select Directory

Select Directory for the captured pictures and recorded videos.

Saving Path

Set a saving path for the recorded video files or captured pictures during live view.

Auto Save

When enabled, the recorded video files or the captured pictures during live view will be automatically saved to the saving path you set.

Note

The maximum pictures that can be auto saved depends on the storage space of the saving path you set.

Recording

Set parameters related to recording.

Video Format

Set format (AVI or RAW) for the recorded video files.

Video Quality

If you set AVI as the video format, you can select **Normal**, **Better**, or **Best** from the drop-down list as the video quality, or drag the slider to adjust the compression ratio so as to set video quality.
The compression ratio for **Normal** is from 0 to 40, for **Better** from 41 to 70, for **Best** from 71 to 100.

Note

The higher the compression ratio is, the better the video quality. The better the video quality, the more image details can be displayed.

Playback Speed

If you set AVI as the video format, you can set the playback speed for the recorded video files.

Original Frame Rate

Set the original frame rate of the recorded video file as the playback speed.

Custom

Enter a frame rate as the playback speed.

Video Naming Rule

Customize a prefix and select **Date and Time** or **Increasing No.** as the naming rule.

Date and Time

The video name will be a number which represents the data and time when the video file is saved. For example, if you set *Video* as the prefix of the name, the full name would be *Video_20190424051532390*.

Increasing No.

The video names will be increasing No. For example, if a video file is the second

one you saved and you set *Video* as the prefix, the full name of the video would be *Video_02*.

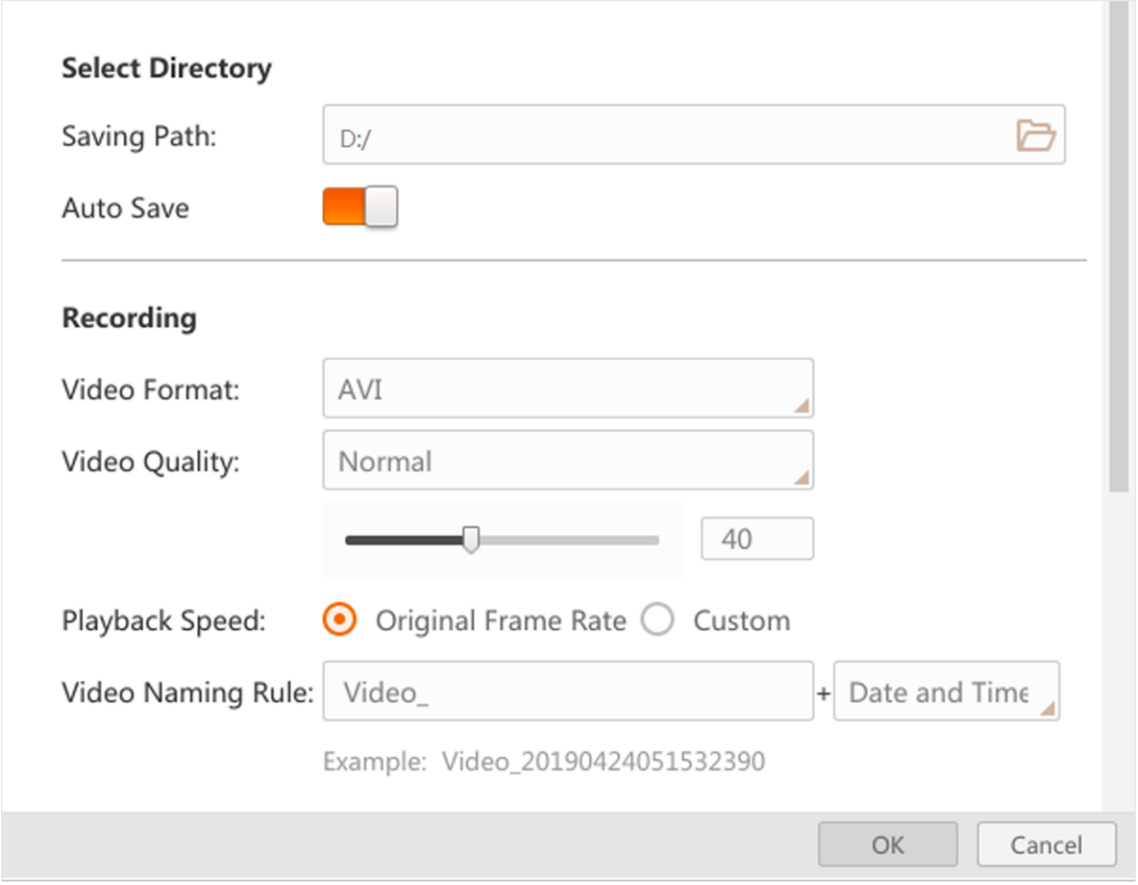


Figure 3-2 Recording Settings

Capturing

Set parameters related to the capturing of pictures.

Picture Format

Set format (**BMP**, **RAW**, **JPG**, **PNG**, **TIFF**) for the captured pictures during live view.

Picture Quality

If you set **JPG** or **PNG** as the picture format, you can select **Normal**, **Better**, or **Best** from the drop-down list as the picture quality, or drag the slider to adjust the compression ratio so as to set picture quality.
The compression ratio for **Normal** is from 0 to 40, for **Better** from 41 to 70, for **Best** from 71 to 100.

Note

The higher the compression ratio is, the better the picture quality.

File Naming Rule

Customize a prefix and select **Date and Time**, **Frame No.**, or **Time Stamp** as the naming rule for the captured pictures.

Date and Time

The picture name will be a number which represents the data and time when the video file is saved. For example, if you set *Image* as the prefix of the name, the full name would be *Image_20190424051532390*.

Frame No.

The picture names will be frame No. For example, if a picture file is the second one you saved and you set *Image* as the prefix, the full name of the video would be *Image_02*.

Time Stamp

The picture name will be a serial number which represents the timestamp. For example, *Image_00000001576677065*.

Continuous Capture

Set the capture mode.

Capture by Frame

The pictures will be captured by frame(s) and the capture will be stopped after the set number of frames . For example, if you set "Capture Every 3 Frame(s)" and "Stop Capturing after 1000 Frame(s)" as the capture mode, a picture will be captured for each 3 frames, and the capture actions end after 1000 frames being acquired.

Capture by Time

The pictures will be captured by time and the capture will be stopped after the time period you set. For example, if you set "Capture Every 2 Second(s)" and "Stop Capturing after 5 Minute(s)" as the capture mode, one picture will be captured each two seconds, and the capture actions will last 5 minutes.

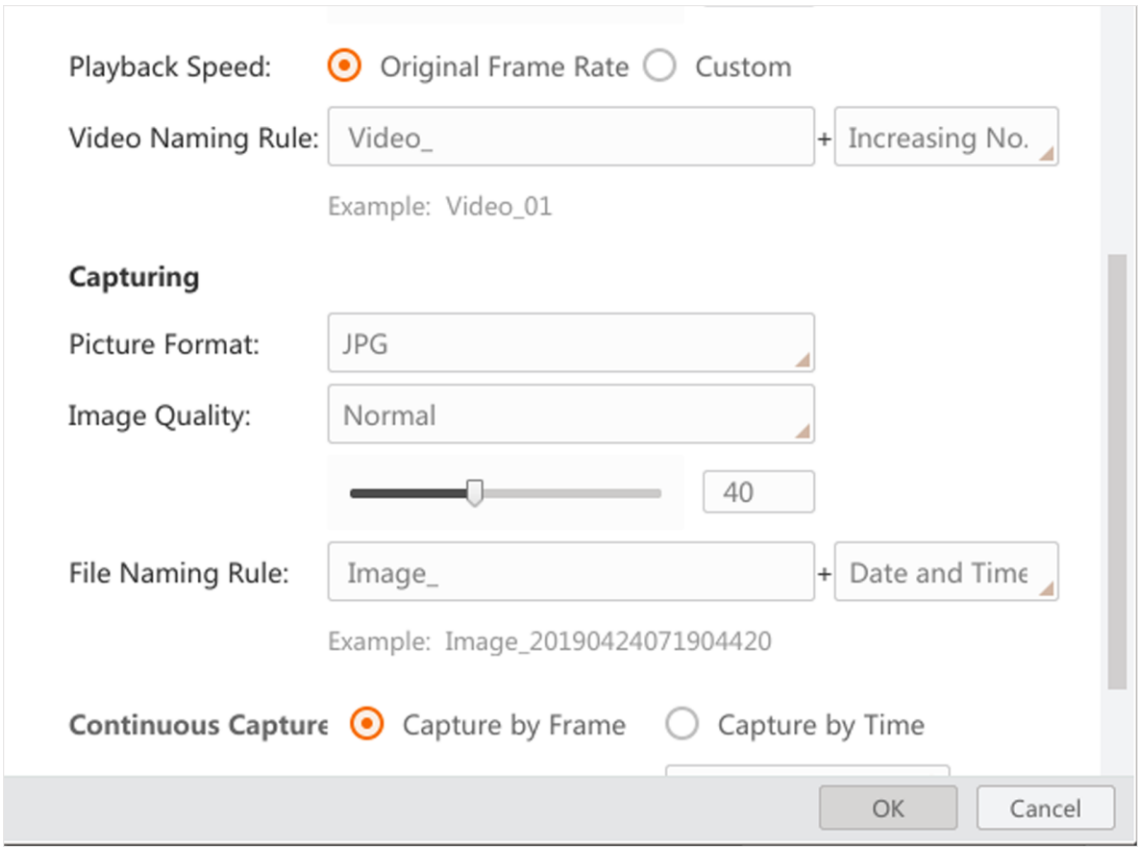


Figure 3-3 Capture Settings

3.3.3 Network Settings

You can configure the network settings, including automatic network detection, adaptive dropping frame, and packet loss prompt.
You can enable or disable **Automatic Network Detection** and (or) **Adaptive Drop Frame** to ensure the fluency of the image data acquisition according to the actual network environment.
You can also enable **Packet Loss Prompt** to allow the Software to pop up a prompt if the packet loss occurs.

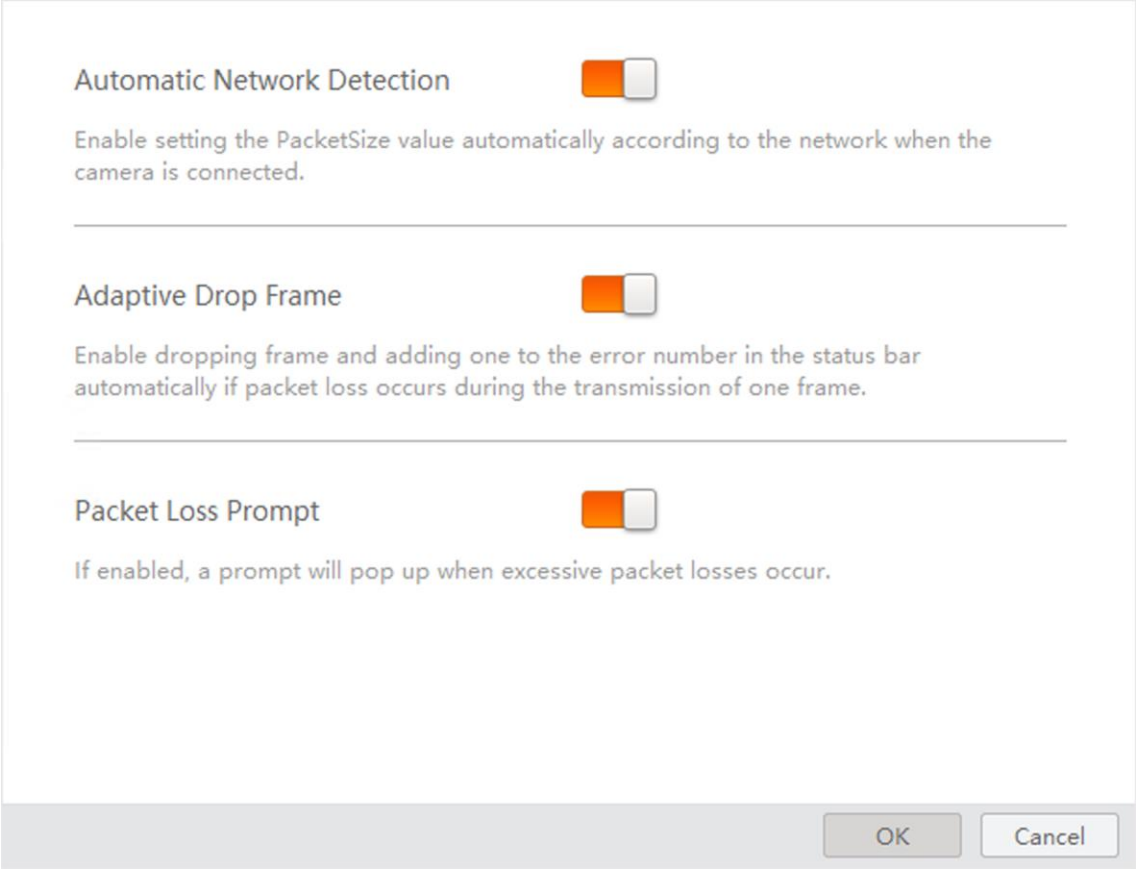


Figure 3-4 Network Settings

3.3.4 Buffer Settings

Buffer settings allow you to balance image quality against image fluency.
You can adjust the values of **Buffers for Getting Stream** and (or) **Buffers for Capture and Recording** according to the memory conditions.

Buffers for Getting Stream

The maximum value is 30.

Buffers for Capture and Recording

The maximum value is 10000.

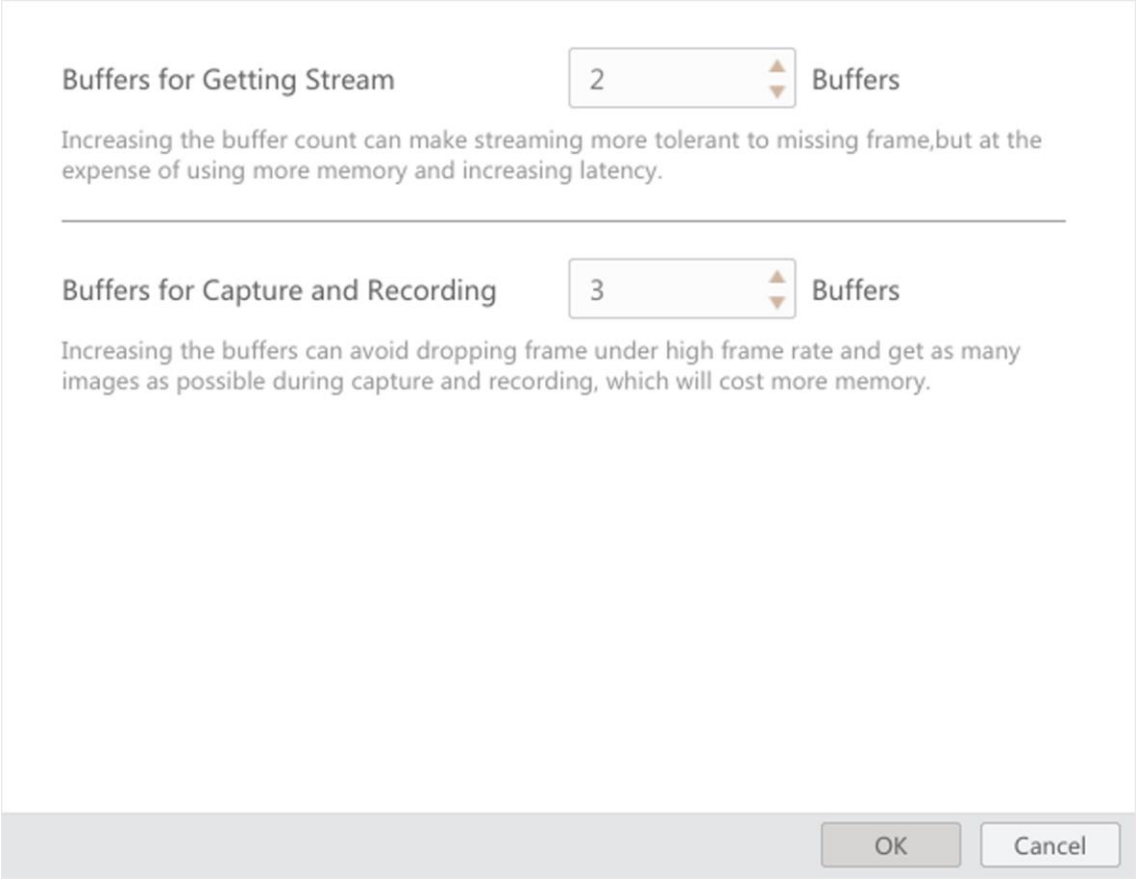


Figure 3-5 Buffer Settings

3.3.5 Resend Packet

Packet resending is a mechanism to ensure image quality by resending the lost or damaged packets during image data acquisition. You can set the packet-resending for the Software, including maximum packet resending percent and the timeout period for packet resending.

You can set the **Resend Packet** switch to on to enable the Software to resending packets, and then configure the following parameters.

Max. Packet Resending Percent (%)

The maximum percent of packets resent within one frame (default value: 10%). With larger packet resending percent, you can get more complete image data. Conversely, you can get more real-time image data.

Timeout Period(ms)

The maximum time period (default value: 50 ms) that the Software can wait between two packets that need to be resent (either for the packet is lost or damaged). If the waiting time exceeds the time you set, the Software will not wait for or resend any packet.

Note

- You can set a relatively long timeout period if there are excessive packet losses.
- You can set the value of Timeout Period from 0 ms to 1000 ms.

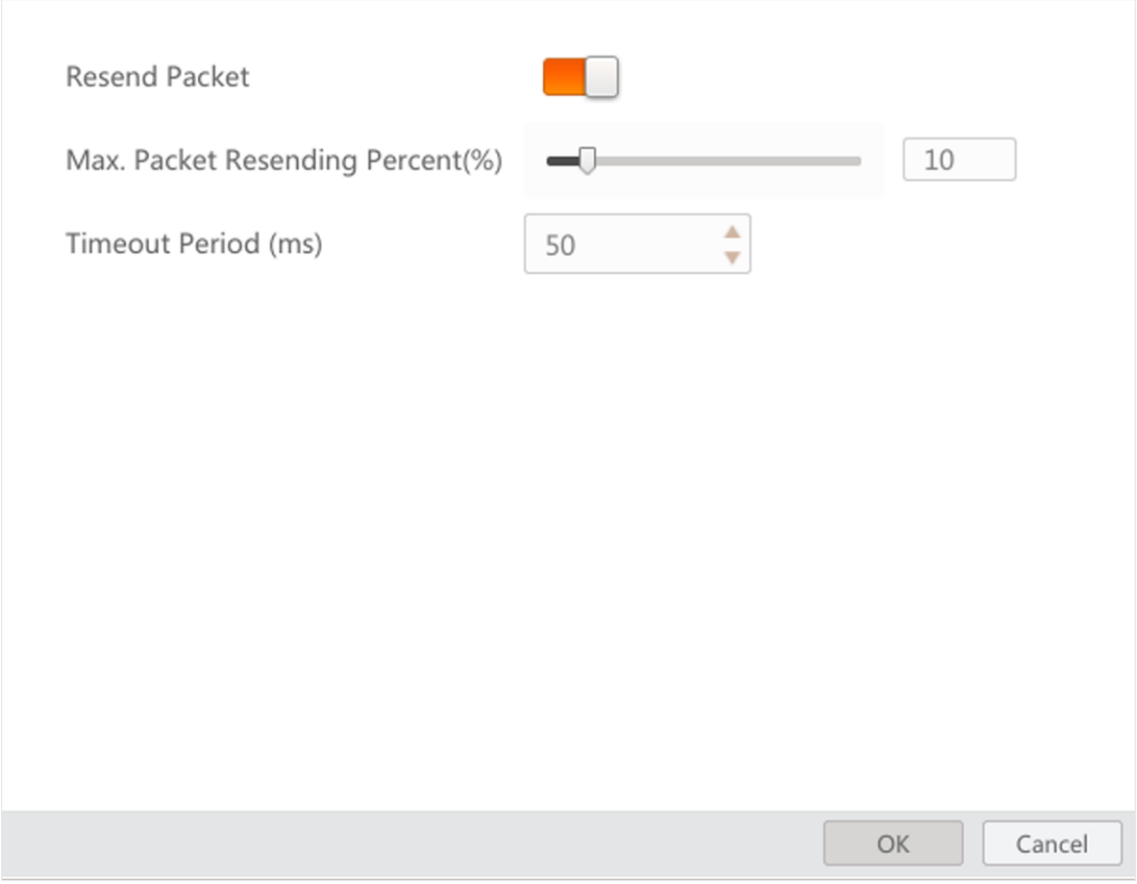


Figure 3-6 Packet Resending Settings

3.3.6 Shortcut

The Software provides default keyboard shortcuts for some frequently-used functions such as connecting/disconnecting camera and starting and stopping acquisition. You can customize the shortcuts according to your actual needs.

Note

The Delete key cannot be used as a keyboard shortcut.

Click **Settings** → **Shortcut** to enter the Shortcut page.
You can do the following operations.

- Customize a Shortcut: Select the text field of a function (such as Start/Stop Live View), and then press one or more keys at the same time to set a shortcut for the function.
- Delete a Shortcut: Select the text field of a function, and then press the Delete key to

delete the shortcut.

- Enable **Respond in Priority**: When you turn on **Respond in Priority**, the shortcut of the Software will still be executed even if the Software is minimized or not on the top layer of the PC desktop.Restore Defaults: Click **Restore Defaults** to restore the shortcuts for all the listed functions to the default settings.

3.4 Tool

The Software provides multiple tools for camera configuration and management.
The following table shows the brief description of each tool.

Table 3-1 Tool Description

Tool	Description
IP Configurator	Configure the IP address of the GigE Vision cameras. See ***IP Configurator*** for details.
Firmware Updater	Update the firmware of GigE Vision cameras and USB3 Vision cameras. See ***Firmware Updater***.
Import/Export Features	Export the selected cameras' feature configuration information as a MFS file to the local PC, or import the MFS file containing camera feature information from the local PC to the selected cameras. See ***Import/Export Features of Multiple Devices*** for details.
Log Viewer	View SDK logs. See ***Log Viewer Tool*** for details.
Virtual Camera	Virtual Camera is a tool designed for scenarios where constructing a real setup of camera environment is not feasible. It can simulate cameras and help to simplify tests during development stage.
Bandwidth Manager	Adjust the bandwidth of the connected cameras to avoid excessive packet losses. See ***Bandwidth Manager*** for details.
GigE Vision Action Command	Trigger actions in multiple cameras at the same time. See ***GigE Vision Action Command*** for details.
Export All Devices Information	Export information of all cameras enumerated on the Software and the information of the current PC in a folder. The information includes device logs, NIC information of the current PC, computer and system information, driver status of the current PC, and camera parameters. The information will be saved as TXT documents.

3.5 Help

The Help sub-menu offers access to the language switching functionality, user manual, SDK documents, and the Software information.
Click **Help** → **Development** to view the SDK documents.

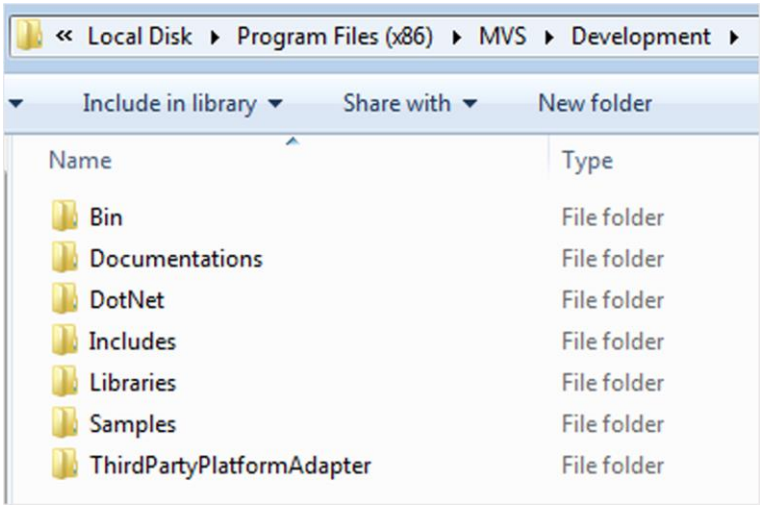


Figure 3-7 SDK Documents

Table 3-2 SDK Documents

Folder Name	Description
Bin	The executable programs compiled using demo.
Documentations	SDK documents including *SDK Development Guide* and *Demo User Manual*.
DotNet	DLL(s) developed via C#.
Includes	Header files.
Libraries	Static libraries.
Samples	Sample codes of various programming languages. **Note** You can also click **Start** → **MVS** → **Samples** in the Windows system to access the Samples folder.
ThirdPartyPlatformAdapter	Third-party plug-ins.

Chapter 4 Device Management

On the device list, the devices are classified into four types, namely, GigE, USB, Camera Link, and GenTL, according to the camera interface. After connecting cameras to the Software, you can perform operations such as saving GemICam XML, and using Event Monitor to determine issues that may occur on your cameras.

4.1 GigE Vision Camera Management

GigE Vision camera is the camera using GigE Vision interface standard for data transmission. After connecting GigE Vision cameras to the Software, you can perform operations such as Multicast settings, saving GenICam XML, and editing device user ID.

Note

GigE Vision is an interface standard for machine vision cameras. It provides a framework for transmitting high-speed video and related control data over Ethernet networks.

4.1.1 Connect GigE Vision Camera

You can connect GigE Vision cameras to the Software in three ways, i.e., letting the Client automatically enumerating local cameras, connecting camera by command, or adding remote camera.

Automatically Enumerate Local Cameras

All the GigE Vision cameras in the same local subnet with the Software will be automatically enumerated in the device list.
You can hover the cursor over the camera interface and then click to refresh the enumerated cameras on the same local subnet with the PC on which the Software runs. Or you can enable the Software to automatically refresh the device list. See ***Settings*** for details.
When the cameras are enumerated, if the camera status is available, you can double-click the camera or click to connect it to the Software.

Note

For details about status of the GigE Vision cameras, see ***Status of GigE Vision Camera***.

Figure 4-1 Local Camera Enumeration

Connect Camera by Command

You can use CMD commands to run the Software and connect cameras to it.

Steps

1. Go to **Start** → **CMD**.
2. Enter "cd" and "the directory of MVS.exe".

   Example

   If the directory of MVS.exe is "C:\Program Files (x86)\MVS\Applications\Win64", you should enter "cd /d C:\Program Files (x86)\MVS\Applications\Win64".

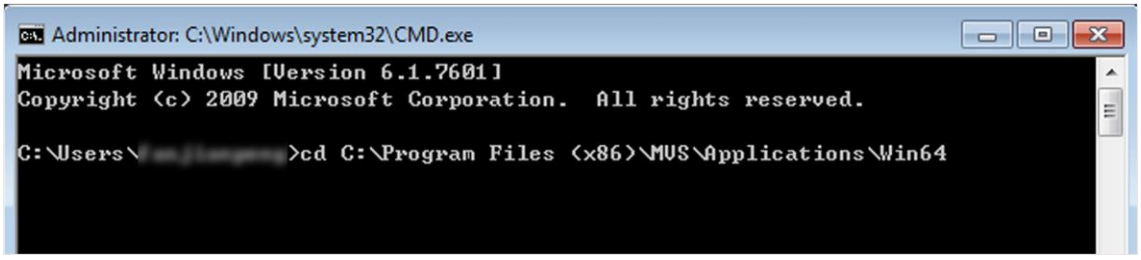


Figure 4-2 Connect Camera by CMD

3. Press the Enter key.
4. Connect the camera to the client software in the following four ways:
   – Connect by Camera IP Address: Enter "MVS.exe/IP xx.xx.xx.xx".

> **Note**
>
> Connection by IP address is not supported by USB3 Vision camera, Camera Link camera, and CoaXPress camera.

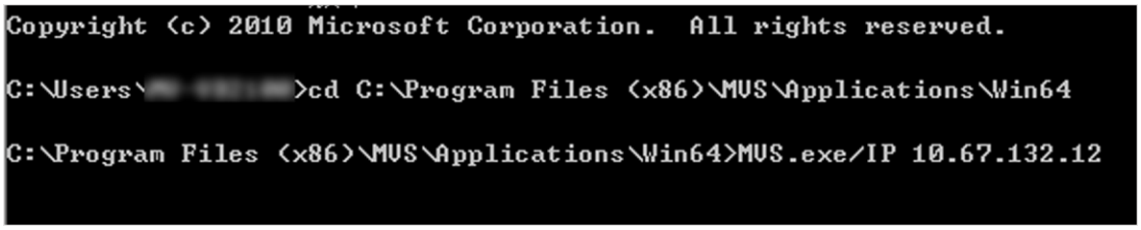


Figure 4-3 Connect Camera by CMD

– Connect by Camera Serial Number: Enter "MVS.exe/SN xxxxxxxx".

Note

xxxxxxxx here refers to the camera serial number.

– Connect by Camera Mac Address: Enter "MVS.exe/Mac xx.xx.xx.xx.xx.xx".

Note

- Connection by Mac address is not supported by USB3 Vision camera and Camera Link camera.
- xx.xx.xx.xx.xx.xx here refers to the camera Mac address.

– Connect by Opening Project File: Enter "MVS.exe/mcfg" +"the directory of the mcfg file"+"mcfg file name.mcfg".

Note

You should have saved camera features as project file. For details about how to save camera features as project file, see *File*.

Example

If the directory of the mcfg is "C:\Users\VB2100\Desktop\CDE" and the name of the mcfg file is "CDE", you should enter "MVS.exe/mcfg C:\Users\VB2100\Desktop\CDE\CDE.mcfg".

5. Press the Enter key.

Result

The Software will start running and parsing the entered parameters such as camera IP address, and then the camera will be connected automatically.

Add Remote Camera

You can add GigE Vision camera NOT in the same local subnet with the client software to the device list.

Steps

1. Right-click the network interface card (for example, **Local Area Connection** in the following picture) to open the right-click menu.

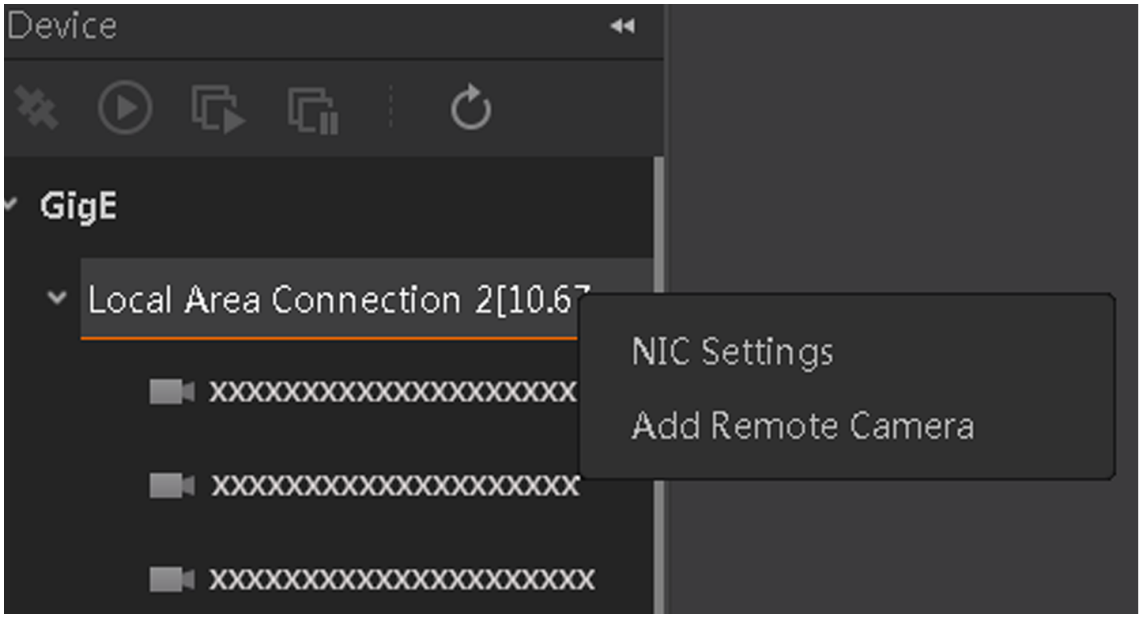


Figure 4-4 Right-click Menu

2. Click **Add Remote Camera** to open the Add Remote Camera window.

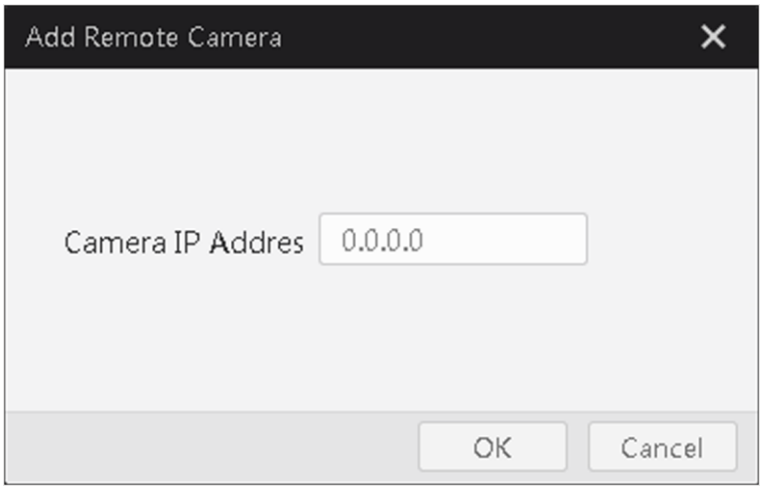


Figure 4-5 Add Remote Camera

3. Enter the camera IP address and then click **OK** to add the camera.

4.1.2 Status of GigE Vision Camera

The Software provides multiple icons to represent different status of GigE Vision cameras. The following table shows the descriptions of the status of the GigE Vision camera on the device list.

Table 4-1 Status Description

Camera Status	Description
	Available and disconnected. **Note** You can double-click the camera or select it and click  on the control toolbar to connect it to the Software. Once connected, changes to  .
	Not available. Another Software or process is accessing the camera.
	The camera is on the same subnet with the PC on which the Software runs, but NOT in the same network segment. You should configure its IP address to the same network segment before you can connect and use the camera. **Note** You can double-click the camera or click **Tool → IP Configurator** to configure the camera's IP address. See ***IP Configurator*** for details about how to configure camera IP address.
	Connected.
	The camera is acquiring streams. **Note** See ***Acquisition and Live View*** for details about how to start acquisition.
	Multicast of the camera is enabled on another Software. And the camera is connected to the current Software.

Camera Status	Description
	Note See *Multicast Settings* for details about how to enable Multicast.
	Multicast of the camera is enabled on another Software. And the camera is not connected to the current Software. Note See *Multicast Settings* for details about how to enable Multicast.

4.1.3 Edit Camera IP Address

If the camera is displayed as (not reachable for the camera is on the same subnet with the PC on which the Software runs, but not in the same network segment), you can edit the camera's IP address to make it reachable.

Steps

1. Right-click the camera displayed as to open the right-click menu.
2. Click **Modify IP** on the right-click menu to edit IP address of the camera.

Note

For details about editing camera IP address, see *Edit IP Address of a Single Camera*.

4.1.4 Multicast Settings

By enabling Multicast, a GigE Vision camera can be accessed through multiple Softwares. This is especially useful when a camera needs to be accessed by different end users. Before that, you need to configure roles for the Softwares to specify different permission for them to access different cameras.

Note

- Multicast configuration is only available for GigE Vision cameras.
- Multicast configuration should be supported by the GigE Vision camera.

For different cameras, a Software can be configured with different roles to access them. In other words, the end user of a Software can have different permissions to access different cameras. The following roles are available:

Table 4-2 Role Description

Role	Description
Controller and Data Receiver	The camera's features are editable, and the Software can receive camera data to display live image.
Controller	The camera's features are editable, but the Software cannot receive camera data to display live images.
Data Receiver	The camera's features are NOT editable, but the Software can receive camera data to display live images. **Note** ● You cannot set the role of a Software as Data Receiver manually. ● Multiple Softwares can be Data Receiver of the same camera.

Note

- For one camera, only one Software can be the role of "Controller and Data Receiver" or "Controller".
- You can configure Multicast for a camera only when the role is set to "Controller and Data Receiver" or "Controller".
- For the Softwares running on the same PC, one of them can only be configured as "Controller" and the others as "Data Receiver".

Enable Multicast When Camera is Available but Disconnected

If the camera status is available and disconnected, you can set "Controller" or "Controller and Receiver" as the Software's role.

Steps

1. Right-click a camera (available and disconnected) on the device list to open the right-click menu.
2. Click **Multicast Setting** to open the Multicast Setting window.
3. Select **Controller** from the **Role** drop-down list.
4. Click **OK** to save the role settings.
   The camera will be connected and Multicast will be enabled automatically.
5. Optional: Edit the IP address and port.

   IP Address

   The IP address of the selected camera.

Port

The port No. of the selected camera.

6. Click **OK** to save the settings.
   After enabling Multicast mode of a camera on Software A, if the camera is remotely added to Software B, or the camera is on the same local subnet of the PC on which the Software C runs, the camera will be displayed as (when disconnected) or (when connected) on Software B or Software C. And the role of Software B and Software C (relative to the camera) will be "Data Receiver".

Enable Multicast When Camera is Connected

For a connected camera, you can only set the Software's role to "Controller and Receiver".

Steps

1. Right-click the camera and then click **Multicast Setting** to open the Multicast Setting window.
   The role for the current Software is set to "Controller and Data Receiver" by default and cannot be edited.
2. Turn on the **Enable** switch to enable Multicast.
   The IP Address field and Port field appear.

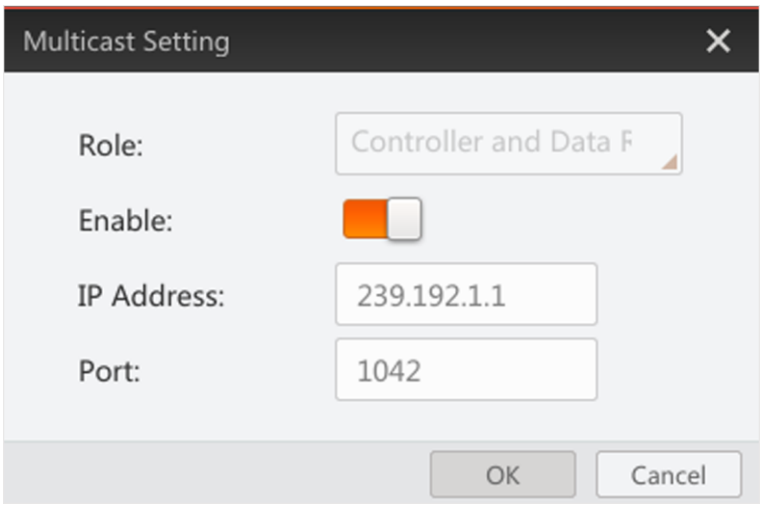


Figure 4-6 MutlticastSettingWindow

3. Optional: Edit the IP address and port.

IP Address

The IP address of the selected camera.

Port

The port No. of the selected camera.

4. Click **OK** to save the settings.
   After enabling Multicast mode of a camera on Software A, if the camera is remotely added to Software B, or the camera is in the same local subnet of the PC on which the

Software C runs, the camera will be displayed as (when disconnected) or (when connected) on Software B or Software C. And the role of Software B and Software C (relative to the camera) will be Data Receiver. In this scenario, the user has the permission to modify the camera's features, as well as view the live video of the camera on Software A; While on Software B and Software C, the user has no permission to modify the camera feature, but can view the live video and features of the camera.

4.1.5 Other Features

Other features are provided for the GigE Vision cameras on the device list, including GVCP Settings, GVSP Settings, GenICam XML settings, device user ID settings, etc.

GVCP Settings

GVCP is short for GigE Vision Control Protocol, which is a communication protocol for the communication between the Software and a GigE Vision camera. GVCP allows the Software to configure and control a GigE Vision camera. The Software sends a command and waits for an acknowledgment (ACK) from the camera before sending its next command, hence data integrity is ensured. In this ACK scheme, the Software can get and set various features of the camera.
When the network condition is not good, data losses may occur in this ACK scheme. In this case, you can configure the GVCP settings to allow the Software to resend the command for multiple times within a certain time period, hence data losses can be alleviated.

Note

- GVCP settings is only available when the camera is connected or in acquisition.
- Cameras connected via frame grabbers does not support this function.

Right-click a GigE Vision camera and then click **GVCP Settings** to open the GVCP Setting window and then configure the two parameters below.

Resending Times

Specify the times for resending the command.
The default value is 3, and the value range is from 0 to 100.

Timeout

Specify the time period (ms) for resending the command. In other words, if the time for resending the command reaches the specified time period, command resending will end.
The default value is 500, and the value range is from 0 to 10,000.

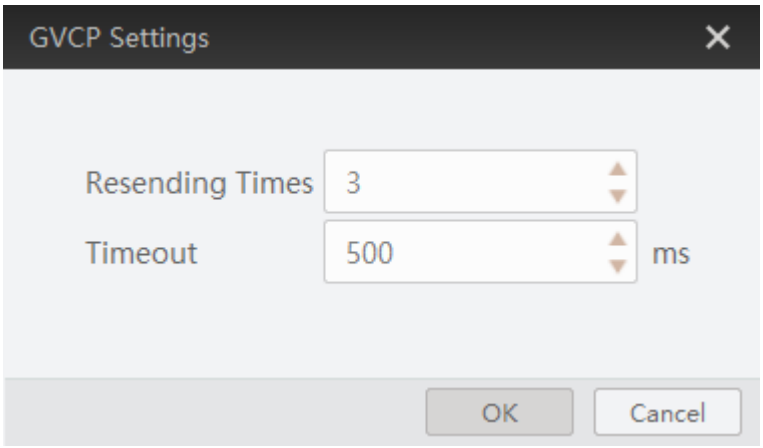


Figure 4-7 GVCP Settings

GVSP Settings

GVSP is short for GigE Vision Streaming Protocol, which provides a protocol for getting non-compressed and compressed data streams. For transmission an image is split into several packages and the packages are recompiled when received. When you set the **Timeout**, you set the waiting duration between each package of an image. If the next package is not received when the waiting duration is longer than the **Timeout** value, the Software will stop receiving the following packages of image and recompile packages received before. When the network condition is not good, setting a short Timeout may cause a low resolution of the image; while setting a long Timeout may lower the continuity of image acquisition.

Note

- GVSP settings is only available when the camera is connected.
- By default, the **Timeout** is *300*.
- Cameras connected via frame grabbers does not support this function.

Right-click a GigE Vision camera and then click **GVSP Settings** to open the GVSP Setting window and then configure **Timeout**.

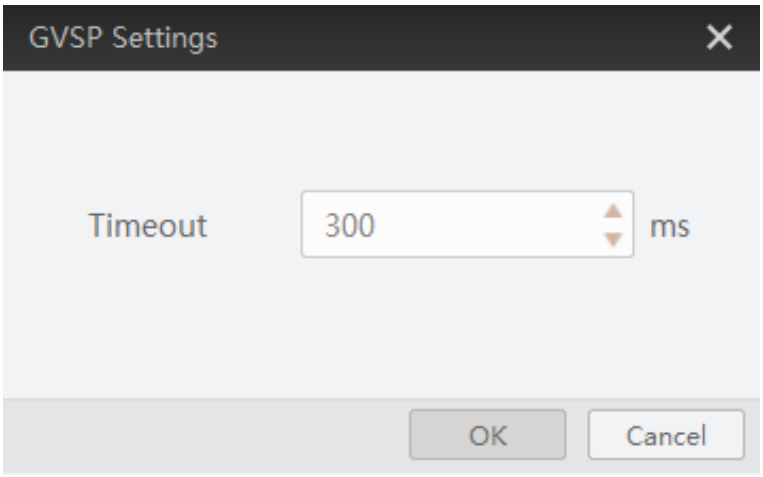


Figure 4-8 GVSP Settings

Save GemICam XML

Right-click a GigE Vision camera, and then click **Save GemICam XML** to save the camera information as XML file for purposes such as secondary development of the Software.

Note

Saving GemICame XML is only available when the camera is connected or in acquisition.

Rename User ID

Right-click a GigE Vision camera, and then click **Rename User ID** to edit user ID of the camera.

Note

Renaming user ID is only available when the camera is connected or in acquisition.

Configure NIC

Right-click a GigE Vision interface and then click **NIC Settings** to set NIC parameters. For details, see *Configurations before Using GigE Vision Cameras*.

Stick Camera to Top

Right-click a GigE Vision camera and then click **Stick to Top** to stick the camera to the top of the GigE Vision camera list.
If you want to cancel sticking the camera to the top, right-click the camera and then click **Cancel Sticking to Top**.

4.2 USB3 Vision Camera Management

USB3 Vision camera is the camera using USB3 Vision interface standard for data transmission. You can connect USB3 Vision to the Software for further management such

as image data acquisition.

4.2.1 Add USB3 Vision Camera

You can add USB3 Vision camera to the Software in two ways, i.e., by automatically enumerating camera, or by command.

- After you connecting a USB3 Vision camera to the PC on which the Software runs, the camera will be automatically enumerated if the USB driver is properly installed. For details about automatically enumerating camera, see ***Automatically Enumerate Local Cameras***.
- You can also connect a USB3 Vision camera to the Software by command. For details, see ***Connect Camera by Command***.

4.2.2 Status of USB3 Vision Camera

The Software provides multiple icons to indicate the status of the USB3 Vision camera. You can do further management according to the status of the cameras.
The following table shows the descriptions of different status.

Table 4-3 Status Description

Camera Status	Description
	Available and disconnected. You can double-click the camera or select it and click on the control toolbar to connect it to the Software. Once connected, the status changes to .
	Connected.
	USB driver exception. You should reinstall the USB driver.
	Not available. Another software or process on the same PC is accessing the camera.
	The camera is acquiring image data.
	USB driver exception (the USB interface of the PC is USB 2.0 interface). You should reinstall the USB driver.
	Connected (the USB interface of the PC is USB 2.0 interface).
	Available and disconnected (the USB interface of the PC is USB2.0 interface).
	Not available (the USB interface of the PC is USB 2.0 interface). Another software or process on the same PC is accessing the camera.
	The camera is acquiring image data (the USB interface of the PC is USB2.0 interface).

4.2.3 Other Features

Other features are provided for the USB3 Vision cameras on the device list, including U3V Transfer settings, device user ID settings, GenICam XML settings, etc.

U3V Transfer Settings

You can edit the packet size and streaming channels for a USB3 Vision camera.
Right-click a USB3 Vision camera and then click **U3V Transfer Setting** to open the U3V Transfer setting window, and then configure **Packet Size** (value range: 64 to 20,480 KB, default value: 1024 KB) and **Streaming Channel(s)** (value range: 1 to 10, default value: 8) according to the performance of the USB frame grabber. The lower the performance of the USB frame grabber, the smaller the **Packet Size** and the more **Streaming Channel(s)** you should set so as to alleviate data transmission between and camera and the Software.

Note

U3V transfer settings is only available when the camera is connected or in acquisition.

Save GemICam XML

Right-click a USB3 Vision camera, and then click **Save GemICam XML** to save the camera information as XML file for secondary development of the Software.

Note

Saving GemICame XML is only available when the camera is connected or in acquisition.

Rename User ID

Right-click a USB3 Vision camera, and then click **Rename User ID** to edit user ID of the camera.

Note

Renaming user ID is only available when the camera is connected or in acquisition.

Stick Camera to Top

Right-click a USB3 Vision camera and then click **Stick to Top** to stick the camera to the top of the USB3 Vision camera list.
If you want to cancel sticking the camera to the top, right-click the camera and then click **Cancel Sticking to Top**.

4.3 Camera Link Camera Management

Camera Link camera is the camera using Camera Link standard for data transmission. After adding Camera Link cameras to the Software, you can do further operations such as

camera parameter configuration.

Note

Camera Link is a serial communication protocol standard designed for camera interface applications based on the National Semiconductor interface Channel-link.

4.3.1 Add Camera Link Camera

The Software supports Camera Link camera. You can connect Camera Link cameras to the Software to perform further operations such as camera feature configuration.

Before You Start

You should have properly connected Camera Link camera to the PC on which the Software runs.

Steps

Note

- The Software doesn't support acquisition and live view for the Camera Link cameras. You can only manage features of Camera Link cameras after connecting them to the Software if no third-party frame grabber is installed on the PC.
- To acquire streams and view live view of Camera Link cameras, you should have installed third-party frame grabber on the PC.
- Camera Link camera doesn't support Bayer settings and ROI/AOI settings.

1. Move the cursor to **Camera Link**, and then click to refresh the Camera Link Camera list.
   The camera will be displayed under the Camera Link interface of the device list.

Note

- The time for refreshing Camera Link camera is longer than that of other types of camera. Please wait patiently.
- The Camera Link camera may be enumerated for two times via serial port and frame grabber respectively.

2. Connect the camera to the Software.
3. Optional: Right-click the camera, and then click **Connection Parameter Settings** to set the baud rate of the camera.

Note

The higher the baud rate, the faster the signals can be transmitted.

4.3.2 Status of Camera Link Camera

The Software provides two icons to indicate the status of the Camera Link camera. You can do further management according to the status of the cameras.
The following table shows the descriptions of different status.

Table 4-4 Status Description

Status Icon	Description
	Available and disconnected. You can double-click the camera, or select the camera and then click  on the control toolbar to connect it to the Software. Once connected, the status icon changes to  .
	Connected.

4.4 GenTL Management

The GenTL (short for Generic Transport Layer) standard provides a generic way to allow the Software to enumerate cameras, communicate with cameras, and if possible, stream data from cameras independent from the underlying transport technology, and configuring features of connected frame grabbers. This allows the Software to control cameras (including third-party cameras) and to acquire data in a transport layer agnostic way.

Steps

1. Right-click **GenTL** on the device list and then click **Select cti File**.
2. Select a cti file from the local PC and load it.

Note

- The cti files of GigE interface and USB3 Vision interface are provided by the Software (directory: *C:\Program Files (x86)\Common Files\MVS\Runtime\Win32_i86* or *C:\Program Files (x86)\Common Files\MVS\Runtime\Win64_x64*).
- The Software supports loading the cti files of GigE, CameraLink, CoaXPress frame grabber. The saving path of the file is *C:\Program Files (x86)\Common Files\MVS\Runtime\Win32_i86* or *C:\Program Files (x86)\Common Files\MVS\Runtime\Win64_x64*.

Table 4-5 cti File Description

File Name	Device Type
MvFGProducerCML.cti	Camera Link frame grabber.
MvFGProducerCXP.cti	CoaXPress frame grabber.
MvFGProducerGEV.cti	GigE frame grabber.

File Name	Device Type
MvProducerGEV.cti	Camera with GEV interface.
MvProducerU3V.cti	Camera with USB interface.
MvProducerVIR.cti	Virtual camera.

- The Software also supports third-party cti files which conform to the GenTL standard.
- For third-party cti files, you need to get them by yourself. You can contact the corresponding manufacturer for support.
- If you have configured the default path of cti file, the Software will load it automatically once you start the Software. See ***General Settings*** for details about how to set the default path of cti file.

The device list will enumerate the cameras that can be discovered by the cti file.

Note

CoaXPress cameras can only be connected by GenTL. If connected, you can control the camera and acquire image data.

3. Optional: Connect the frame grabber, and then click to refresh cameras after loading the cti file.

   Different icons indicate different status of a frame grabber.

Table 4-6 Frame Grabber Status

Icon	Status	Description
	Available	The frame grabber can be connected and operated.
	Connected	The Software has been connected to the frame grabber. You can configure parameters of the frame grabber and enumerate cameras connected to the frame grabber.

   The cameras connected to the enumerated frame grabber will be displayed. You can double-click a camera to connect to it.
4. Optional: Perform the following operations.
   - For CameraLink frame grabbers which cannot enumerate real cameras, right-click a frame grabber and select **Open as a Virtual Camera** to connect and operate the cameras of the frame grabber as virtual cameras.
   - After connecting to the frame grabber, the feature tree of the frame grabber will be displayed on the right. Configure the features if necessary.
   - After connecting to the frame grabber, right-click it and then select **Save GenICam XML** to save the frame grabber's GenICam file to the PC in XML format.

- After disconnecting to the frame grabber, you can right-click the frame grabber and select **Upgrade Firmware** to upgrade its firmware.
- Upgrade firmware of a single camera connected to frame grabber: Click to connect to a frame grabber and enumerate cameras connected to it. Right-click a camera and select **Upgrade Firmware**. Click to select an upgrade package (a dav file), and then click **Upgrade**.

Note

Reboot the PC after upgrade, or the upgrade will not take effect.

- Clear the currently loaded cti file: Disconnect all cameras under **GenTL**. Right-click **GenTL**, and then click **Clear cti File**.

4.5 Event Monitor

The Event Monitor is a tool to determine causes of issues that may occur when using the device. When enabled, you can view all the time-stamped GigE Vision or USB3 Vision events.

Steps

Note

The Event Control feature should be supported by your device, or the Event Monitor functionality will be unavailable.

1. Connect the camera with the software by one of the following operations.
   – Select a camera from the device list and click on the control toolbar to connect it with the software.
   – Double-click the camera on the device list to connect it with the software.
2. Select **Advanced Features** tab on the Feature List Panel on the right of the main page.
3. In **Event Control Information**, check the event(s) that you want to view.
4. Right-click the camera on the device list and select **Event Monitor** to open the Event Monitor window.
5. Check **Messaging Channel Event**.
6. Optional: Click to select a saving path, and then check **Auto Save** to automatically save the generated events to the PC.
7. Start acquisition, and then a large number of events will appear on the Event Monitor window.
   – Click on the display window to start acquisition.
   – Right-click the camera on the device list and click **Start Acquisition**.

Note

- Up to 10000 events can be displayed on the Event Monitor window.
- Events will keep being obtained even if you close the Event Monitor window.

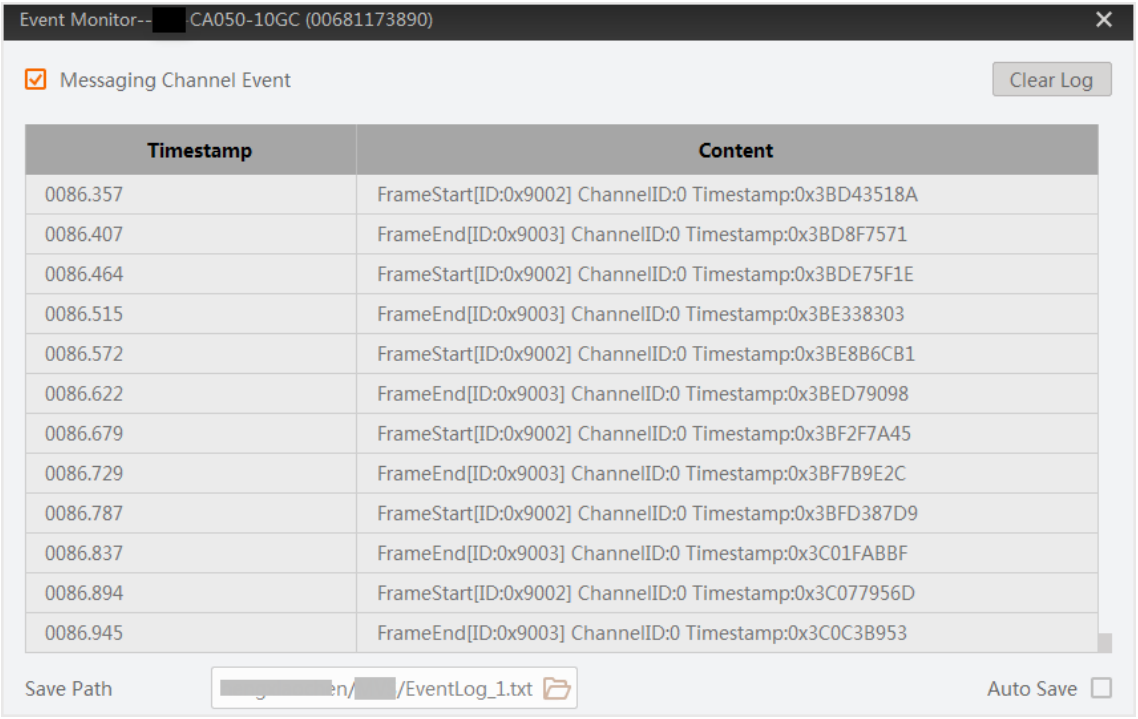


Figure 4-9 Event Monitor

8. Optional: Click **Clear Log** at the upper-right side of the window to clear all the events displayed before.

4.6 Add a Virtual Camera

Virtual Camera is a tool designed for scenarios where constructing a real setup of camera environment is not feasible. It can simulate cameras and help to simplify tests during development stage.

Steps

1. Click **Tool** → **Virtual Camera** to open the Virtual Camera window.
2. On the Virtual Camera window, select and add the camera models you want to simulate.

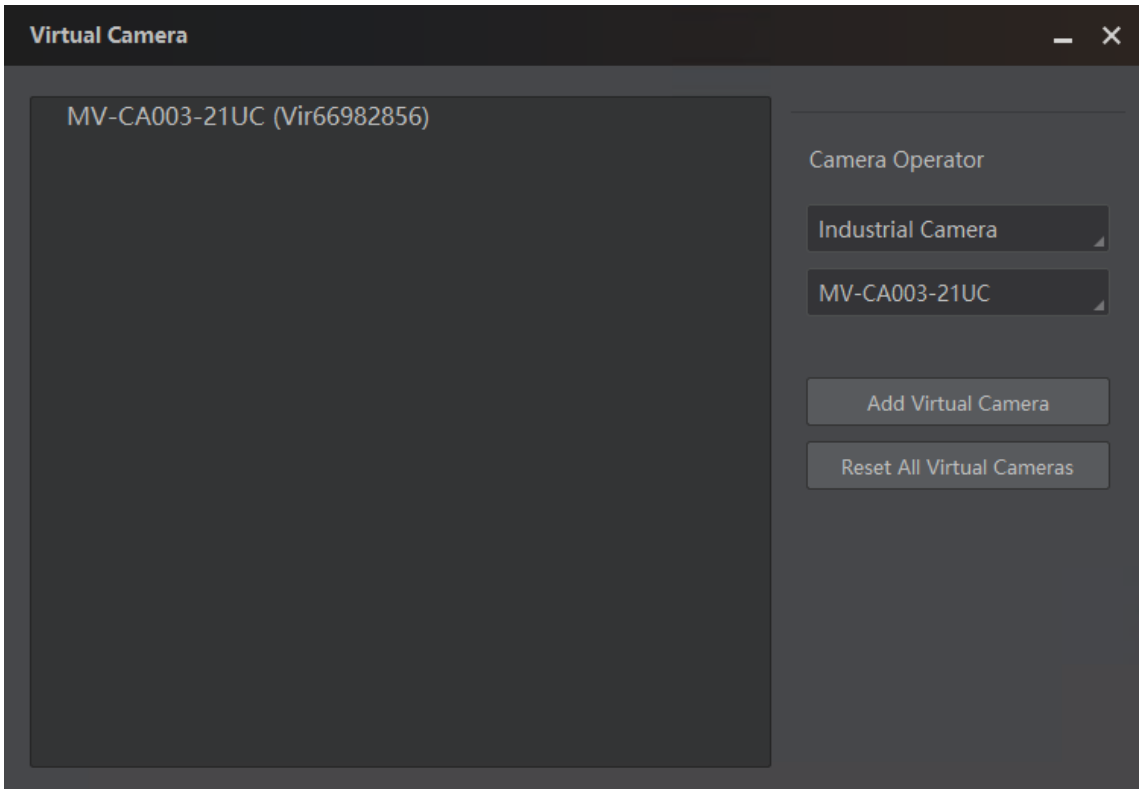


Figure 4-10 Virtual Camera

Note

The supported virtual camera models are subject to the displayed options.

The added virtual cameras will be displayed on the Device List.

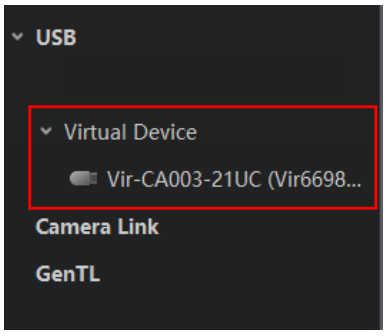


Figure 4-11 Virtual Camera List

Note

If there is no virtual camera displayed, click to refresh.

3. Optional: You can also add virtual cameras via GenTL. Right-click **GenTL** and click **Select cti File**. Select and open **MvProducerVIR.cti** file to display virtual cameras.
4. Double-click a virtual camera to show the feature tree of the camera.

5. Select a pixel format at the Image Format Control part.
6. Go to *C:\Windows\Temp\VirtualCamera\Cameras*, and find the file folder named by the virtual camera No.
7. Open the file folder, and then put images in the file folder named Mono8 or RGB24.

Note

Make sure the resolution of the images is the same with the resolution of the camera.

8. Optional: Perform further operations as needed on the Virtual Camera window.
   - **Change Online Mode**: Right-click the virtual camera and click **Change Online Mode** to switch its mode between online and offline.
   - **Delete a Virtual Camera**: Right-click the virtual camera you want to delete, and click **Delete** to delete it.
   - **Reset All Virtual Cameras**: Click **Reset All Virtual Cameras** to reset all added virtual cameras to their default settings.

What to do next

Start acquisition of the camera to play the imported images.

4.7 Dead Pixel Correction

You can conduct dead pixel correction on a camera to fix dead pixel.

Before You Start

Make sure that the camera has been connected to the Client.

Steps

1. Select a camera on the device list.
2. Right-click the camera name and select **Dead Pixel Correction**.
3. Optional: Export the dead pixel file and edit the dead pixel information.
4. Select a dead pixel file (MFA format) and click **Import**.
   A progress bar will be displayed when importing, and a message box noting "Imported" will pop up when the import is finished.

Chapter 5 Camera Feature Configuration

The Software provides multiple methods to configure the camera features, including configuring manually, configuring via User Set, configuring via project file, configuring via File Access, and batch exporting and importing features.

5.1 Feature Tree

Features are capabilities of the cameras and camera modules that can be controlled by setting firmware parameters. The feature tree displays all available features of a connected camera and you can edit the parameters under each feature.

Note

The available features of the camera vary with different camera models.

You can perform the following four generic operations.

Table 5-1 Generic Operations on Feature Tree

Generic Operation	Description
Show or Hide Features	Click to show or hide the camera features under all feature categories.
Switch User Level	Switch user level (Beginner, Expert, or Guru) at the bottom of the Feature Tree tab. **Note** The higher the user level, the more camera features will be displayed. Guru Level provides the most comprehensive camera features for professional use.
Add Feature/Parameter to Favorites	Right-click a frequently-used feature category or a specific feature/parameter, and then click **Add to Favorites** to add it to the Favorites. By default, the features/parameters added to Favorites are ranked by time. You can drag the added feature/parameter to adjust its rank.
View Description of Feature/Parameter	Click the name of a feature or parameter to view its description at the bottom of the tab page.
Switch Language	Click to switch the language of this pane to Chinese.

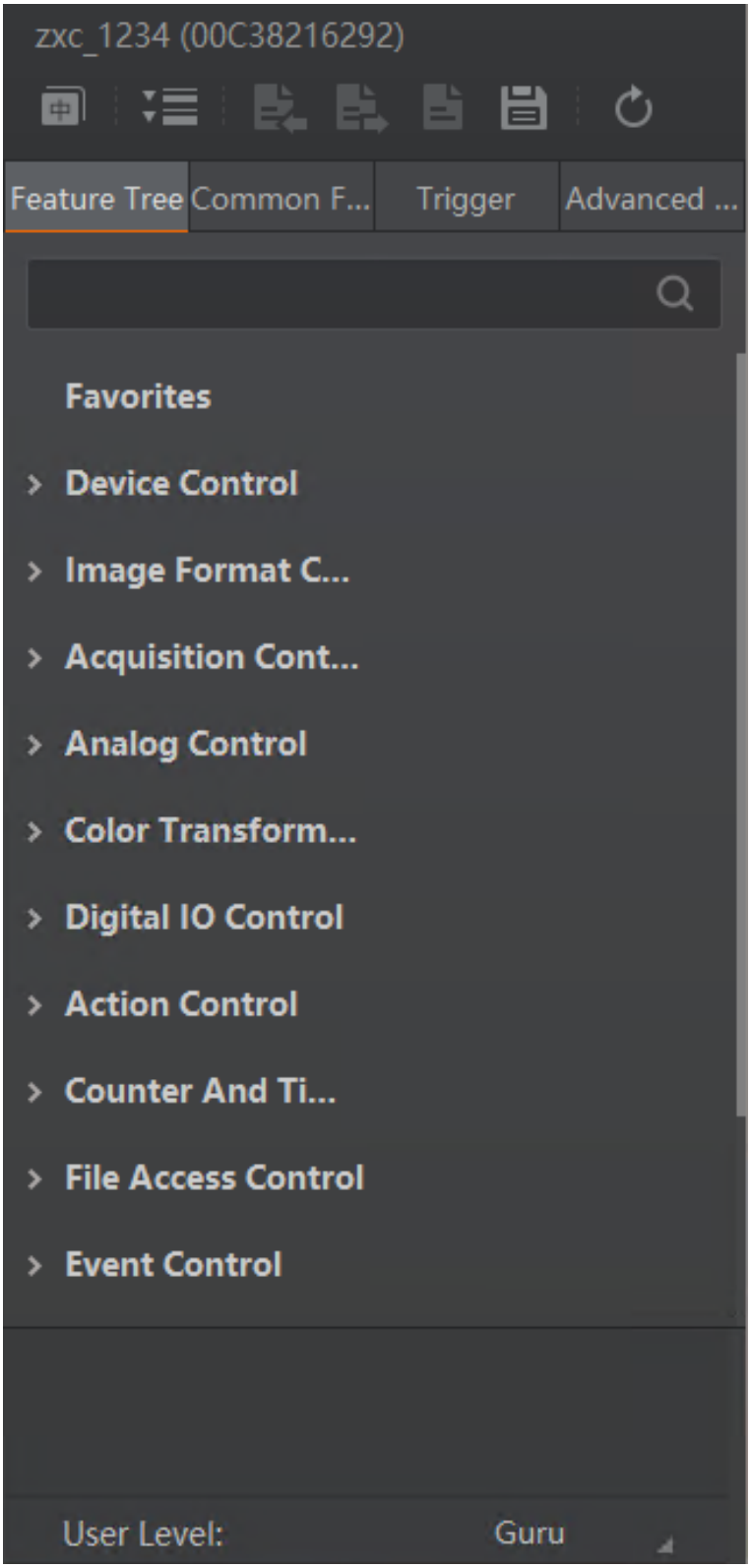


Figure 5-1 The Feature Tree Tab

The following table briefly introduces the description of each feature category.

Table 5-2 Feature Category Description

Feature Category	Description
Device Control	Contains the features related to the control and information of the camera. You can do the followings: ● View the camera details including device type, version, manufacturer details, device ID, device temperature, etc. ● Modify the alias and reset the camera.
Image Format Control	Contains the features related to the format of the transmitted image. You can do the followings: ● View the live view image width and height, pixel size, etc. ● Set ROI, modify pixel format, set image reverse, test pattern, and set the embedded information, etc.
Acquisition Control	Contains the features related to image acquisition, including trigger and exposure control. You can set the trigger mode, trigger source, acquisition mode, etc.
Analog Control	Contains the features related to the video signal conditioning in the analog domain. You can adjust the analog signal including analog gain, black level, brightness, gamma, sharpness, AOI, etc.
LUT Control	Contains the features related to the look-up table (LUT) control. You can view the user look-up table and set the LUT index and value.
Digital I/O Control	Contains the features related to the control of the input and output pins of the camera. You can manage the digital input and output.
Action Control	Contains the features related to the control of action command. You can use the features to define the mechanism of the action command.

Feature Category	Description
Counter and Timer Control	Contains the features related to the usage of programmable counters and timers. You can set the counter and timer, which count the triggering signal and control the exposure according to your needs.
File Access Control	Contains the features related to accessing files in the camera. You can use File Access to export and import camera settings.
Event Control	Contains the features related to the generation of event notifications by the camera. You can use Event Monitor to view the messaging channel events to determine causes of issues that may occur during the use of your camera.
Chunk Data Control	Contains the features related to the generation of supplementary image data (i.e., Chunk data) and the appending of that data to every image that you acquire. You can enable chunk data, and set the content of the chunk data.
Transport Layer Control	Contains the features related to the control of transport layer. You can set the parameters of transport layer of the camera.
User Set Control	Contains the features related to the global control of camera settings. **User Set Current** The currently loaded user set. ● "0" represents **Default**, i.e., the factory settings. ● "1" represents **UserSet1**. ● "2" represents **UserSet2**. ● "3" represents **UserSet3**. **User Set Selector** Select User Set. **Note** The number of User Sets vary with different camera models. **Default** The read-only factory settings. In other words, the default startup settings on the camera.

Feature Category	Description
	User Set1, User Set2, User Set3 The user sets that can be used to load and save your own camera settings. Initially, these user sets contain the same parameter values as the **Default** user set. You can save one of them to overwrite those values with your own settings to create a user set that is customized for your usage scenario. See the description of **User Set Save** below for details about saving User Set. **User Set Load** Load the User Set specified by User Set Selector to the camera and make the it active. When a user set is loaded, it overwrites the current camera settings. **Note** ● Loading a user set is only possible when the camera is idle, i.e., not acquiring images. ● Except for the **Default** user set, you should have saved a User Set before you can load it. See the description of **User Set Save** below for details about saving User Set. **User Set Save** Save your own camera settings as the User Set specified by User Set Selector. **Note** ● Only the **UserSet1**, **UserSet2**, and **UserSet3** can be saved. The other user sets are read-only. ● Saving a user set is only possible when the camera is idle, i.e., not acquiring images. **User Set Default** Select User Set to automatically load and make it active by default when the camera is reset to its power up state.

5.2 Common Features

On the Common Features tab, you can configure the features which are frequently used in camera configuration, including basic features (Acquisition Frame Rate Control Enable,

Exposure Auto, Gain Auto, etc.), ISP, and transport layer control.

5.2.1 Basic Features

The Basic Features allow you to set features like Acquisition Frame Rate, Exposure Time, Gain, etc.

Note

The available features and parameters vary with different camera models. Here we only introduce part of the features and parameters.

Acquisition Frame Rate Control Enable

Controls if the Acquisition Frame Rate feature is adjustable and used to control the acquisition rate. Otherwise, the acquisition rate is implicitly controlled by the combination of other features like Exposure Time, etc.

Acquisition Frame Rate(Fps)

Set an upper limit for the frame rate (fps) at which frames are captured.
This is useful if you want to operate the camera at a constant frame rate in continuous image data acquisition.

Resulting Frame Rate(Fps)

Displays the value of the maximum allowed frame rate (fps) in image data acquisition. In continuous acquisition, the **Resulting Frame Rate** parameter is useful for optimizing the frame rate for your imaging application. You can adjust **Acquisition Frame Rate** until the **Resulting Frame Rate** reaches the desired value.

Exposure Time

Specify how long the image sensor is exposed to light during image acquisition when **Exposure Mode** is Timed and **Exposure Auto** is Off.

Note

- The **Exposure Mode** parameter should be set to Timed, or the **Exposure Time** parameter is not available.
- The **Exposure Auto** parameter should be set to Off, or the **Exposure Time** parameter is not available.

Gain Auto

Set the Automatic Gain Control (AGC) mode.

Off

Gain is controlled manually using **Gain**.

Once

The camera will automatically adjust gain for only once. After that, the state will

automatically return to **Off**.

Continuous

Gain will be constantly auto-adjusted by the camera.

Gain(dB)

Set an amplification factor applied to the video signal so as to increase the brightness of the image output by the camera.

Note

- **Gain Auto** should be set to Off, or the parameter will not be available.
- Increasing the gain increases all pixel values of the image.

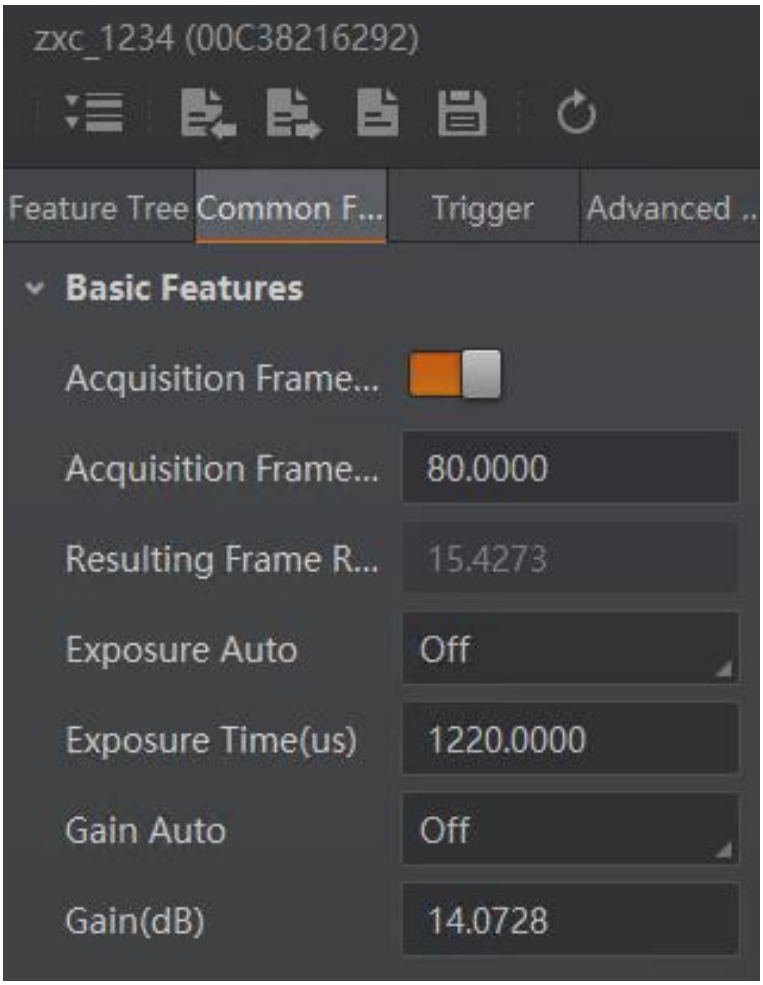


Figure 5-2 Basic Features

5.2.2 ISP

Follow the instructions below to configure the ISP parameters.

Gamma Enable

Enable the gamma correction of pixel intensity, which helps optimizing the brightness of acquired images for displaying on a monitor.

Gamma Selector

Specify a gamma correction mode.

User

The gamma correction value can be entered manually for the **Gamma** parameter as desired.

sRGB

The gamma correction value will be automatically set to approximately 0.4. This value is optimized for image display on sRGB monitors.

Gamma

The gamma correction value.

Sharpness Enable

If enabled, the **Sharpness** parameter will be available. The larger the **Sharpness** value, the more distinct the contours of the image objects will be. This is especially useful in applications where cameras must correctly identify numbers, letters or characters.

Hue Enable

Enables/disables hue adjustment.

Hue

Hue of the image in degrees.

Saturation Enable

Enables/disables saturation adjustment.

Saturation

Saturation of the image in percent.

Balance White Auto

Balance White Auto is the 'automatic' counterpart of the manual white balance feature.

Bayer Interpolation Method

If you select **Bayer** as the pixel format, select **Quick**, **Balance**, or **Optimal** as the bayer interpolation method.

Configure White Balance (Bayer)

If the **Pixel Format** parameter of the camera is set to Bayer, perform the following steps to

configure white balance parameters.

Before You Start

Make sure you have started acquiring image data. For details, see *Acquisition and Live View in 1-Window Mode*.

Steps

1. Go to the White Balance section of the Common Features tab.
2. Set **Balance White Auto**.

Balance White Auto

Set the mode for automatic white balancing between the color channels. Once set, the white balancing ratios are automatically adjusted.

Off

Set white balancing manually. See the step 3 below for details.

Once

White balancing is automatically adjusted once by the camera. Once it has converged, it automatically returns to the Off state.

Note

If you select **Once**, skip step 3.

Continuous

White balancing is constantly automatically adjusted by the camera.

Note

If you select **Continuous**, skip step 3.

3. If you select **Off** as the value of Balance White Auto, perform the following sub-steps to configure white balance manually.

Note

- To configure white balance manually, the **Gamma Enable** parameter in the feature tree should be turned off.
- To configure white balance manually, the **Color Transformation Enable** parameter in the feature tree should be turned off if the camera supports this parameter.
- To configure white balance manually, the **Hue Enable** parameter and the **Saturation Enable** parameter should be turned off if the camera supports the two parameters.

1) Click **Execute** of **White Balance** to open the White Balance Settings window.
2) Click **Capture** to capture an image.
3) Click draw a Region of Interest (ROI), which is shown as a green rectangle, on the original image to select the white area on the image.

Note

- If there's no white area on the original image, place a white object in front of the camera.
- You can also click to cancel the ROI settings.

Once you have drawn the ROI, the recommended value for the R (Red) channel, G (Green) channel, and B (Blue) channel will be displayed. You can manually adjust them if required.

4) Optional: Click **Restore** to restore the settings.
5) Click **Optimize** to execute optimization.
   - The optimized image will be displayed on the right.
   - You can view the optimized value of R (Red) channel, G (Green) channel, and B (Blue) channel at the lower right of optimized image.

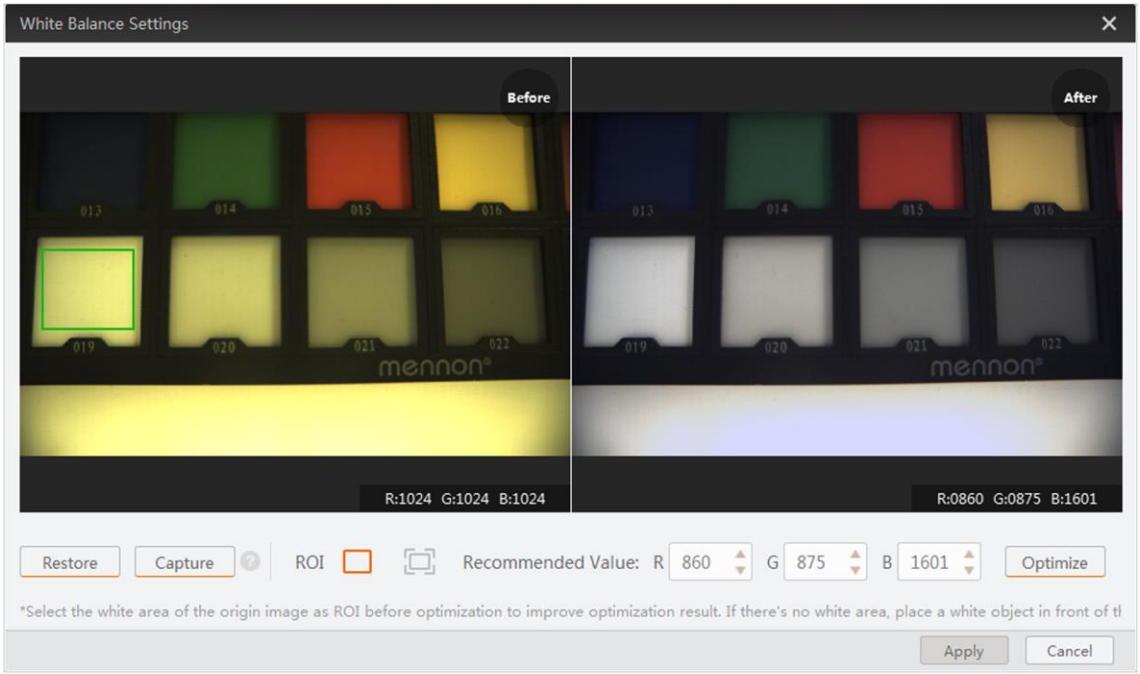


Figure 5-3 Optimization Result

6) Click **Apply** to apply the settings to the camera.

Configure White Balance (YUV/RGB/BGR)

If the **Pixel Format** parameter of the camera is set to YUV, RGB or BGR, you can go to the White Balance section of the Common Features tab to set the white balance parameters.

Note

- White balance parameters in only available for color camera.
- The available parameters vary with different camera models.

Balance White Auto

Set the mode for automatic white balancing between the color channels. Once set, the white balancing ratios are automatically adjusted.

Off

Set white balancing manually using **Balance Ratio Selector** and **Balance Ratio**.

Once

White balancing is automatically adjusted once by the camera. Once it has converged, it automatically returns to the Off state.

Continuous

White balancing is constantly automatically adjusted by the camera.

Balance Ratio Selector

Selects which Balance ratio to control.

Red

Balance Ratio will be applied to the red channel.

Green

Balance Ratio will be applied to the green channel.

Blue

Balance Ratio will be applied to the blue channel.

Balance Ratio

Set the weight value (0 to 4095) for the channel selected from **Balance Ratio Selector**.

5.2.3 Transport Layer Control

The Transport Layer Control feature allows you to configure parameters related to data packet transmission.

Note

The available features and parameters vary with different camera models. Here we only introduce part of the features and parameters.

GEV SCPS Packet Size

Specify the maximum size (unit: byte) of a data packet transmitted via Ethernet. The larger the packet size, the less the Ethernet overhead load and hence the higher the network efficiency.
The default value (1,500 bytes), which is also the recommended value, is sufficient for most configurations.

Note

If you increase the packet size above 1,500 bytes, make sure that Jumbo Frame of the network adapter is enabled.

Gev SCPD

Specify the delay (in timestamp counter units) to insert between each packet for this stream channel. This can be used as a flow-control mechanism if the application or the network infrastructure cannot keep up with the packets coming from the device.

Note

Increasing the delay may reduce the amount of dropped packets at the expense of slowing the data transmission. As a result, the camera's frame rate may decrease.

GEV PAUSE Frame Reception

Controls whether incoming PAUSE Frames are handled on the given logical link.

GEV Stream Channel Selector

Selects the stream channel to control.

LinkConfiguration

Bootstrap register ConnectionConfig.

LinkConfigurationPreferred

Bootstrap register ConnectionConfigDefault.

CI Configuration

Select a channel mode for the camera. The image outputting way varies according to different channel mode.

5.3 Trigger

On the Trigger tab, you can configure features related to the trigger of IO input and IO output.

5.3.1 IO Input

On the Trigger tab, the IO Input section displays trigger related parameters, which can be used to control the acquisition of images.

Note

The features vary with different camera models.

Trigger Selector

Select the type of trigger for image acquisition.

Frame Burst Start

The trigger for starting the capture of the bursts of frames in an acquisition.
A burst of frame(s) is defined as the capture of a group of one or many frame(s) within an acquisition

Trigger Mode

Controls if the selected trigger is active.

Off

Disable the selected trigger.

On

Enable the selected trigger.

Trigger Source

Specify the internal signal or physical input Line as the trigger source.

Software

Specify that the trigger source will be generated by the software when you execute the *TriggerSoftware* command or set **Enable Auto Trigger** switch to on.

Line 0, Line 1, Line 2 ...

Specify the selected physical line (or pin) and associated I/O control block as the external source for the trigger signal.

Counter 0

Specify the selected Counter signal as the internal source for the trigger.

Action 1

Specify the selected Action Command as the internal source for the trigger.

Note

For details about Action Command, see *GigE Vision Action Command*.

Anyway

All the above-mentioned trigger source types (**Software**, **Line 0, Line 1, Line 2 ...**, **Counter 0**, and **Action 1**will be used as the source for the trigger.

Trigger Activation

Specify which signal transition activates the trigger.

Note

Trigger Activation is only available when **Trigger Source** is set to **Line 0, Line 1, Line 2 ...**, **Counter 0**, or **Anyway**.

Rising Edge

Specify that the trigger is considered valid on the rising edge of the source signal.

Falling Edge

Specify that the trigger is considered valid on the falling edge of the source signal.

Level High

Specify that the trigger is considered valid if the level of the source signal is high.

Level Low

Specify that the trigger is considered valid if the level of the source signal is low.

Trigger Delay

Specify the delay in microseconds (μs) to apply after the trigger reception before activating it.

Auto Trigger Time

Specify the interval in milliseconds (ms) to generate the trigger signal automatically.

Note

- **Auto Trigger Time** is only available when you set **Software** as the Trigger Source.
- **Auto Trigger Time** is only effective when the **Enable Auto Trigger** switch is set to on.

Enable Auto Trigger

Enable the software to generate the trigger signal automatically.

Note

The parameter is only available when you set **Software** as the Trigger Source.

Trigger Software

Click **Execute** to execute the *TriggerSoftware* command so as to generate the trigger signal.

PostDivider

Sets the PostDivider value for the PostDivider sub-module.

PreDivider

Sets the pre-divider value for the pre-divider sub-module.

Encoder Selector

Selects which Encoder to configure.

Encoder Source A/B

Selects the input line as signal source for the shaft encoder module.

Encoder Trigger Mode

This enumeration value selects the circumstances for the shaft encoder module to

output trigger signals.

Encoder Counter Mode

Selects the counting mode of the tick counter of the shaft encoder module.

Encoder Counter

This integer value (read only) indicates the current value of the tick counter of the shaft encoder module.

Encoder Counter Max

This integer value sets the maximum value for the tick counter of the shaft encoder module.

Encoder Counter Reset

This command resets the tick counter count of the shaft encoder module to 0.

Encoder Max Reverse Counter

This integer value sets the maximum value for the reverse counter of the shaft encoder module.

Encoder Reverse Counter Reset

This command resets the reverse counter of the shaft encoder module to 0 and informs the module that the current direction of conveyor movement is forward. Reset must be carried out before the first conveyor movement in the forward direction.

5.3.2 IO Output

On the Trigger tab, the IO Output section provides parameters which allow you to control the general input and output signals of the camera.

Note

The displayed features vary with different camera models. This topic only introduces common IO Output features.

Line Selector

Selects the physical line (or pin) of the external device connector or the virtual line of the Transport Layer to configure its parameters such as line mode.

Line Mode

Control if the selected line is used to input signals, output signals, or control lights.

Input

Use the selected line to input signals.

Line Debouncer Time

Set a debouncer time (range: 0 to 1000000, unit: μs) to filter out invalid short

signals (i.e.,contact bouncing signals). Once you set a debouncer time, signals that do not last longer than the time will be ignored.

Strobe

Used the selected line to output signals to control light source of the camera.

Line Source

Exposure Start Active

If the exposure starts, the output signals for controlling the light will be triggered.

Acquisition Start Active

If acquisition starts, the output signal for controlling the light will be triggered.

Acquisition Stop Active

If acquisition stops, the output signal for controlling the light will be triggered.

Frame Burst Start Active

If the burst of a frame starts, the output signal for controlling the light will be triggered.

Frame Burst Stop Active

If the burst of a frame stops, the output signal for controlling the light will be triggered.

Soft Trigger Active

Trigger the output signal for controlling the light via the Software.

Hard Trigger Active

Trigger the output signal for controlling the light via the camera.

Counter Active

Trigger the output signal for controlling the light by the counter.

Timer Active

Trigger the output signal for controlling the light by the timer.

Strobe Enable

Enable the strobe mode.

Strobe Line Duration

Set the time duration (unit: μs) of the output signal for controlling the light.

Strobe Line Delay

Set the delay time (unit: μs) for triggering the output signal for controlling the light if the events defined in **Line Source** occur.

Strobe Line Pre Delay

Set the pre delay time (unit: μs) for triggering the output signal for controlling the light if the events defined in **Line Source** occur.

5.3.3 Encoder Control

For line scan cameras, if the trigger mode is set to line trigger, you can configure the encoder signal sources for triggering.

Encoder Selector

Select an encoder.

Encoder Source A/B

Set the signal source A and B respectively for the encoder.

Note

It is recommended that you select different sources for A and B. If they are set to the same source, the shaft encoder will not output signal.

Encoder Trigger Mode

Select the triggering direction of the signal sources from **Any Direction**, **Forward Only**, and **Backward Only**.

Encoder Counter Mode

Select a counting mode for the counter of the encoder from **Ignore Direction**, **Follow Direction**, and **Backward Direction**.

Encoder Counter

(Read Only) Displays the number of triggered signals counted by the encoder counter in real time.

Encoder Counter Max

Set the maximum value allowed for the encoder counter.
When the value displayed by **Encoder Counter** reaches the set maximum value during counting, **Encoder Counter** will be automatically cleared when the next valid signal is received, and the counting will start again.**Encoder Counter** can also be cleared manually via **Encoder Counter Reset**.

Encoder Counter Reset

Click **Execute** to reset **Encoder Counter** to 0.

Encoder Max Reverse Counter

Set the maximum value allowed for the reverse counter of the encoder to allow the camera to not output images until the object returns to the starting position in the forward direction.

Encoder Reverse Counter Reset

Click **Execute** to reset the count of the reverse counter to 0.

5.3.4 Frequency Converter Control

For line scan cameras, if the trigger mode is set to frame trigger or line trigger, you can configure the parameters for converting the frequencies of hard triggering signals or shaft encoder signals to the frame trigger or line trigger frequencies required by the camera.

Input Source

Select an input source for the frequency conversion.

Note

N/A indicates no signal source is selected.

PreDivider

Set a positive integer for the PreDivider.
Signal of the input source is first processed by the PreDivider, which divides the signal frequency by the set integer and then sends the processed signal to the Multiplier.

Note

Signals with frequencies above 100 kHz must be processed by the PreDivider, because the Multiplier can only accept signals within the range of 10 to 100 kHz. Periodic jitter of the encoder signal is accepted.

Multiplier

Set a positive integer for the Multiplier.
The Multiplier multiplies the frequency of the signal received from the PreDivider by the set integer, and then sends the processed signal to the PostDivider.

PostDivider

Set a positive integer for the PostDivider.
The PostDivider divides the frequency of the signal received from the Multiplier by the set integer. The resulting signal will be used by the camera as the trigger signal.

5.4 Advanced Features

On the Advanced Features tab, you can configure features related to ROI feature, AOI feature, embedded information, color correction matrix settings, LUT (Look-up Table) feature, and other features.

5.4.1 Draw ROI

After ROI (Region of Interest) being configured, the system only acquires the image data within the ROI, which improves the acquisition efficiency.

Before You Start

Make sure you have exited the AOI drawing mode.

Steps

Note

You can also go to **Feature Tree** → **Image Format Control** and then configure Width, Height, Offset X, and Offset Y to set ROI. The value of Width plus the value of Offset X should not be larger than the Max. Width, and the value of Height plus the value of Offset Y should not be larger than the Max. Height.

1. Click or double-click the camera to connect it with the Software.
2. Select the connected camera.
3. Click **Advanced Features** on the Feature List panel.
4. Click to display the ROI features.
5. Select an ROI from the ROI Selector drop-down list.
6. Select pixel format from the Pixel Format drop-down list.
7. Draw ROI.
   - Click **ReDraw**, and then drag the cursor on the image to draw ROI (displayed as a blue rectangle).
   - Click **Edit**, and then the ROI (displayed as a blue rectangle) will cover the whole image. You can move the cursor to the edge of the rectangle, and then drag the two-way arrow to adjust the ROI.
8. Perform one of the following operations.
   - Manually adjust the OffsetX, OffsetY, width of ROI, and height of ROI.
   - Move the cursor to the edge of the blue rectangle, and then drag the two-way arrow to adjust the size of the ROI.

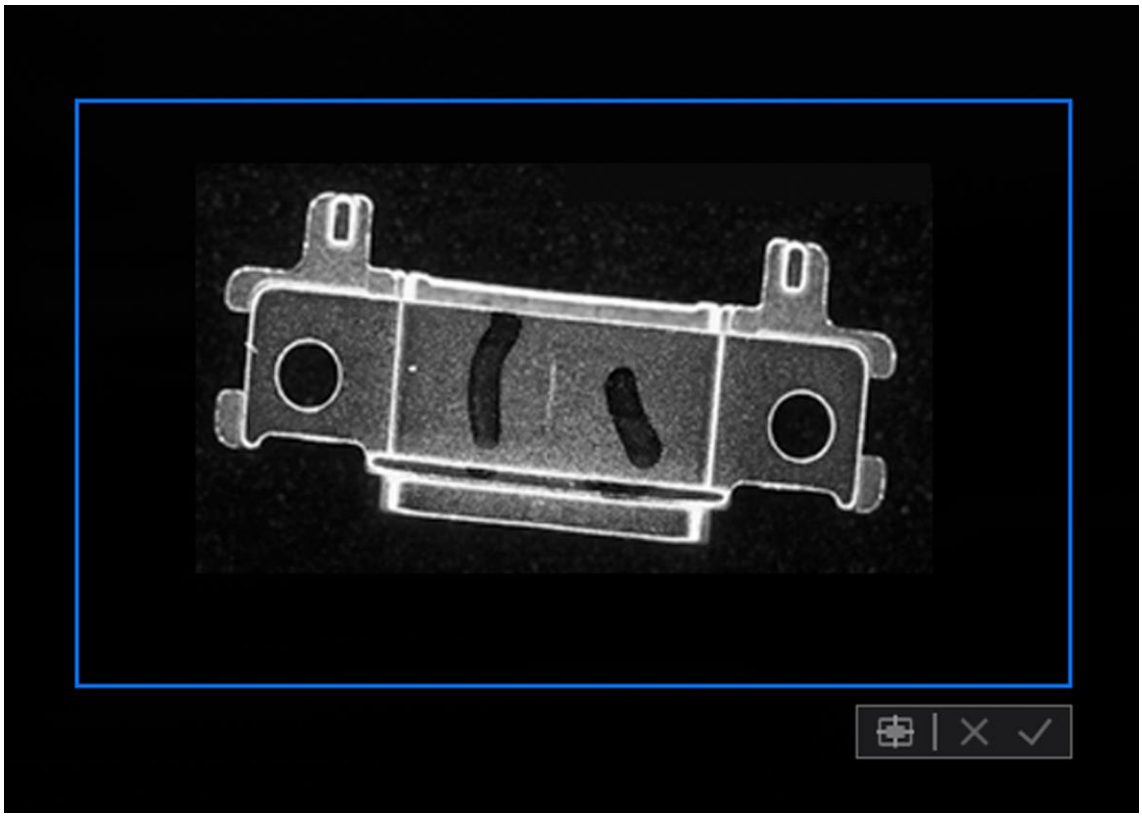


Figure 5-4 ROI

9. Optional: Adjust the position of the ROI.
   – Click to move the ROI to the center of the Live View window.
   – Hover the cursor onto the ROI until the cursor turns into a hand icon and then drag the ROI to adjust its position.
10. Finnish drawing.
   – Right-click the image and then click **Finish**.
   – Click ✓.

Note

The image resolution will be lower after setting ROI.

Only the selected ROI will be displayed.

11. Optional: Click **Restore Max. ROI** to restore the image to the original size.

Note

The image resolution will also be restored to the original state.

5.4.2 Configure AOI

AOI, which is short for Auto Function ROI, is the ROI that provides certain automatic

functions.

Perform the following steps to configure AOI.

Steps

1. Draw an AOI.

Note

Drawing the AOI is similar to drawing ROI. You can refer to *Draw ROI* for details.

2. Select the AOI type.
   - Select **AOI1** from **AOI Selector**, and then enable **AOI Usage Intensity** to set the exposure of the whole image to the same as the AOI exposure.
   - Select **AOI2** from **AOI Selector**, and then enable **AOI Usage White Balance** to set the white balance of the whole image to the same as the AOI white balance.

Note

AOI2 is only available for color camera.

5.4.3 Embedded Information

The Embedded Information feature allows you to embed data into the acquired images. You can select data to embed them into the acquired images. The selected ones will be displayed on the Embedded Information window, you can view the data details on it.

Note

- For details about viewing details of the embedded information on the Embedded Information window, see *View Embedded Information*.
- The types of data that can be embedded into the acquired images include Timastamp, Gain, Exposure, Brightness, White Balance, Frame Number, Triggering Number, Line Input/Output, and ROI.
  White Balance data is only available for color camera.

Embedding data into acquired images is realized in two ways, i.e., through the Hikrobot private protocol, or through the Chunk Data Control feature. If the camera supports the Chunk Data Control feature, the way through the Chunk Data Control feature shall prevail; If the camera doesn't support the Chunk Data Control feature, embedding data is realized through the Hikrobot private protocol.

- If the camera supports the Chunk Data Control feature, you should check **Chunk Mode Active** first, and then select data.
- If the camera doesn't support the Chunk Data Control feature, select data directly (see the picture below).

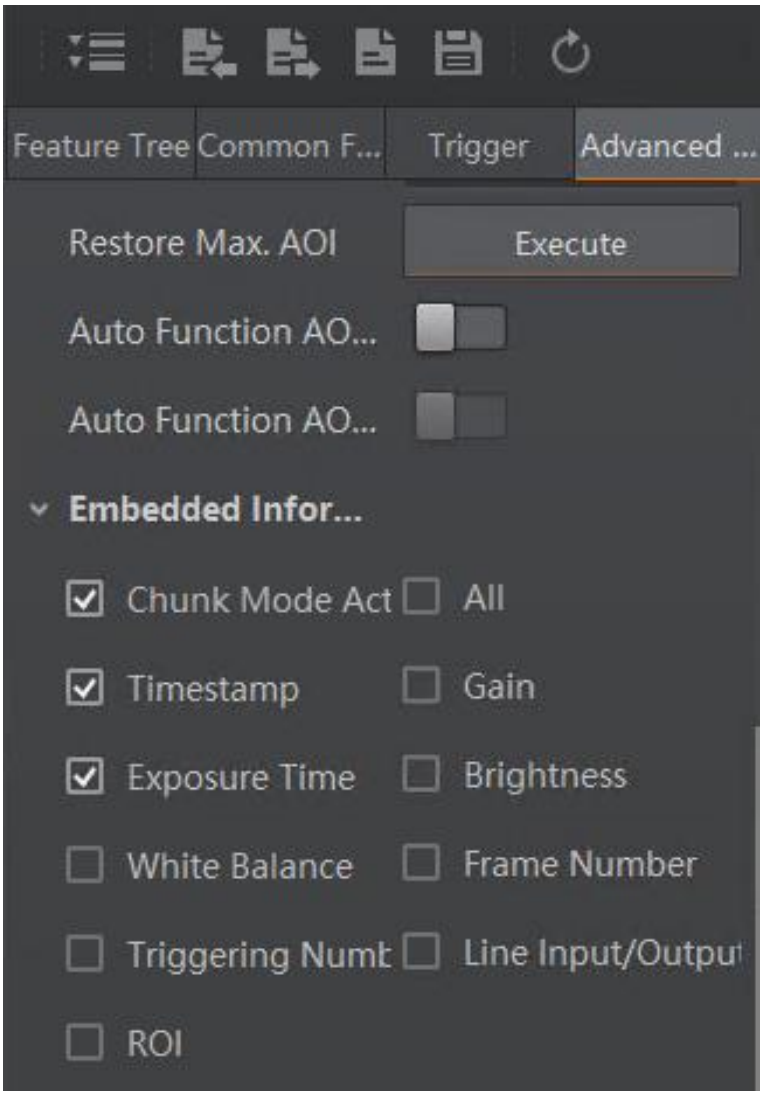


Figure 5-5 Embedded Information

5.4.4 Color Correction Matrix Settings

You can define multiplicative factors in Color Correction Matrix (CCM) to transform color contributions (e.g., R, G, B or B, G, R) of each incoming color pixel to corrected values, so as to enhance color fidelity of the images output by your camera. This is useful in areas where high color fidelity is required, such as microscopy.

Before You Start

Make sure the camera supports Color Transformation Control or Bayer format. Otherwise CCM settings will be unavailable.

Steps

1. Connect the camera to the Software, and then select it.
2. Go to the feature tree panel, and then select the **Advanced Features** tab.

3. In the CCM settings area, turn on **CCM Enable**.
4. Set multiplicative factors in the 9 fields below (see the figure ***Figure 5-6***), which represent a 3 × 3 color correction matrix.

Note

Valid value range of the multiplicative factor is from - 4 to 4.

Example

Take RGB to RGB transformation for an example. In this case, multiplicative factors (from **a11** to **a33**) marked in the figure ***Figure 5-6*** represent the following meanings.

a11

Red contribution to the red pixel.

a12

Green contribution to the red pixel.

a13

Blue contribution to the red pixel.

a21

Red contribution to the green pixel.

a22

Green contribution to the green pixel.

a23

Blue contribution to the green pixel.

a31

Red contribution to the blue pixel.

a32

Green contribution to the blue pixel.

a33

Blue contribution to the blue pixel.

$$\begin{bmatrix} r_{out} \\ g_{out} \\ b_{out} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} * \begin{bmatrix} r_{in} \\ g_{in} \\ b_{in} \end{bmatrix}$$

Figure 5-6 Color Transformation Matrix in RGB to RGB Transformation

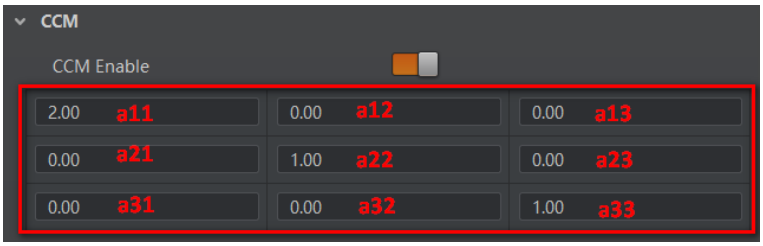


Figure 5-7 CCM Settings

5.4.5 Other Features

Configure the following parameters according to your need.

Binning Selector

Selects which binning engine is controlled by the BinningHorizontal and BinningVertical features.

Binning Horizontal/Vertical

Number of horizontal/vertical pixels to combine together.

Decimation Horizontal/Vertical

Horizontal/vertical sub-sampling of the image.

Shading Selector

Selects the mode of shading correction.

Activate Shading

Activates the selected shading set.

NUC Enable

Enable the FPNC and PRNUC Control

PRNUC User Enable

Enable PRNUC user table

Event Selector

Selects which Event to signal at the host application.

Event Notification

This enumeration sets the type of a notification that will be sent to the host application for the selected event.

5.4.6 Configure LUT

LUT is short for Look-up Table, which is basically an array. It provides a mathematically precise and fast way to replace the pixel values in the image by values defined by you. For example, you can create a "luminance look-up table" to replace the luminance value (or gray value) in the images to optimize the luminance of the images. The Software sorts out

the frequently-used LUT parameters in the LUT section on the Image Processing tab.

Before You Start

Make sure you have set **LUT Index** and **LUT Value** in the feature tree.

LUT Index

Set a pixel value that you want to replace with a new value.

LUT Value

Set a new pixel value to replace the value you set in **LUT Index**.

Steps

1. Connect the camera to the Software and select the camera.
2. Go to the **Advanced Features** tab on the Feature List panel.
3. Click to display the LUT parameters.
4. Select a value (e.g., Luminance, Red, Green, or Blue) from **LUT Selector** to set the LUT type.

   Luminance

   Luminance LUT, i.e., the look-up table for optimizing luminance of the images.

   Red

   Red LUT, i.e., the look-up table for optimizing red value of the images.

   Green

   Green LUT, i.e., the look-up table for optimizing the green value of the images.

   Blue

   Blue LUT, i.e., the look-up table for optimizing the blue value of the images.

   Note

   The available LUT types vary with different camera models.

5. Turn on **LUT Enable** to enable LUT.
6. Select the type of line (Fold Line, Curve, Free Line, and Adaptive) to be displayed on the LUT graph.

   Note

   - Each point on the line defines the Output value in corresponding to an Input value. The Input values represent the pixel values that need to be replaced, while the Output values represent the new pixel values that will replace the old ones.
   - By default, the maximum Input value for the line is the value you set for **LUT Index**, and the maximum Output value for the line is the value you set for **LUT Value**.

7. Optional: Adjust the line on the LUT graph.
   – For Fold Line and Curve, drag each node to edit the line.

Note

Scan the QR code to view the video clip which shows editing line by dragging each node.

- For Free Line, click or drag the cursor on the graph to edit the line.
- For Adaptive, specify gamma, contrast, and luminance values and the LUT graph will be automatically generated.

Note

You can zoom in the LUT graph for higher precision by scrolling up the mouse wheel on the graph.

8. Click **Execute** of **Apply to Camera** to apply the LUT settings to the camera.
9. Optional: Perform the following operations.

Load LUT Settings from Camera	Click **Execute** of **Load from Camera** to load LUT settings from the camera to the chart.
Export LUT Settings from File	Click **Execute** of **Export to File** to export the LUT settings to the local PC as a TXT file.
Import LUT Settings from File	Click **Execute** of **Import from File** to import the LUT settings from a TXT file.
Clear Line Settings	Click **Execute** of **Clear** to clear the line settings of the chart.

5.5 Temperature Window

The Temperature Window allows you to view temperature values and variation curves of temperature screening regions.

Note

Only the fourth tab of the camera feature configuration pane of infrared cameras is the Temperature Window tab. For other cameras, the fourth tab is Advanced Features (see *Advanced Features*).

When configuring the temperature screening parameters, you can choose whether to display on the Temperature Window the temperature values and curves of the temperature screening regions you have drawn. The value shows the real-time statistics of the corresponding region; the curve shows the temperature variation of the corresponding region over the last 12 hours.

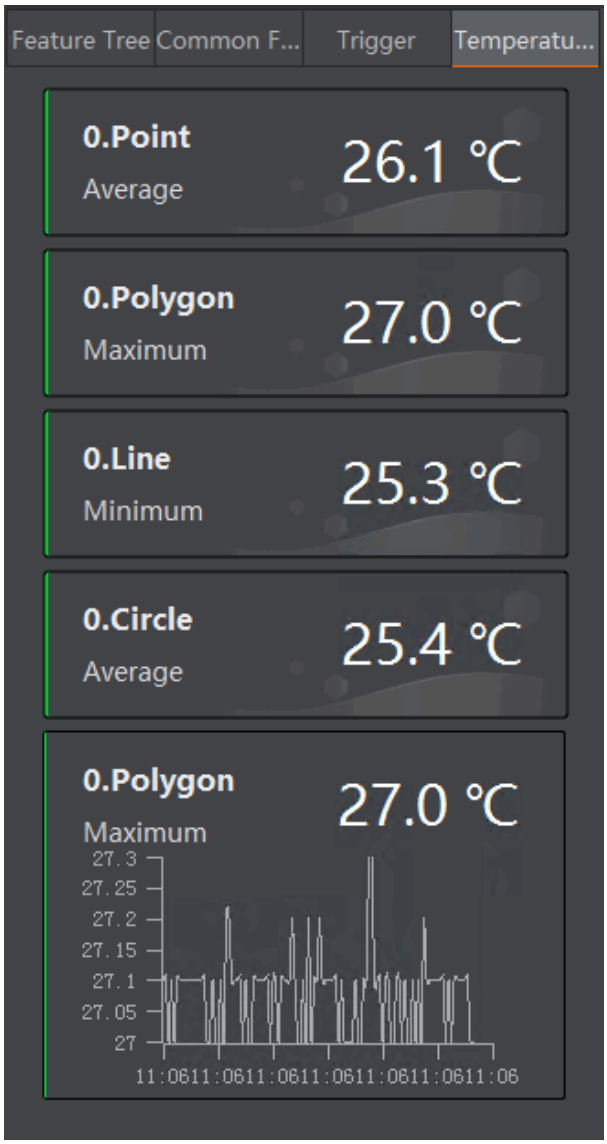


Figure 5-8 Temperature Window

Note

The number of windows displayed on this tab depends on the display parameter configurations. Up to 4 temperature value windows and 1 temperature curve window are allowed to be displayed here.

Refer to *Temperature Screening Configuration* for details about how to draw regions for temperature screening and how to configure the relevant parameters.

5.6 Import/Export Features of a Single Device

You can export the feature configurations of the selected device as an MFS or HCF file to

the local PC, and import the file from the local PC to the selected devices to fast configure all its features without the inconvenience of configuring its features one by one.

Before You Start

Connect the camera or frame grabber to the Software and make sure its image data acquisition has been stopped.

To export features of a selected camera, you only need to click . If you need to import features of a single camera, perform the following steps.

Note

- The read-only feature cannot be exported.
- The exported information doesn't contain camera IP address, MAC address, serial No., and user ID.

Steps

1. Click and then select a file from the local PC.

Note

- For cameras, select an MFS file; for frame grabbers, select an HCF file.
- Only when the model of the source camera or frame grabber is same with that of the target camera or frame grabber can the file be imported.

2. Click **Import** to import the feature configurations.

5.7 Import/Export Features of Multiple Devices

On Import/Export Features window, all the GigE Vision cameras on the same local subnet with the PC on which the Software runs, the connected USB3 Vision camera, the connected Camera Link cameras will be displayed automatically. You can select camera(s) and then export their feature configurations to the local PC as MFS files, or import MFS files to fast load the feature configurations to the camera(s).

Steps

Note

The Software does not support importing or exporting features of multiple frame grabbers.

1. Open the Import/Export Features window in one of the following two ways.
   - Click **Tool** → **Import/Export Features**.
   - Click **Import_Export_Features** in the installation directory of the Software.

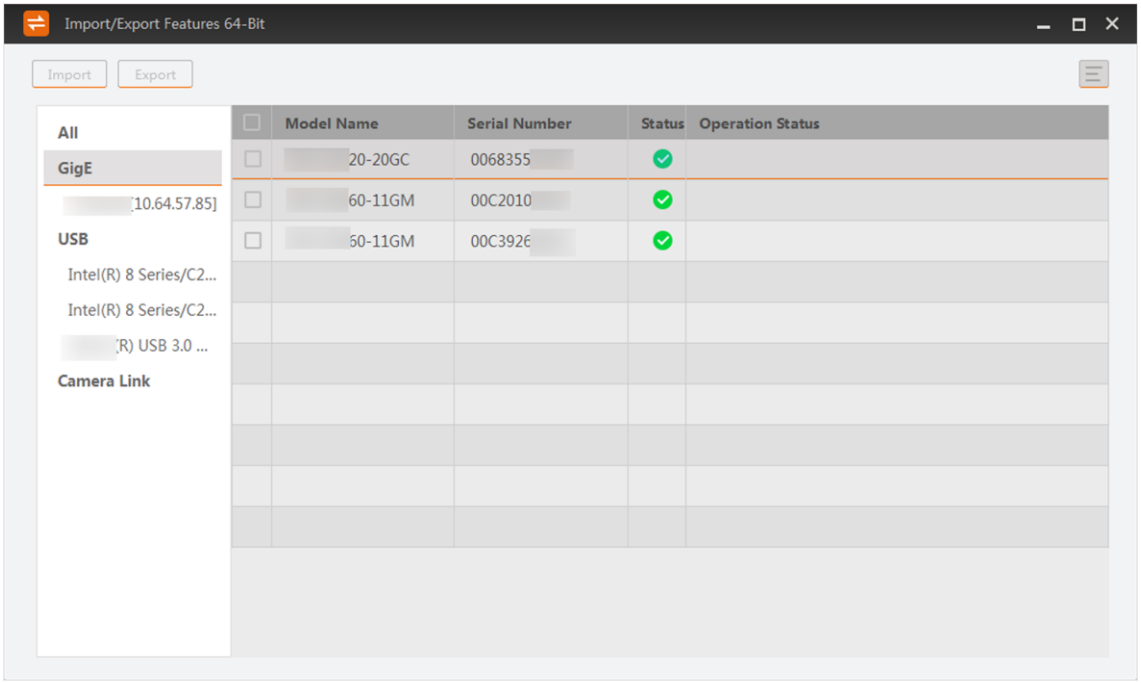


Figure 5-9 Import/Export Feature Window

2. Optional: Click to select the to-be-displayed information (model name, device user ID, MAC address, etc.).
3. Select an interface from the interface list on the left.
4. Select cameras under the selected interface.

Note

- Up to 20 cameras can be selected.
- You can only select the cameras of Free status.

5. Export or import the features of the selected cameras.
   – Click **Export** to export the features of the selected cameras as a MFS file.

   Note

   The exported MFS file is named as "camera model_serial number" by default and the name cannot be edited by default. Example: MV-CA060-11GM_00604207150.

   – Click **Import** to select a MFS file so as to import the features saved in the file to the selected cameras.

   Note

   - The progress and results of the operation are displayed on the Operation Status column.
   - You can view the exception information and error code if importing features to a specific camera fails.

5.8 File Access

The File Access feature allows you to export the User Set or DPC (Defective Pixel Correction) file of a connected device to the local PC as a binary file, or import a binary file from the local PC to a connected device.

Note

- The feature should be supported by the camera.
- The File Access feature is available to use only when the camera is idle, i.e., not acquiring images.
- For details about User Set, see *User Set Control*.

5.8.1 Import User Set

You can import a binary file from the local PC to the User Set of the camera.

Steps

1. Connect the camera to the Software.
2. Click to open the File Access window.
3. Select a User Set (**User Set1**, **User Set2**, or **User Set3**) or **DPC** from the drop-down list.
4. Click **Import** to select the corresponding binary file and import it.

Note

- DPC can only be imported to the same camera, while User Set can only be imported to the cameras of the same model.
- The DPC will be imported and be effective directly. While for User Set, you should load the User Set to make it effective (see Step 5).

5. If you select a User Set in step 3, load the User Set to make it effective.
   1) Click **Feature Tree**.
   2) Click to display the features under **User Set Control**.
   3) Select a User Set from **User Set Selector**.
   4) Click **Execute** to execute the ***User Set Load*** command to load the selected User Set.

5.8.2 Export User Set

Perform the following task to export User Set to the local PC.

Before You Start

Save the current camera settings to a specific User Set. See ***User Set Control*** for details.

Steps

1. Connect the camera to the Software.
2. Click to open the File Access window.

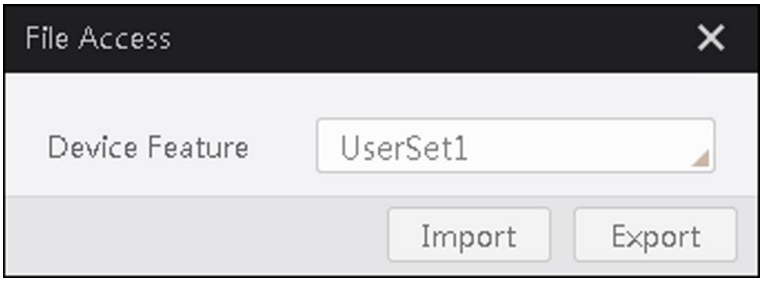


Figure 5-10 File Access Window

3. Select a User Set or DPC from the drop-down list.
4. Click **Export** to export the User Set to the PC as a binary file.

Note

- The file format is mfa by default.
- The name of the exported file is "Camera Model_Camera Serial Number_User Set Name" by default. Example: MV-CA023-10GC_00682345470_UserSet2.mfa

   A prompt will appear when the Use Set is exported.
5. Optional: Click **View** to go to the directory of the exported file.

5.9 User Set Control

A User Set is a group of parameter values with all the settings needed to control the camera. In other words, each User Set includes the values of almost all camera parameters. You can globally control the camera settings by saving and loading User Set. If you have configured the camera parameters as required, you can save them as a User Set.You can load your own User Set to restore the camera to the saved group of parameter values with a minimum of configuration effort.

User Set Description

Click or double-click a camera to connect it to the Software, and then click to open the User Set Control window.

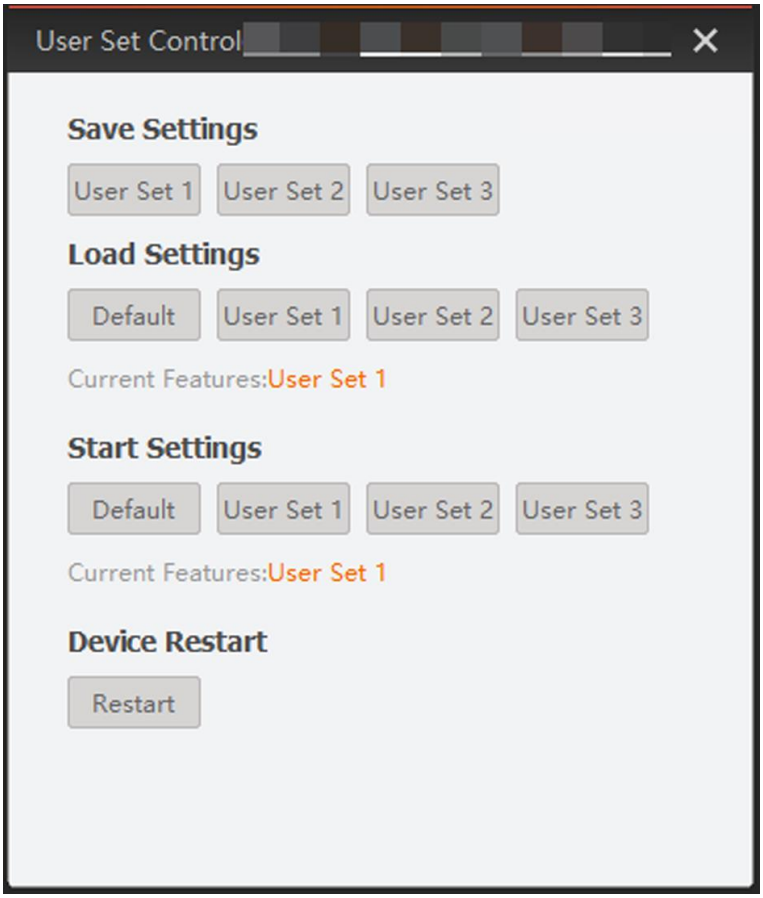


Figure 5-11 User Set Control Window

Table 5-3 Difference between Default User Set and Customizable User Set

Default	Read-only factory settings. In other words, the default startup settings on the camera.
User Set 1, 2, 3...	User sets that can save your own camera settings. Initially, customizable user sets contain the same

	parameter values as the **Default** user set. You can save your own camera settings to these user sets to suit your applications. **Note** Number of user sets vary with different camera models.

User Set Operations

Do the following to save, load, and activate user sets.

Save Settings

Click a user set to save the current camera parameters to the user set.

Load Settings

Click a user set to load the settings in the user set to the camera. When a user set is loaded, it overwrites the current camera settings but does not take effect immediately. You need to activate the settings in **Start Settings** and then restart the camera.

Note

Loading user sets is only available when the camera is idle, i.e., not in acquisition.

Start Settings

Click a user set to activate the camera settings in the user set. You need to restart the camera afterward.

Device Restart

Click **Restart** to reboot the camera in order to apply the new camera settings.

Note

You need to reconnect to the camera after rebooting. You might need to refresh the camera list to show the camera after a reboot.

Chapter 6 Acquisition and Live View

You can start image data acquisition and view the live video of a single machine vision camera or the live video of multiple machine vision cameras simultaneously. And during the live view, you can determine the optimal image quality and perform operations such as recording video, capturing pictures, and zooming in or out.
Acquisition and live view are two different concepts:

Acquisition

The process in which the camera acquires image data.

Live View (or Live Video)

The display of live images by rendering the image data acquired by the camera.

6.1 Acquisition and Live View in 1-Window Mode

You can view the live video of a specific camera or multiple cameras in 1-window mode. When viewing live videos of multiple cameras, you can switch camera to view live video.

Steps

1. Connect camera(s) to the Client.
2. Start acquiring image data.
   – If only one camera is connected, click  to start acquiring image data from the camera.
   – If multiple cameras are connected, click  to start acquiring image data from the connected cameras simultaneously.

   If you are acquiring image data from a single camera, the live view of the camera will be displayed; If multiple cameras,the live view of the currently selected camera will be displayed.

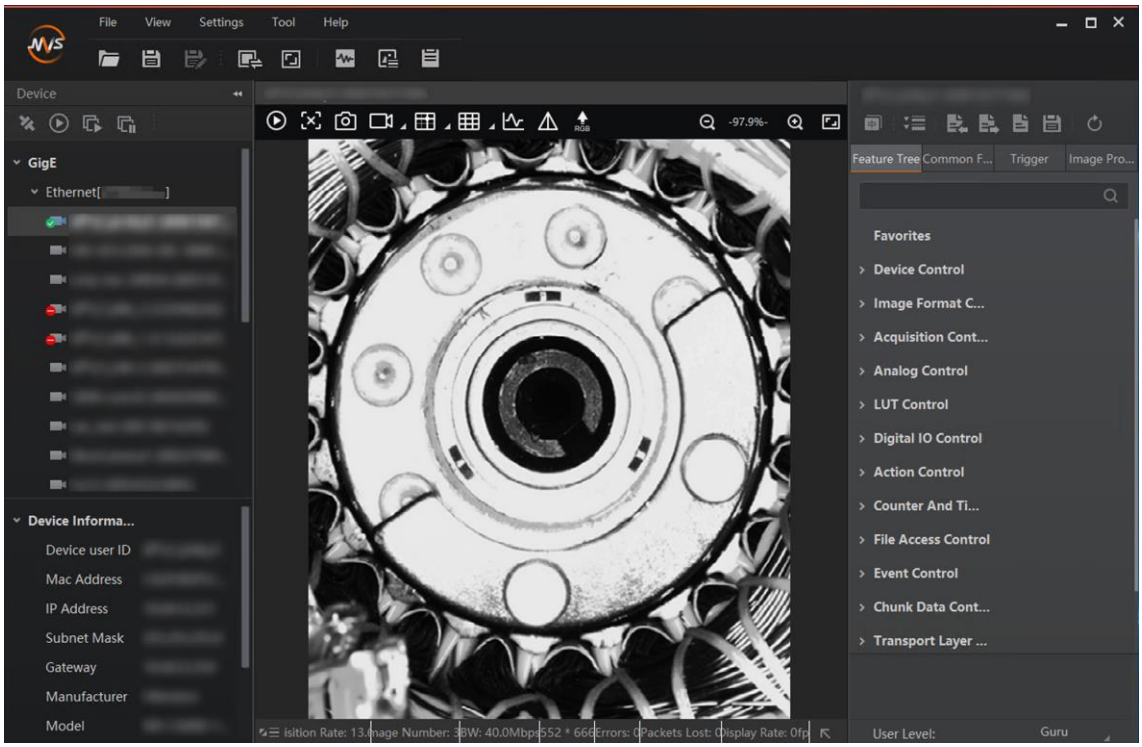


Figure 6-1 1-Window Mode Live View

3. Optional: Perform the following operations if required.

Stop/Resume Live View	Click ⛶ to stop live view, and click ⛶ to resume live view **Note** After live view being stopped, acquisition still goes on.
Switch Camera for Live View	If you are acquiring image data from multiple cameras, you can double-click the connected camera on the device list to switch camera for live view.
Display Thumbnail View	Click ↖ at the lower-right of the image to display the thumbnail view. When you zoom in the live view image, an orange rectangle, which represents the zoomed-in part of the original image, will display on the thumbnail view. You can drag the rectangle to view details of different parts of the original image. **Note** See *More Functions* for details about image zoom.

4. Stop acquisition.

– Click to stop acquiring image data from the currently selected camera.
– Click to batch stop acquiring image data from the connected cameras.

6.2 Acquisition and Live View in Multiple-Window Mode

You can view the live view of a specific camera or the live videos of multiple cameras in multiple-window mode. In this mode, you can view the live videos of multiple cameras simultaneously.

Steps

Note

You can acquire image data from up to 16 cameras simultaneously.

1. Connect camera(s) to the Software.
2. Click , and then select a multiple-division mode.
3. Drag the connected camera(s) from the device list to the display window(s) to view the camera's live video.
4. Start acquiring image data.
   – If only one camera is connected, click to start acquiring streams from the camera.
   – If multiple cameras are connected, click to start acquiring image data from the connected cameras simultaneously.
5. Optional: Perform the following operations after starting acquisition.

Adjust Window Position	Drag the title bar of a display window under live view to adjust its position.
Stop/Resume Live View	Move the cursor to the lower part of the live video image, and then click on the appeared toolbar to stop live view of the selected camera. And click to resume live view. **Note** After live view being stopped, acquisition still goes on.
Switch to 1-Window Mode	Double-click the live video image or click the Maximize button to switch to 1-window mode. **Note** ● You can double-click the live video image again or click the Minimize button to restore the window division mode to multiple-window mode. ● When switching from multiple-window mode to 1-window mode, the live video of the first live-viewed camera in

multiple-window mode will be displayed. You can drag the camera from the device list to the display window or double-click to camera to switch camera for live view.

6. Stop acquiring image data.
   – Move the cursor to the lower part of the live video image, and then click on the appearing toolbar to stop acquisition of the selected camera.
   – Click to batch stop acquisition.

6.3 View Local Image and Video

You can view local images and videos on the Software. The supported image formats include BMP, JPG, PNG, TIFF, and RAW. For videos, only the videos of RAW format can be played on the Software.

Before You Start

Make sure that no camera is connected to the Software.

Steps

1. Open local image or video file.
   – Click **File** → **Open Local File** to select an image or video file from the local PC.

   Note

   If the display window is in multi-window mode, you should have selected a window before clicking **File** → **Open Local File**.

   – Right-click the display window and then click **Open Local File** to select an image or video file from the local PC.
   - If the opened local image is in BMP, JPG, PNG, or TIFF format, the image will be displayed.
   - Images in Bayer10/12, Bayer 10/12 packed format are not supported.
   - If the opened local image or video is in RAW format, and its file name doesn't conform to the required naming rules, the following window will be displayed.

   Note

   If the image or video is in RAW format, its name should conform to the following rules:
   - For image: XXX_w frame width value_h frame height value_p pixel format.raw (e.g., image_w1280_h728_pMono8.raw).
   - For video: XXX_w frame width value_h frame height value_p pixel format_f frame rate value.raw for video (e.g., video_w1280_h728_ pMono8_f30.raw).

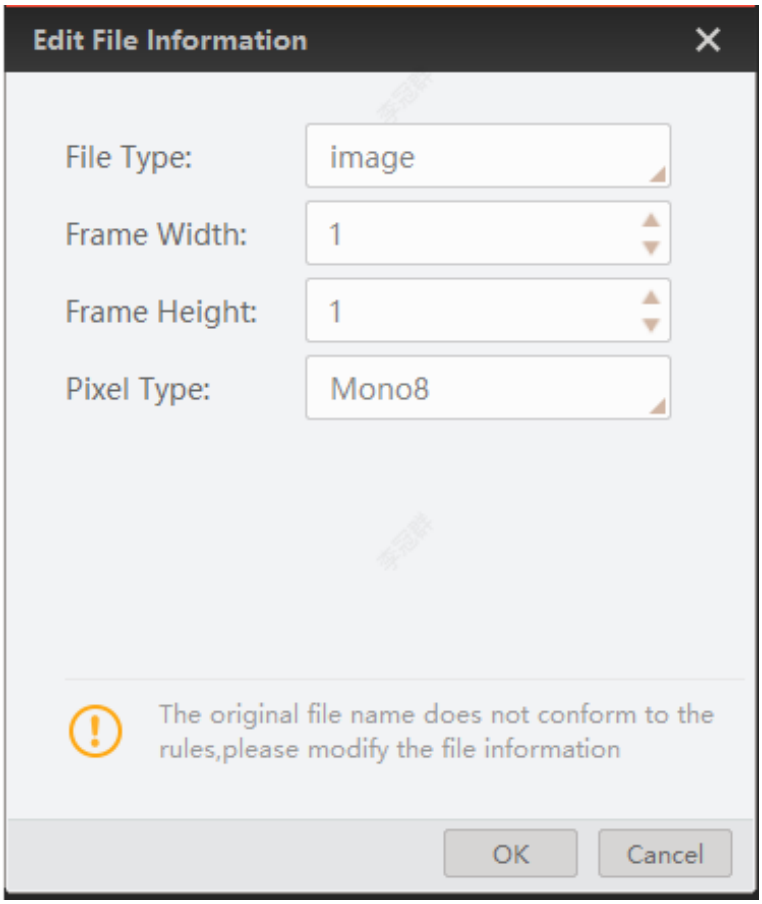


Figure 6-2 Edit File Information

2. Edit the file information, including file type, frame width, frame height, and pixel type.
3. Click **OK**.
   The image or video will be displayed as you edited.
4. Right-click the image and then click **Clear Local File** to clear the local file from the Software.

6.4 Full Screen Live View

You can view live view in full screen in both 1-window mode or multiple-window mode.
In multi-window mode, you can click or **Full Screen** on the right-click menu to enter the full screen mode. And right-click the image and then click **Exit Full Screen** to exit full screen mode.
In 1-window mode, you can double-click the image to enter or exit the full-screen mode.

6.5 Customize Window Division

Three default window division modes are provided in Custom Division module, i.e., 2 X 2 (4-Window), 3 X 3 (9-Window), and 4 X 4 (16-Window). You can add the three modes to the

Window Division panel, or merge (or split) windows based on the three modes.

Steps

1. Click to display the window division panel.

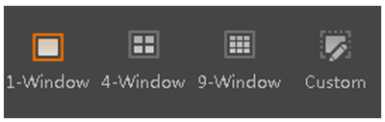


Figure 6-3 Window Division

2. Click **Custom** to open the Custom Division window.

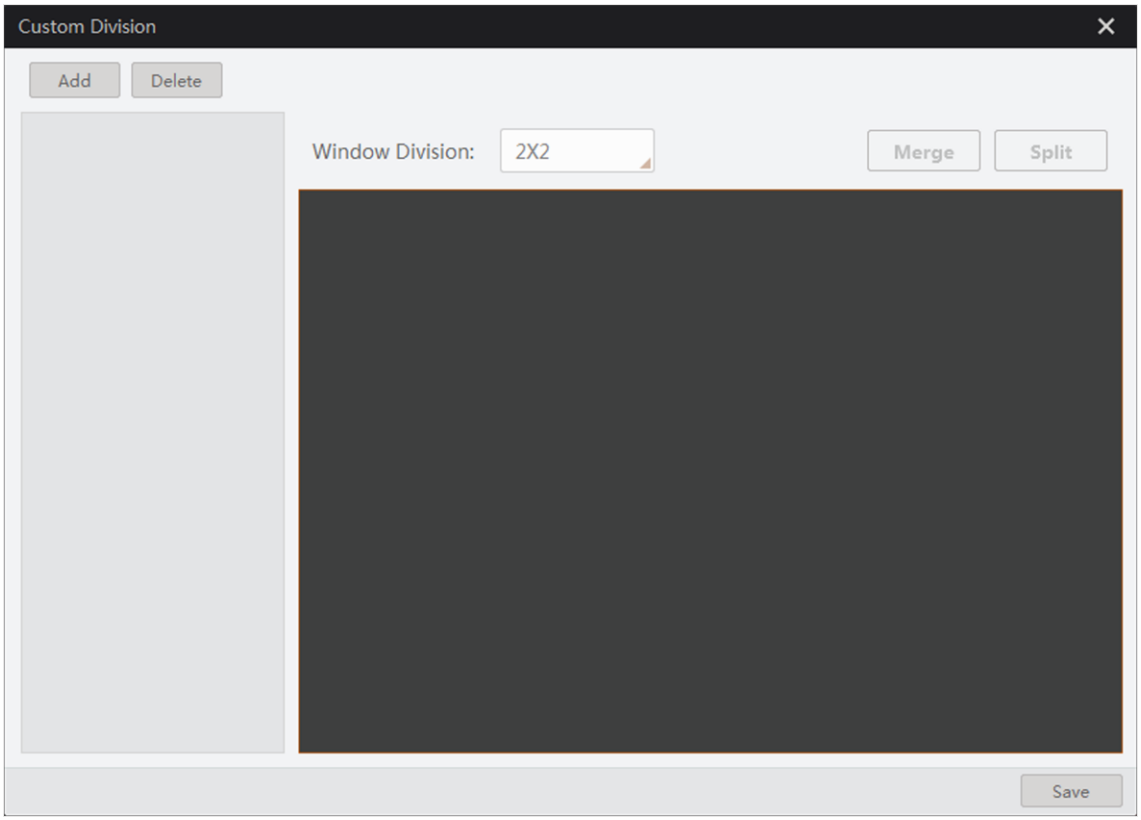


Figure 6-4 Custom Division

3. Click **Add** to open the following window.

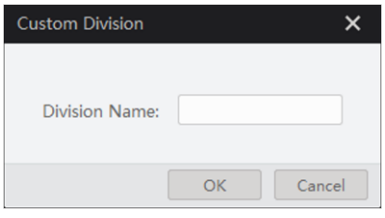


Figure 6-5 Division Name

4. Create a name for the window division mode and then click **OK**.
5. Select a window division mode from the Window Division drop-down list.
6. Optional: Merge or split windows.

1) Select windows.

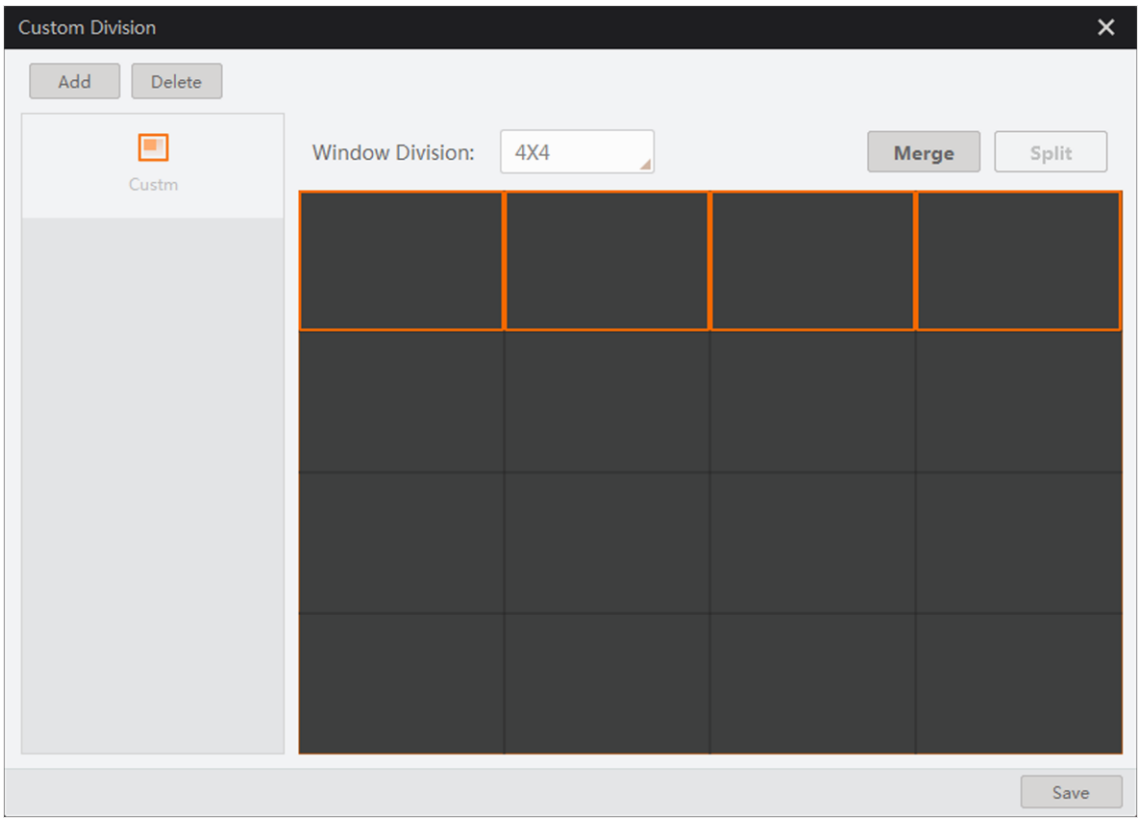


Figure 6-6 Select Windows

2) Click **Merge** to merge the selected windows into a larger one.

Note

You can merge the selected windows only when the combination of the selected windows is of rectangle shape.

3) Optional: Select the merged window and then click **Split** to split it into the original windows.

7. Click **Save**.

The custom window division mode will be displayed on the window division panel.

Figure 6-7 Custom Division Added

6.6 Capture and Recording

During live view, you can capture pictures and record video files.

Steps

1. Start live view. See *Acquisition and Live View in 1-Window Mode* for details.
2. Perform the following operations.

Capture and Save Picture	Click to capture a picture and save the picture to the local PC.
Start or Stop Recording	Click to start recording, and click again to stop recording. **Note** During recording, the recording time will be displayed, and you can click at the upper-right of the display window to view the buffer usage, number of frame processed and frame dropped.
Continuously Start and Stop Capturing Pictures	Click (beside) and then click to continuously capture pictures of the live view, and click the icon again to stop capturing. **Note** During recording, the number of the captured pictures will be displayed in real time, and you can click at the upper-right side of the display window to view the buffer usage, number of frame processed and frame dropped. A prompt will pop up once you finish capturing picture(s) or recording.

3. Optional: Click **View** on the prompt to view the picture(s) or video file(s) in the saving path.

Note

You can set the saving path of the captured picture(s) and recorded video file(s). You can also set other parameters for recording or continuous capture. See *Capture and Recording Settings* for details.

6.7 Set Cross Line

During live view, you can display a cross line on the live view image to adjust the position of the object in the view.

Steps

1. Select a camera and start live view.

> **Note**
>
> See ***Acquisition and Live View in 1-Window Mode*** and ***Acquisition and Live View in Multiple-Window Mode*** for details about how to start live view. In multiple-window mode, you can set the cross line for each window.

2. Click to display the cross line on the live view image.
3. Click (beside) to open the following window.

Figure 6-8 Cross Line Settings

4. Set the parameters, such as thickness, position, and color, and the cross line will change accordingly in real time.

Window Coordinates

The cross line will be displayed on the display window.

Image Coordinates

The cross line will only be displayed on the image.

Axis X

Adjust the position of the axis X.

Axis Y

Adjust the position of the axis Y.

Position

Click **Center** to position the cross line to the center.

Zoom Center

If enabled, you can zoom in or zoom out the image based on the intersection point of the cross line.

Note

For details about image zoom (or digital zoom), see *More Functions*.

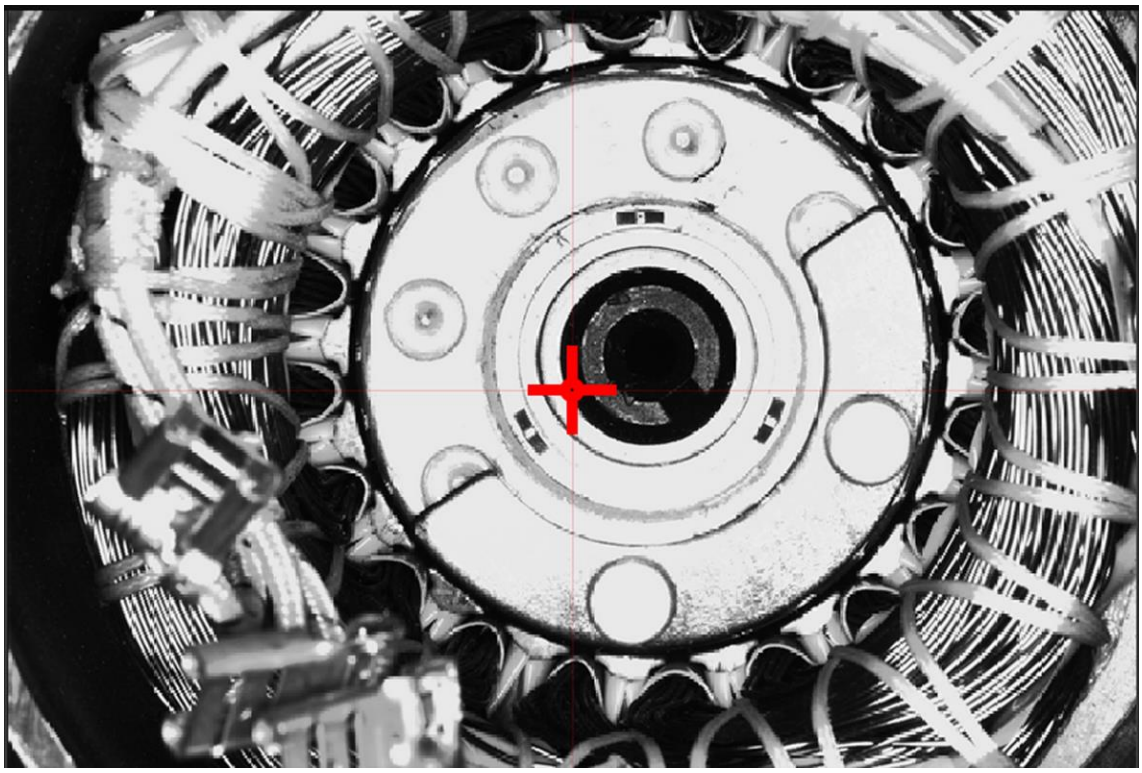


Figure 6-9 Cross Line

5. Optional: Manually adjust the cross line.

Adjust Center of the Cross Line	Hover the cursor over until the cursor turns into , and then drag to adjust the center of the cross line.
Adjust X Axis of Cross Line	Click the X axis of the cross line until the cursor turns into , and then drag to adjust the X axis.
Adjust Y Axis of Cross Line	Click the Y axis of the cross line until the cursor turns into , and then drag to adjust the Y axis.
Hide Cross Line	Click to hide the cross line. Or right-click , and then click **Hide Cross Line** to hide the cross line.
Lock Cross Line	Right-click , and then click **Lock Cross Line** to lock the cross line.

Locate Cross Line to the Image/Window Center	Right-click  , and then click **Central** to locate the cross line to the center of the image or display window.

6.8 Configure Grid

You can configure grids on the image when acquiring image data in 1-window mode. This is especially helpful when you need to align objects on the image.

Steps

1. Connect a camera and then start acquisition in 1-window mode.

Note

For details about image acquisition in 1-window mode, see *Acquisition and Live View in 1-Window Mode*.

2. Click  to display grids on the image.

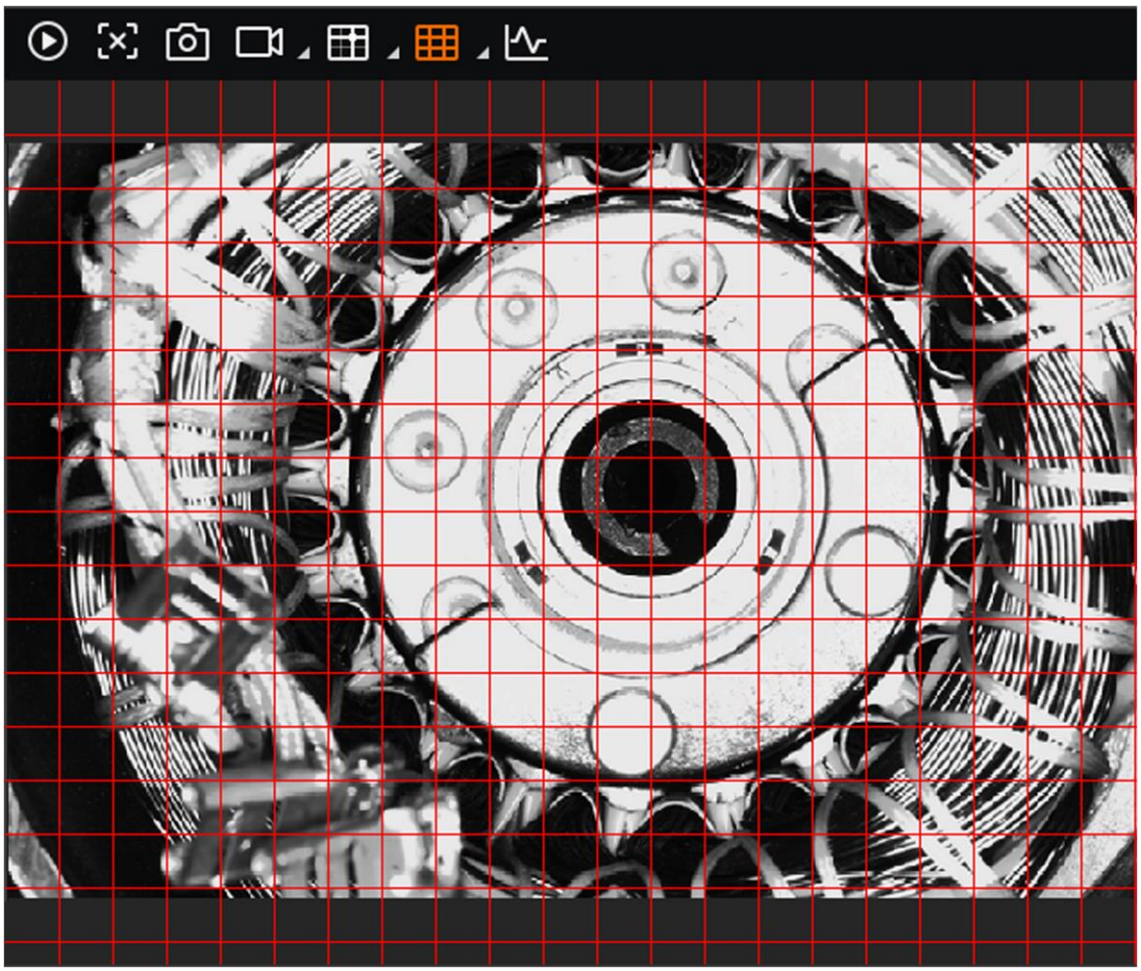


Figure 6-10 Grids Displayed on Image

3. Optional: Click (beside) to configure grid parameters, including grid spacing and color.

Grid Spacing

Set the grid spacing value. You can set the value to 30, 60, or 90. You can also customize a value as required. The larger the value, the more scattered the grids will be.

6.9 View Acquisition Status

During acquisition or live view, you can view the acquisition status of the camera(s), including the acquisition rate, image number, bandwidth, resolution, errors, packets lost and display rate, etc.

View Acquisition Status in 1-Window Mode

During acquisition or live view (in 1-Window mode), a status bar appears at the bottom of the display window to display in real time the acquisition status of the selected camera. You can click in the lower-left corner to select status parameters (the selected ones

will be displayed on the status bar).
For GigE Vision cameras, you can select the following status parameters: acquisition rate, image number, bandwidth, resolution, errors, packet lost, packets requested to resend, packets resent, display rate, location, RGB, YUV, zoom, and temperature.

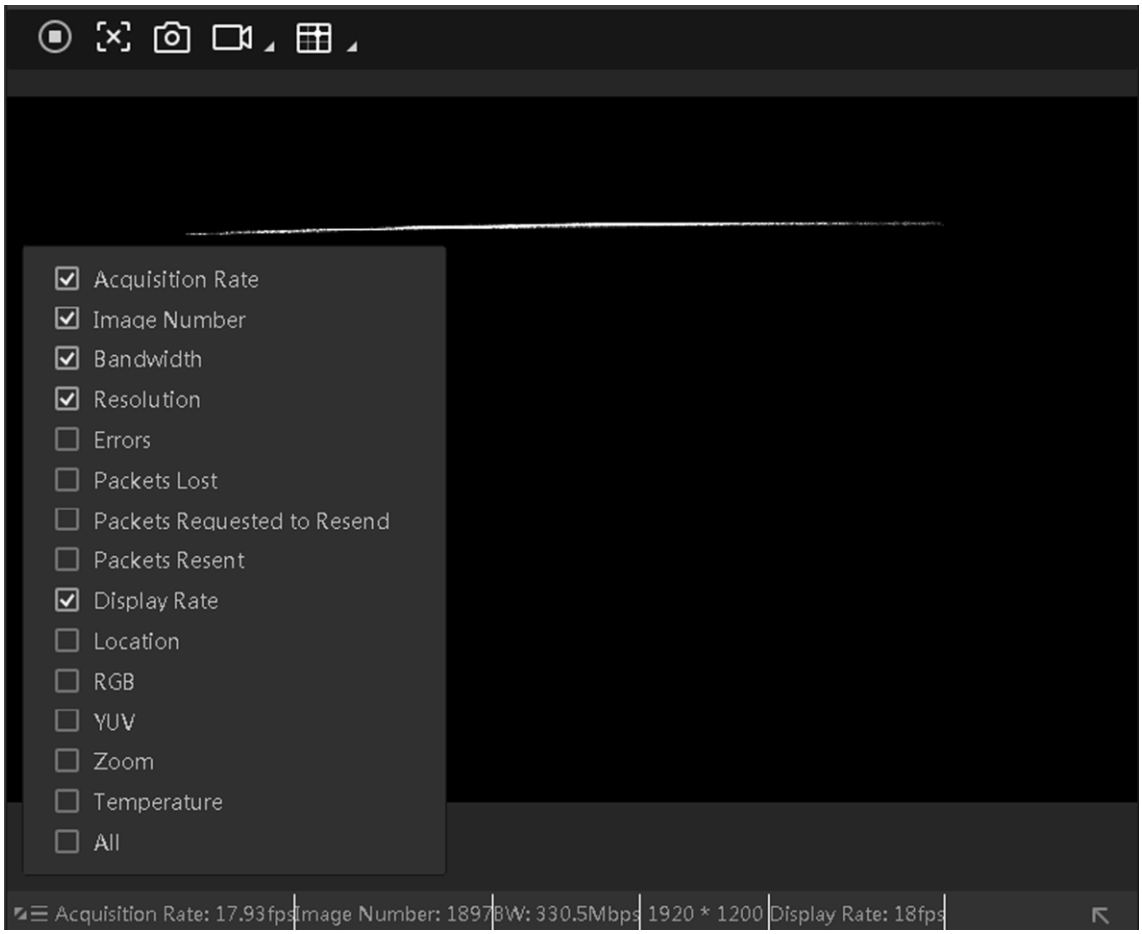


Figure 6-11 GigE Vision Camera Acquisition Status

For USB3 Vision cameras, you can select the following status parameters: acquisition rate, image number, bandwidth, resolution, errors, packet lost, display rate, location, RGB, YUV, zoom, and temperature.

Figure 6-12 USB3 Vision Camera Acquisition Status

View Acquisition Status of Multiple Cameras Simultaneously

During live view of multiple cameras, you can click to open the Status window to view the acquisition status of these cameras. After that, you can click **More** to open the parameter panel, and then select parameters to be displayed on the Status window or status bar.

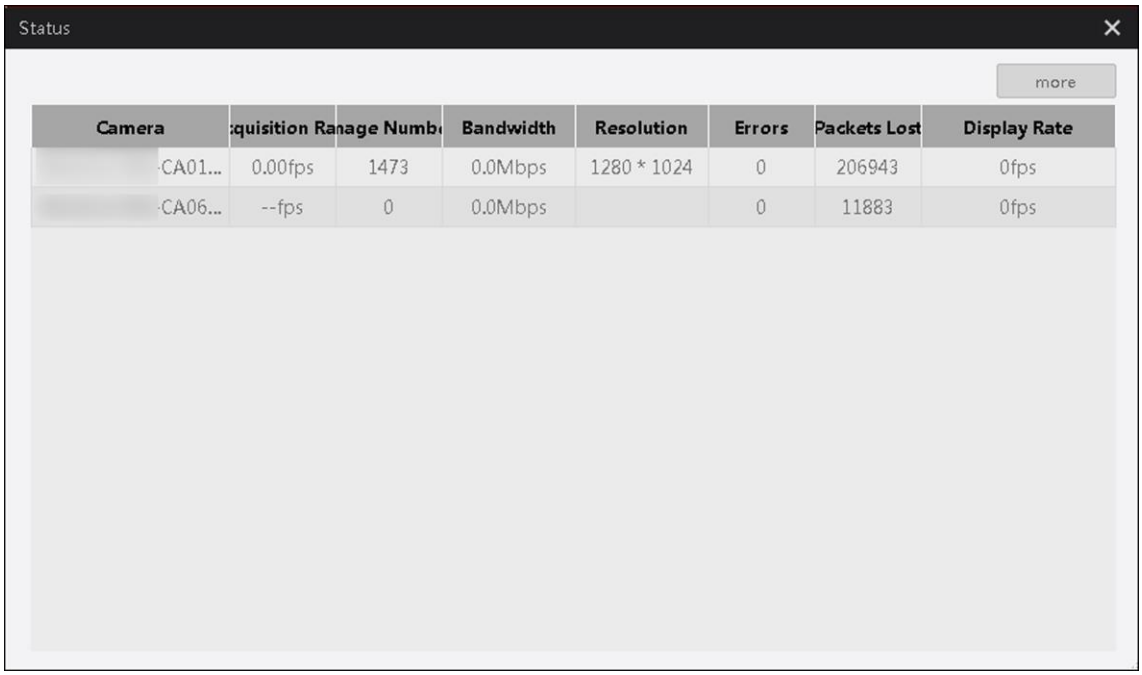


Figure 6-13 The Status Window

6.10 View Embedded Information

During live view, you can view the information embedded into the image data, including timestamp, gain, exposure, external trigger number, etc.
After starting live view, you can click to open the Embedded Information window to view the embedded information.
You can click to select the information (timestamp, gain, exposure, etc.) which needs to be displayed on the window.

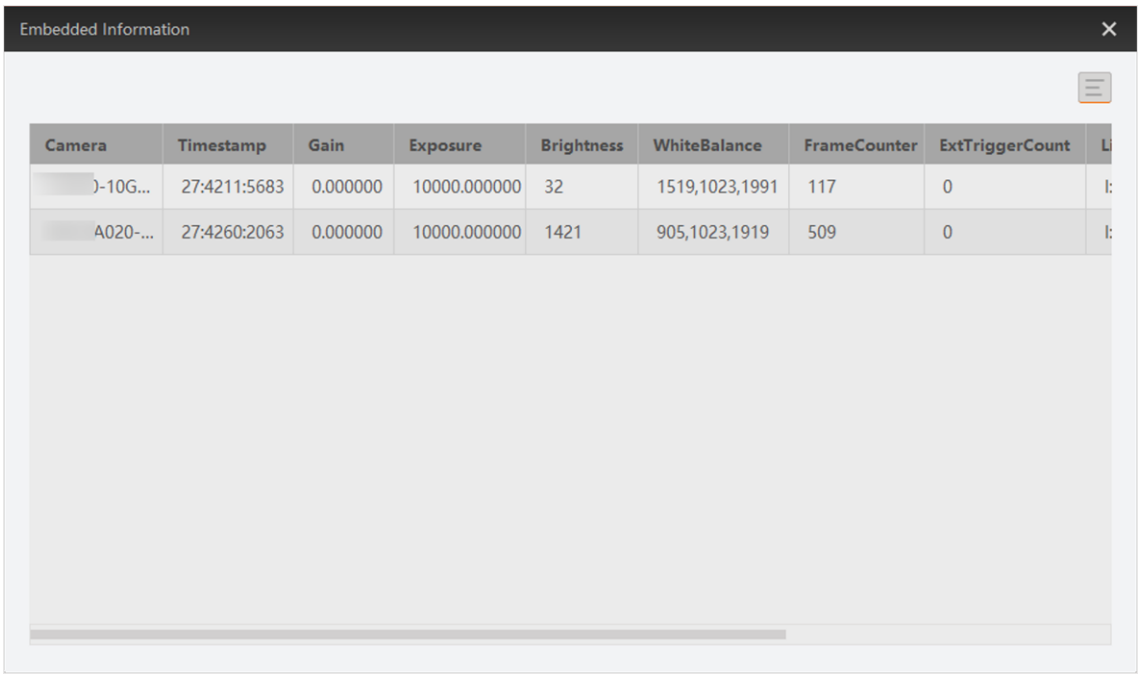


Figure 6-14 Embedded Information Window

6.11 View Histogram

The Histogram functionality allows you to quickly evaluate the image quality by viewing the real-time distribution of different color channels (for color camera) or the real-time distribution of gray values in the images (for mono camera).

Note

The following text only takes viewing the histogram data of color camera for an example.

Start acquisition and then click to open the Histogram window.

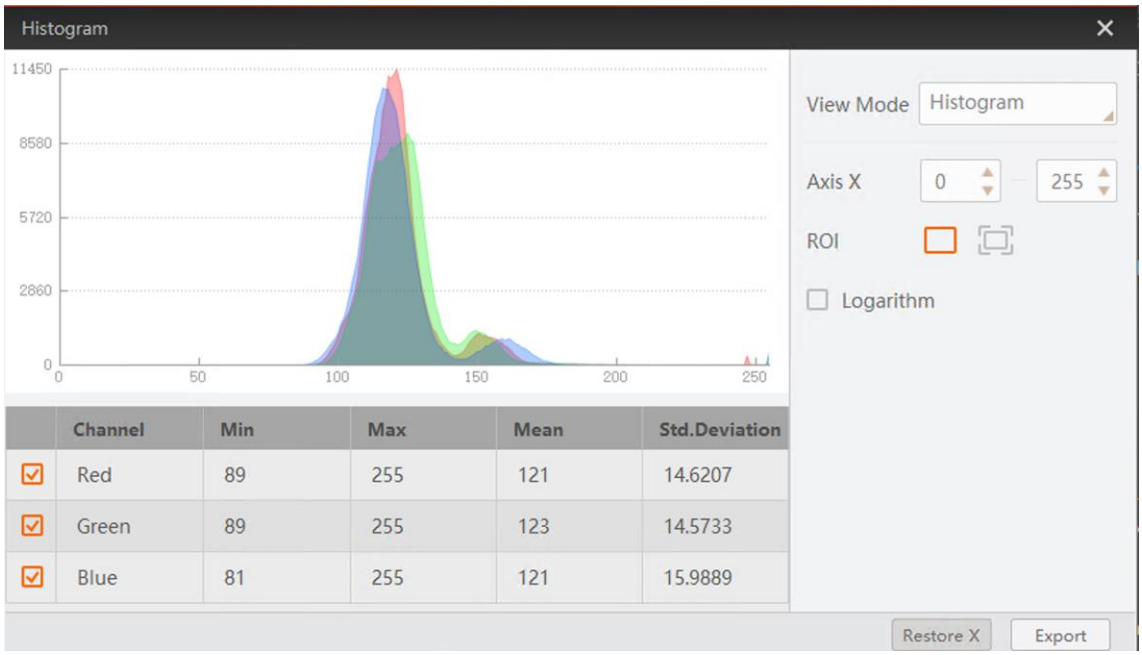


Figure 6-15 The Histogram Window

View Mode

Set the view modes, including Histogram, Line Profile and Column Profile.

Histogram

Axis X

Set the value range of the axis X of the histogram.

Line Profile

Location

Display the coordinates value of your cursor when you moving your cursor on the images.

Line Axis

Set the value range (0 to the horizontal resolution of the image) of the selected line which is parallel with the X axis.

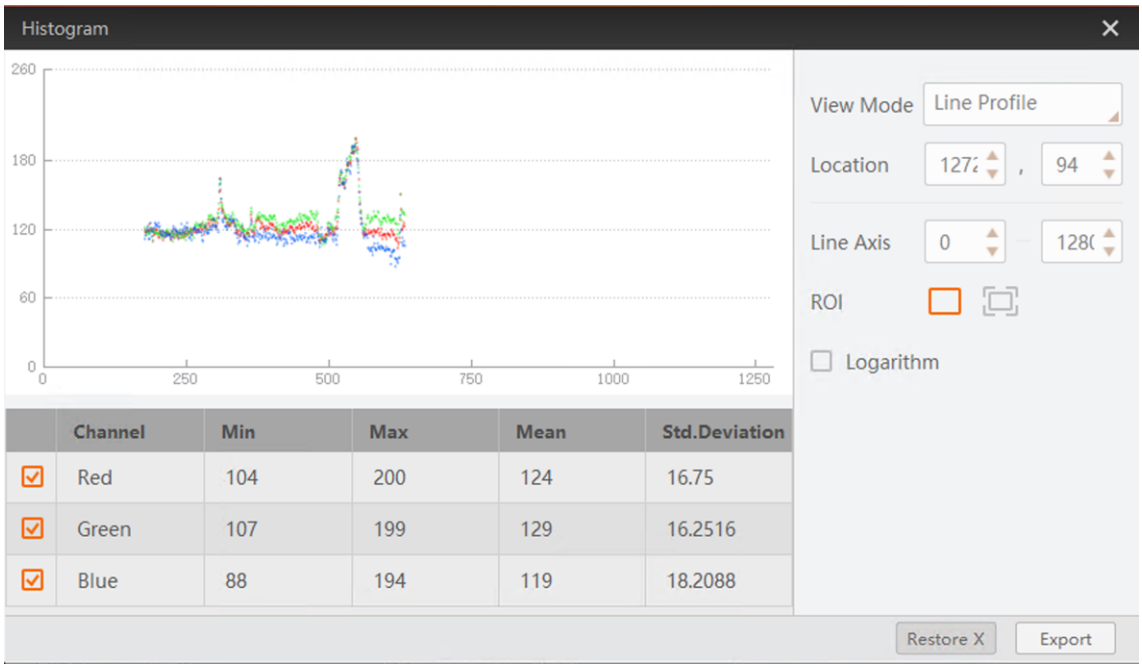


Figure 6-16 Line Profile Mode

Column Profile

Location

Display the coordinates value of your cursor when you moving your cursor on the images.

Column Axis

Set the value range (0 to the vertical resolution of the image) of the selected line which is parallel with the X axis.

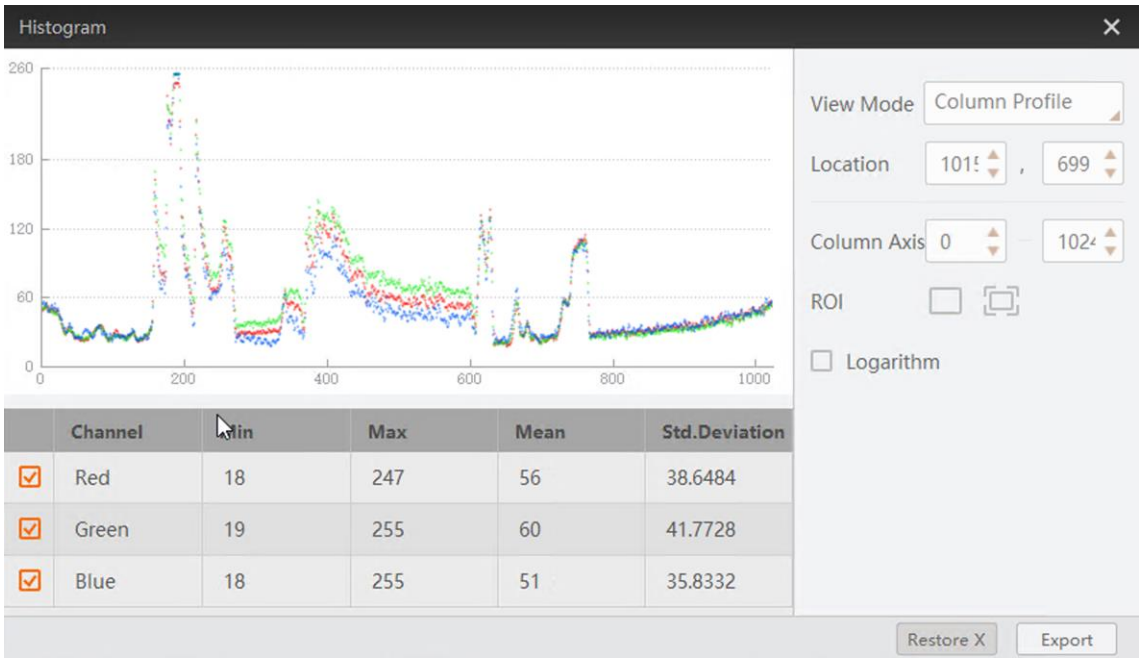


Figure 6-17 Column Profile Mode

ROI

Click and then drag the cursor on the image to draw a ROI. After that, the histogram only displays the color channel distribution or gray value distribution within the ROI.

You can click to cancel the ROI settings.

Logarithmic Scale

Switches between a linear and a logarithmic view of the data.

You can do the following operations if required.

Table 6-1 Available Operations

Operation	Description
Panning and Zooming	Panning and zooming allows you to look at specific areas of the histogram in more detail. ● Panning: Drag the cursor on the histogram to pan the histogram. ● Zooming: Move the cursor to the histogram and then scroll the mouse wheel to zoom in or zoom out. Scan the QR code to view the video clip which shows panning and zooming.

Operation	Description
	
Select Color Channel for Display	If the camera is a color camera, you can check the checkbox(es) in the table, the selected color channel's real-time distribution will be displayed on the histogram.
Export Histogram Data	Click **Export** to export the histogram data to the local PC.
Restore X	Click **Restore X** to restore the coordinates if you have zoomed the histogram.

6.12 Temperature Screening Configuration

For infrared cameras, you can perform temperature screening configurations, such as drawing different types of temperature screening regions and configuring the relevant parameters, including those related to screening, alarm, and display.

6.12.1 Draw a Region for Temperature Screening

To perform temperature screening configurations, you need to first draw regions for temperature screening.

Before You Start

Make sure you have connected an infrared camera to the Software.

Steps

1. Start the live view of the camera.

Note

Refer to *Acquisition and Live View in 1-Window Mode* and *Acquisition and Live View in Multiple-Window Mode* for details.

2. Click above the live view window.

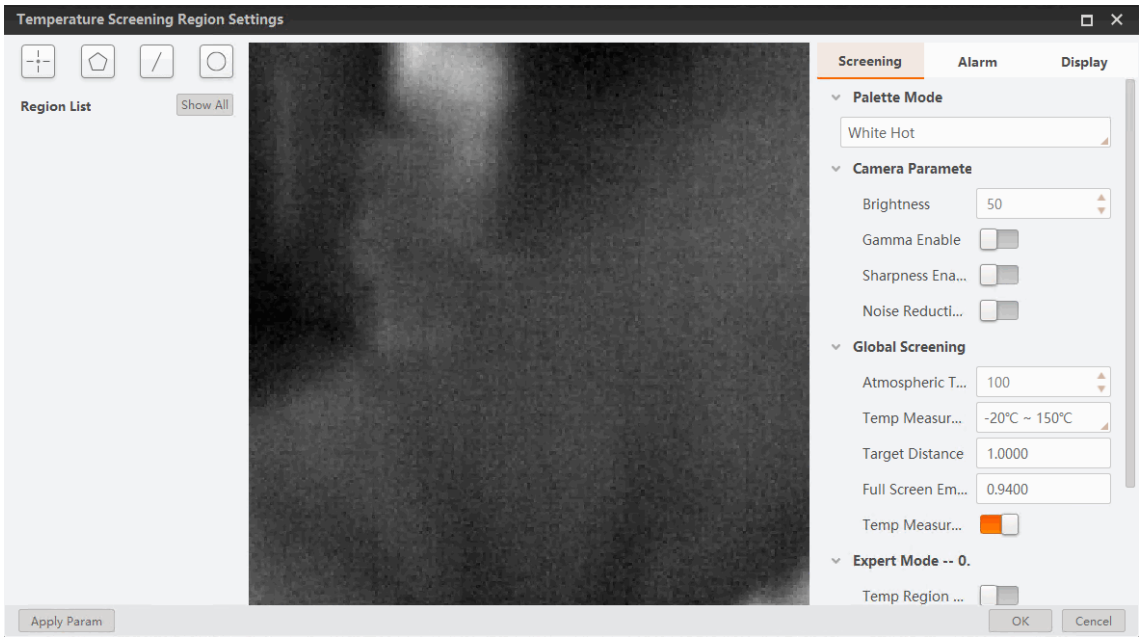


Figure 6-18 Temperature Screening Region Settings Window

3. On the top left of the configuration window, select a type of temperature screening region according to the table below.

Table 6-2 Temperature Screening Region Type

Icon	Region Type	Maximum No. Allowed
	Point	10
	Polygon	10
	Line	1
	Circle	1

The corresponding type of region will be added to **Region List** in the format "index.Type" (e.g., 0.Point). For each region type, the index starts with 0 and increases by one each time.

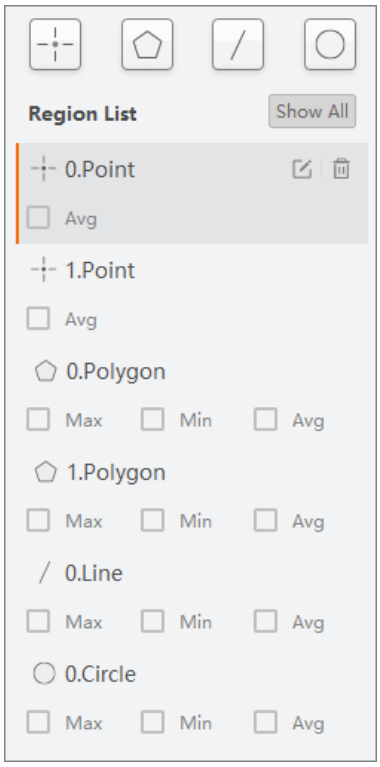


Figure 6-19 Example of Region List

4. From the list, select a region to be drawn, click , and draw on the live view window following the instructions below.

Region Type	Drawing Instruction
Point	Click to draw a point.
Polygon	Click to draw the first vertex of the polygon, move your cursor and click again to draw more vertices as needed, and double-click to finish drawing.
Line	Click to draw one end of the line, move your cursor, and click to draw the other one.
Circle	Click, hold, and drag to draw a circle.

Note

If needed, after a region is drawn, you can click to draw again.

5. For each region, select **Max**, **Min**, or **Avg** as needed to display the maximum value, minimum value, and mean value respectively for the regions drawn.

Note

For points, only **Avg** (mean value) is available.

6. Optional: Select a region from the list and click to delete it if needed.
7. On the bottom left of the configuration window, click **Apply Param** to save your settings. The regions you have drawn and their corresponding real-time statistics will be displayed on the live view window.

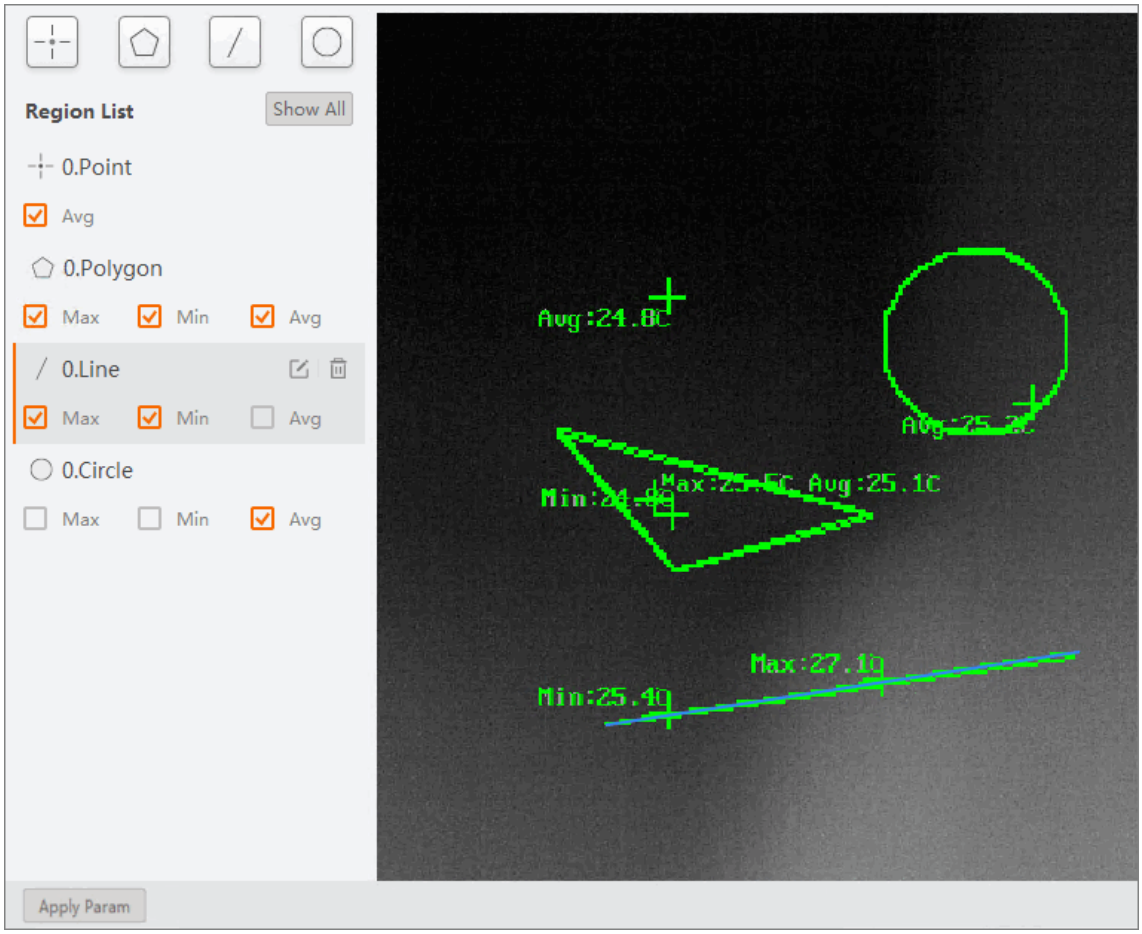


Figure 6-20 Temperature Screening Regions and Statistics

8. Optional: Click **Show All** to display all the regions you have drawn on the live view window.

6.12.2 Configure Temperature Screening Parameters

Besides drawing temperature screening regions, you can also set parameters related to screening, alarm, and display on the Temperature Screening Region Settings window.

Note

For the configurations to take effect, you can either click **OK** on the bottom right corner of the window or click **Apply Param** on the bottom left. Clicking **OK** will close the configuration window, whereas clicking **Apply Param** will not and you can continue with the configurations.

Screening

Under **Screening**, you can configure parameters related to the palette mode, camera basics, global screening, and expert mode.

Palette Mode

Select a palette mode for the camera from White Hot, Black Hot, etc.

Camera Parameter

Brightness

Adjust the brightness level of the live view image correspondingly. The larger the value, the brighter the image.

Gamma Enable

When enabled, you can set the gamma value correspondingly. The larger the value, the stronger the contrast.

Sharpness Enable

When enabled, you can set the sharpness level for the edges of the live view image.

Noise Reduction Enable

When enabled, the signal-to-noise ratio of the image will be boosted, so as to improve the quality of the image.

Global Screening

Set the global temperature screening parameters for the temperature screening regions.

Atmospheric Transmissivity

If a germanium glass needs to be added in front of the lens of the infrared camera, the transmittance of the germanium glass can be set by this parameter.

Note

If no germanium glass is needed, you can keep this parameter as 100.

Temp Measurement Range

Select a temperature measurement range as needed from **-20℃ ~ 150℃** and **0℃ ~**

550℃.

Target Distance

Set the linear distance from the target object to be measured to the device (unit: m).

Full Screen Emissivity

Set the emissivity of the target object. The emissivity value varies for different objects. Refer to the user manual of the corresponding camera model for details.

Temp Measurement Expert Mode

When enabled, you can set the corresponding parameters for each temperature screening region respectively.

Expert Mode

Temp Region Reflect Enable

Set whether to enable reflection for the temperature screening region when there is a high-temperature object at the scene, and a measured object with low emissivity reflects the high-temperature object.

Temp Region Reflectance

Set the reflectance value of the temperature screening region, which needs to be consistent with the temperature value of the high-temperature object.

Temp Region Target Distance (m)

Set the linear distance from the target object to be measured to the device (unit: m).

Temp Region Emissivity

Set the emissivity value of the target object (unit: %). The emissivity value varies for different objects. Refer to the user manual of the corresponding camera model for details.

Alarm

Under **Alarm**, you can configure parameters related to the temperature triggered alarms for a single region or of comparing two regions.

Single Region Alarm

Set the alarm rule for a single temperature screening region you have drawn.

Point

For point ROIs, you can set the following parameters for conditions to trigger or restore alarms.

Point Temp

Select **>** or **<** from the drop-down list, and enter a temperature value correspondingly to set the alarm rule.
E.g., If you select **>** and enter 50 in the box, an alarm will be triggered when the screened temperature exceeds 50°C.

Tolerance Temp

Set the threshold for restoring alarms of the region.
E.g., If the tolerance temperature is set to 5°C while the rule for triggering alarms is set to > 50°C, alarms will be canceled when the screened temperature is less than or equal to 45°C.

Polygon/Line/Circle

For polygon, line, and circle ROIs, you can select a specific type of temperature statistics (Maximum, Minimum, Average, and Variation) and set the corresponding alarm triggering and restoring rules. The configuration process is similar to those of setting **Point Temp** and **Tolerance Temp** for point ROIs.
E.g., If you select **Maximum**, **>**, and enter 50 in the box, an alarm will be triggered when the maximum temperature value of the region exceeds 50°C.

Multi-Region Alarm

Set up to four multi-region alarm rules which compare the chosen type of statistics of two temperature screening regions. Follow the steps below to configure a rule.

1. Select a region from the drop-down list for **Region Index 1**, which will be set as the reference region (i.e., the region being compared to).
2. Select another region from the drop-down list for **Region Index 2**, which will be set as the target region.
3. Choose a specific type of temperature statistics to be compared between the regions from **Maximum**, **Minimum**, **Average**, and **Variation**.
4. Select **>** or **<** from the second drop-down list, and enter a temperature value correspondingly to set the alarm rule.

E.g., If you select **Maximum**, **>**, and enter 10 in the box, an alarm will be triggered when the maximum temperature value of the target region is 10°C greater than that of the reference region.

Display

Under **Display**, you can configure parameters related to the display settings of the live view window and the temperature window.

Basic Display

Temperature Bar

When enabled, a temperature bar will be displayed on the right side of the live view window.

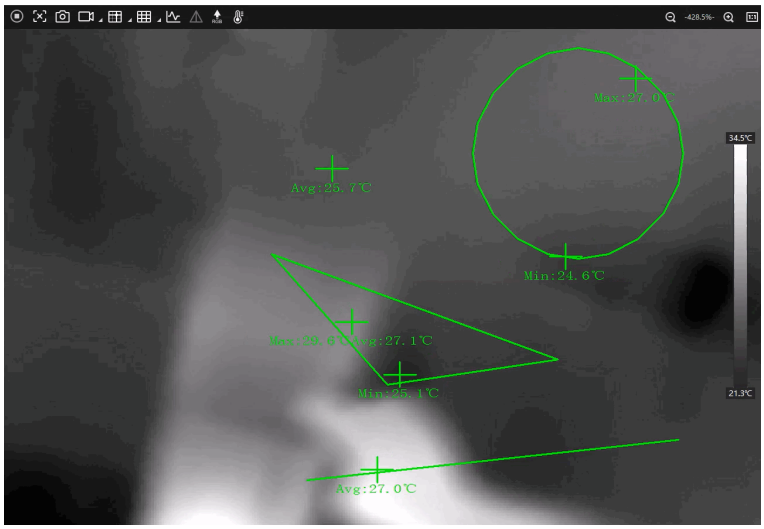


Figure 6-21 Temperature Bar

Region Information Overlay

Select a overlay mode for the region information from the followings.

- **None**: Disable region information overlay. No information is displayed when the camera acquires images or when the images are saved.
- **Camera**: Overlay information of the temperature screening regions to the camera, so that the information will be displayed when the camera acquires images and when the images are saved.
- **Client**: Overlay information of the temperature screening regions to the Client, so that the information will be displayed when the camera acquires images, but not when the images are saved.

Temperature Window

You can set up to 4 displays of temperature values and 1 display of the temperature curve to be displayed on the Temperature Window. For each display, you can select a temperature screening region and a type of statistics as shown below.

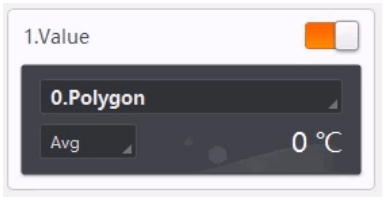


Figure 6-22 Temperature Window Settings

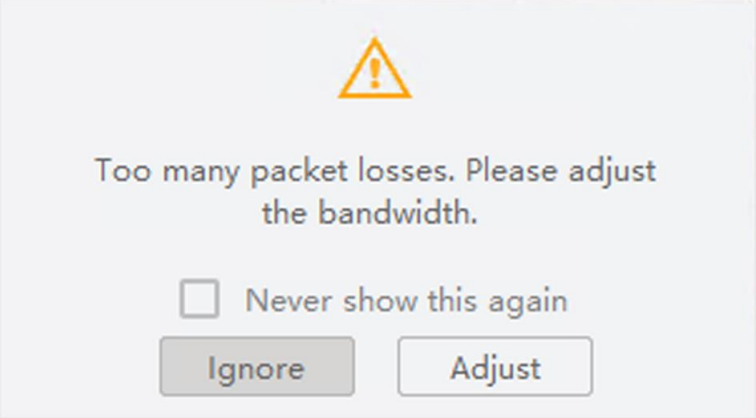
Refer to *Temperature Window* for how the display outcome looks like.

6.13 More Functions

The Software provides additional functions for live view, such as digital zoom and image rotation.

Table 6-3 Function Description

Function	Description
Image Zooming	Right-click the image to open the right-click menu and then click **Zoom in**/**Zoom out**, or move the cursor to the image and scroll the mouse wheel to zoom in or zoom out the image. **Note** This operation is not available for local images and local videos. You can also click to zoom in, or click to zoom out. **Note** ● After zooming in the live view image, you can drag the image to view more details. For details about how to set window division, see ***Customize Window Division***. ● You can also use cross line for image zooming. See ***Set Cross Line*** for details. ● You can set keyboard shortcut for image zooming. See ***Shortcut*** for details.
Fit to Window/Actual Size	Right-click the image, and then click **Fit to Window** to fit the size of the image to that of the display window. Right-click the image, and then click **Actual Size** to restore the image to its original size (original resolution). **Note** ● You can set keyboard shortcuts for the two operations. See ***Shortcut*** for details. ● The two operations are not supported by local images and local videos.

Function	Description
Image Rotation	Right-click the image and then click **Rotate Left** or **Rotate Right** to rotate the image to the left or to the right respectively. **Note** Image rotation is not supported by local images and local videos.
View Settings	Adjust the image quality of the live video by setting the display mode, filtering mode, vertical synchronization mode, and rendering engine. See ***View*** for details.
Adjust Band Width	During image data acquisition, if excessive packet losses occurs, a prompt will pop up to remind you to adjust bandwidth. In this case, you can tap **Adjust** to adjust the bandwidth so as to alleviate packet losses.  **Figure 6-23 Excessive Packet Losses Prompt**
Check Image Sharpness	Click ⚠ to show the sharpness indicator. **Note** Only available for Mono-8 pixel format in 1-Window division mode.

Function	Description
Export Pixel RGB Values	Click RGB to export the RGB values of each pixel to local disk. **Note** Only available in 1-Window division mode.

Chapter 7 Tool Management

The Software provides multiples tools for the management, configuration, and maintenance of cameras, such as IP Configurator (for editing camera IP address), Bandwidth Manager (for optimizing bandwidth occupied by cameras), GigE Vision Action Command (for trigger actions in multiple cameras simultaneously), etc.

7.1 IP Configurator

The online GigE Vision cameras in the same local subnet with the PC on which the Software runs will be enumerated in the device list. You can configure the IP addresses and other network parameters of these cameras.

Note

You can move the cursor to **GigE** and then click to manually refresh the cameras.

You can view the camera status on the Status column of the device list. If the camera status is free or unreachable, you can edit its network parameters including IP address.

Free

The camera is available and you can edit its IP address.

In Use

The Software or other processes are accessing the camera. You need to stop the live view and disconnect the camera, or terminate other processes to access the camera.

Unreachable

The camera is unreachable due to one of the following two reasons:

- The network of the camera is abnormal. Check the camera network settings.
- The camera is on the same subnet with the PC on which the Software runs, but NOT in the same network segment. You should modify its IP address to the same network segment with the PC to make the camera available for connection and use.

You can also click to select camera information (model name, device user ID, status, etc.). The selected item will be displayed on the camera list.

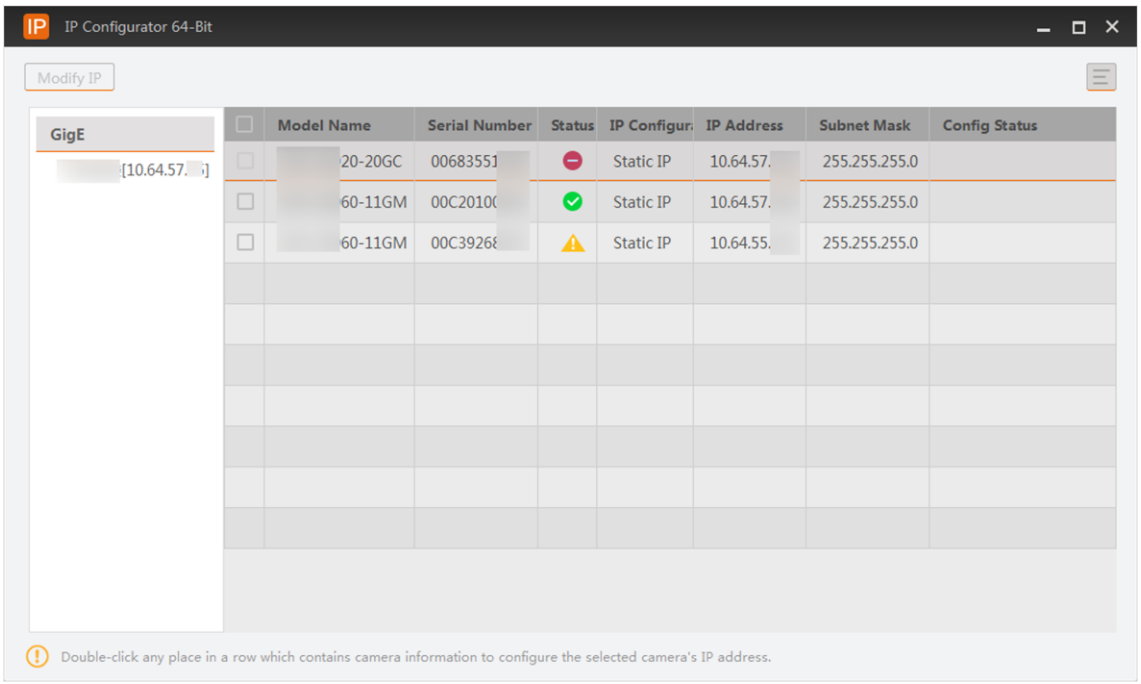


Figure 7-1 IP Configurator

7.1.1 Edit IP Address of a Single Camera

You can modify the IP address of a single camera if the camera status is Free or Unreachable.

Steps

1. Select a network interface.
2. Double-click any place in the camera row to open the Modify IP Address window.
3. Select the **Static IP**, **DHCP**, or **LLA** as the IP type.

Note

You can change the IP type only when the camera status is Free. And if you change the IP type, the camera will be reset to its power up state.

Static IP

For setting the IP type as Static IP, you can modify the IP address, subnet mask, and default gateway.

DHCP

The camera is set to automatically obtain an IP address. This means that the IP address will dynamically change (within a range) every time the camera or computer is restarted.

LLA

The camera uses a default IP address from the link-local address block. Link-local addresses for IPv4 are defined in the address block 169.254.0.0/16 in CIDR notation. In IPv6, they are assigned the address block fe80::/10.

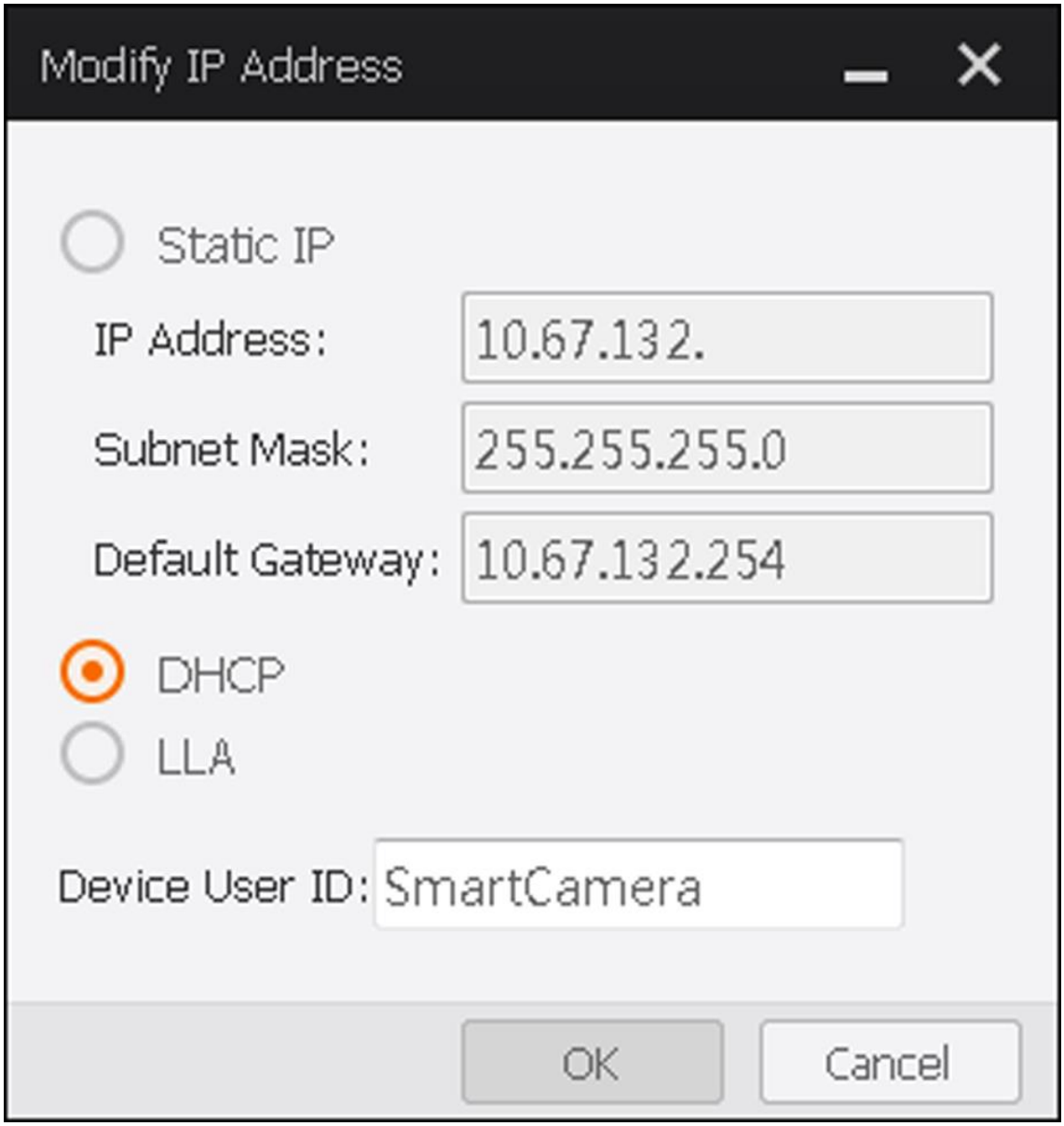


Figure 7-2 Modify IP Address

4. Optional: Edit the camera name in Device User ID field.
5. Click **OK** to save the settings.

Note

If the modified IP address conflicts with another device's IP address in the same local subnet, a prompt will pop up to remind you that IP conflict occurs. Change the IP address in this situation.

7.1.2 Edit IP Addresses of Multiple Cameras

You can batch modify the IP addresses of multiple cameras under the same interface.

Steps

1. Select a network interface.
2. Select the cameras to be modified.

Note

You can select up to 20 cameras.

3. Click **Modify IP** to open the Batch Modify IP window.

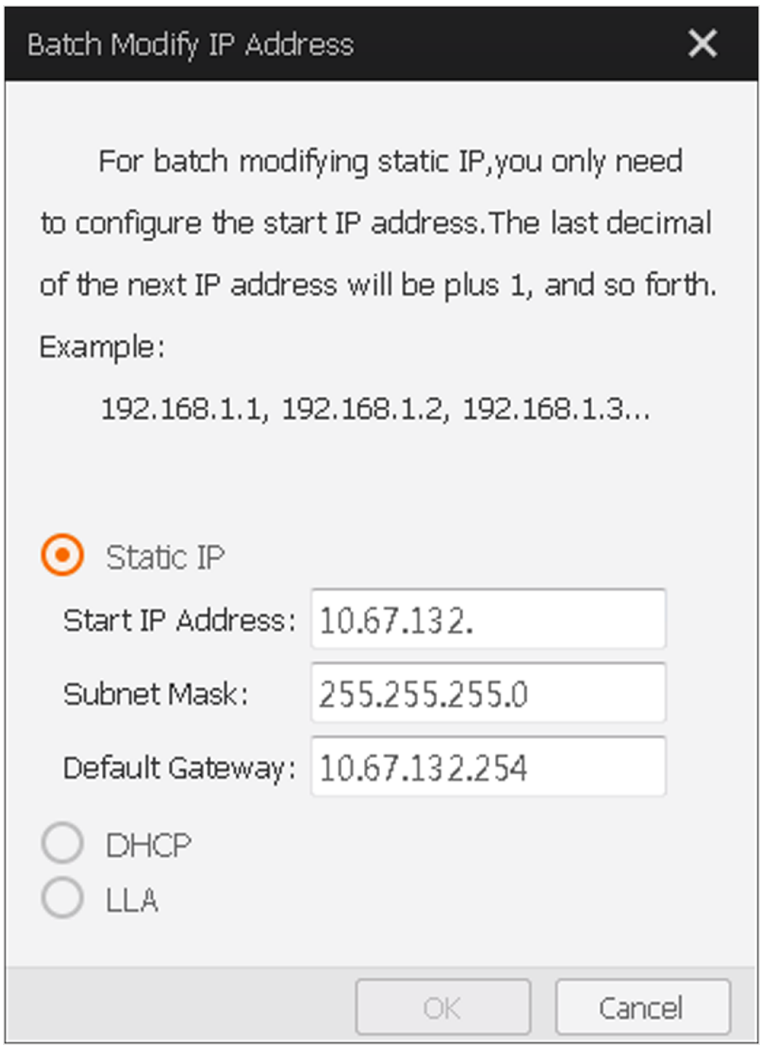


Figure 7-3 Batch Modify IP Addresses

4. Select **Static IP**, **DHCP**, or **LLA** as the IP type.

Note

- For setting the IP type as Static IP, you can set the start IP address, subnet mask, and default gateway.
- For batch modifying static IP, you only need to configure the start IP address. The last decimal of the next IP address will be plus 1, and so forth (example: 192.168.1.1, 192.168.1.2, 192.168.1.3...).

5. Click **OK** to save the settings.

Note

If the modified IP address conflicts with another device's IP address in the same local subnet, a prompt will pop up to remind you that IP conflict occurs. Change the IP address in this situation.

7.2 Firmware Updater

You can update the firmwares of the cameras or frame grabbers via the Firmware Updater tool.

Steps

Note

- Cameras of different types of interfaces cannot be updated at the same time.
- The firmware update file should match the camera model.

1. Open the Firmware Updater window.
   – Click **Tool** → **Firmware Updater** on the main page.Open **Firmware_Updater** in the installation folder.

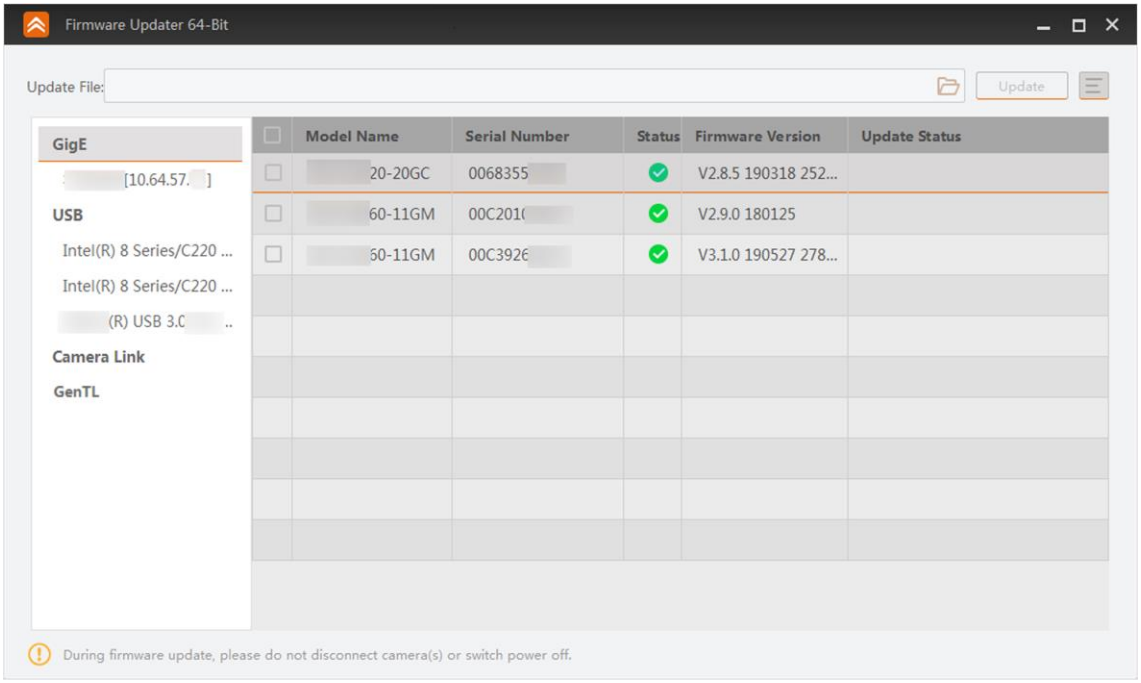


Figure 7-4 Firmware Updater

2. Optional: The device information will be displayed on the window. You can conduct the following operations as needed.

   GigE and USB Interfaces

   - Select **GigE** or **USB**, and the devices connected to it will be displayed on the right.
   - Select an interface under **GigE** or **USB**, and the cameras connected to the interface will be displayed on the right.
   - The tool will auto refresh the cameras by default. You can also click on the right of **GigE** and **USB** to manually enumerate the cameras.

   Camera Link Interfaces

- Select **Camera Link**, and the devices connected to the camera link will be displayed on the right.
- Select an interface under **Camera Link**, and the cameras connected to the camera link will be displayed on the right.
- The tool will not auto refresh the devices connected to camera link by default. You need to click on the right of **Camera Link** to manually enumerate the cameras.

GenTL Interfaces

Right-click **GenTL** and click **Select CTI File**. Select and open a CTI file, and the tool will enumerate the frame grabbers and cameras in the CTI file.

- Select **GentTL**, and all the frame grabbers in the CTI file will be displayed on the right.
- Select a frame grabber under **GentTL**, and the cameras connected to the frame grabber will be displayed on the right.
- Select a camera under **GentTL**, and the cameras connected to all the frame grabbers will be displayed on the right.
- The tool will not auto refresh the frame grabbers and cameras connected by the GenTL by default. You need to click on the right of **GenTL** to manually enumerate the cameras.

3. Optional: Click to select the to-be-displayed device information (model name, MAC address, firmware version, etc.).
4. Select cameras or frame grabbers to be updated.

Note

No more than 20 cameras or frame grabbers can be selected.

5. Click to select an update file (DAV format) in the local PC.
   The matched cameras will be selected automatically.
6. Click **Update**.

Note

- During the update, do not break the connection between the devices and the PC, and ensure that the devices are working.
- The devices will restart automatically upon finishing the update.
- The update of frame grabbers will take effect after restarting the PC.

7.3 Bandwidth Manager

The Bandwidth Manager allows you to adjust the bandwidth distribution of the connected cameras to avoid excessive packet losses so as to ensure data integrity. This is especially useful when multiple cameras use a same network interface for image acquisition.

Note

- All GigE Vision cameras produced by Hikrobot support bandwidth adjustment by Bandwidth Manager. You can also adjust bandwidth for GigE Vision cameras by setting the **Gev SCPS Packet Size** parameter and the **Gev SCPD** parameter. For details about the two parameters, see *Transport Layer Control*.
- Part of the USB3 Vision cameras produced by Hikrobot support bandwidth adjustment by Bandwidth Manager. You can also adjust bandwidth for USB3 Vison cameras by setting the **Device Link Throughput Limit Enable** parameter and the **Device Link Throughput Limit** parameter. You can inquire our technical support for details about how to adjust bandwidth by the two parameters if your USB3 Vision camera supports the two parameters.

Make sure that the camera(s) whose bandwidth needs to be adjusted are not in acquisition and that their Trigger mode is turned off, and then click **Tool** → **Bandwidth Manager** to open the Bandwidth Manager window.
You can click to select the to-be-displayed information (model name, device user ID, MAC address, etc.).

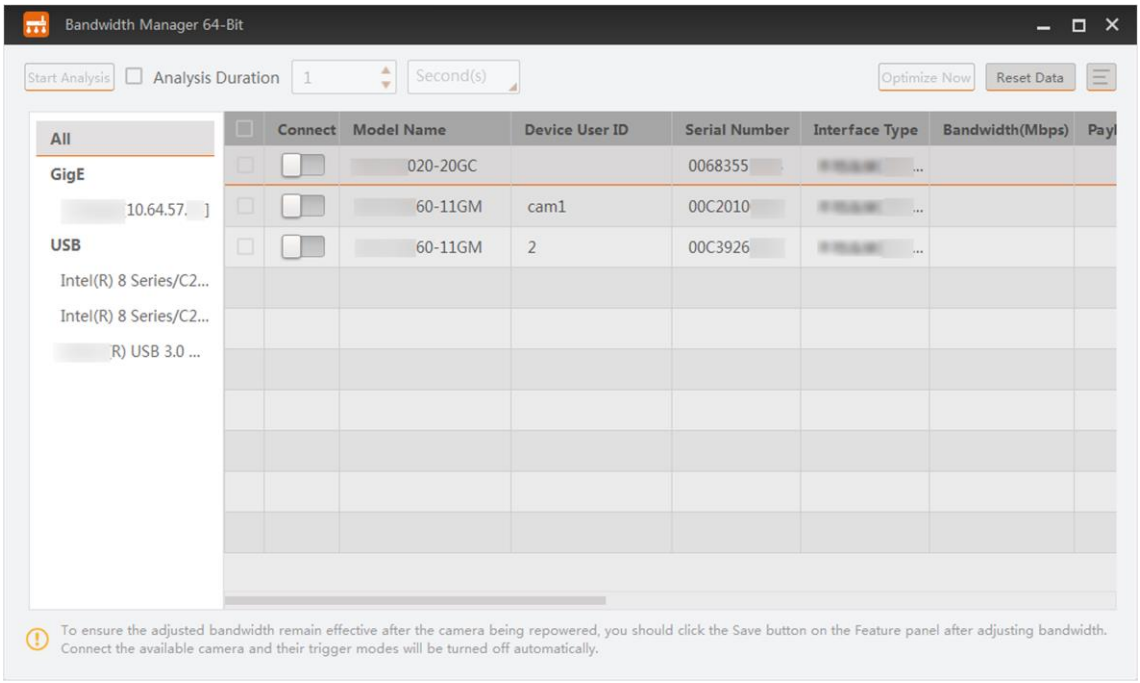


Figure 7-5 Bandwidth Manager Window

The list on the left shows the information of the GigE and USB interfaces on the PC.

- If you select **All**, the camera list on the right will display all cameras under the GigE

interfaces and USB interfaces.
- If you select **GigE**, the camera list on the right will display all cameras under the GigE interfaces.
- If you select **USB**, the camera list on the right will display all cameras under USB interfaces.
- If you select a specific Interface, the camera list on the right will display all cameras under the selected interface.

Analysis before Optimization

After connecting camera(s), click **Start Analysis** to start analysis, and then click **Stop Analysis** to complete analyzing the bandwidth distribution of the cameras (you can also set the analysis duration to automatically stop analysis when the duration ends). And the value of payload received, frame sent, frame received, etc., will be displayed.

Note

You can click **Reset Data** to reset the value of the above-mentioned parameters to 0.

Table 7-1 Information Item Description

Information Item	Description
Payload Sent (Mbps)	The payloads that the camera sent to the PC during analysis.
Payload Received (Mbps)	The payloads that the camera received from the PC during analysis.
Frame Sent (fps)	The frames that the camera sent to the PC during analysis.
Frame Received (fps)	The frame that the camera received from the PC during analysis.
Images	The number of images that the PC received from the camera during analysis.
Lost Packets	The amount of packets that the PC failed to receive from the camera during analysis.
Lost Frames	The amount of the frames that the PC failed to receive from the camera during analysis.

Bandwidth Optimization

Based on the analysis result, you can optimize bandwidth distribution of the connected cameras in the following two ways:
- Select a GigE interface and then click **Optimize Now** to automatically optimize the bandwidth of the selected camera(s).

Note

Only GigE Vision cameras support the Optimize Now function.

- Manually adjust the bandwidth, and then analyze again to view the changed value of payload received, frame sent, frame received, etc.

Note

The less the payload losses and frame losses, the better the image quality would be.

7.4 GigE Vision Action Command

The Action Command is used to trigger actions in multiple cameras in a network simultaneously. When Action Command is configured, the Software can send commands across the network and have devices in a predefined group respond based on how they have been configured to respond to certain commands. In this way, a single command can trigger actions such as Frame Start in multiple cameras with a minimum of latency and configuration effort. The Action Command can be used in various scenarios where image fusion is required.

Before You Start

Search for the following three parameters in the feature tree and configure them for each camera that needs to receive commands.

Note

- The camera should support the Action Control feature, or configuring Action Command will be unavailable.
- ActionDeviceKey, ActionGroupKey, and ActionGroupMask are all displayed in hexadecimal notation.

Table 7-2 Parameter Description

Parameter	Description
ActionDeviceKey	A kind of password which enables the camera to check the validity of the commands.
ActionGroupKey	Used to specify a group of cameras to perform actions.
ActionGroupMask	Used to filter out some cameras from the specified group.

Steps

1. Go to **Tool** → **GigE Vision Action Command**.

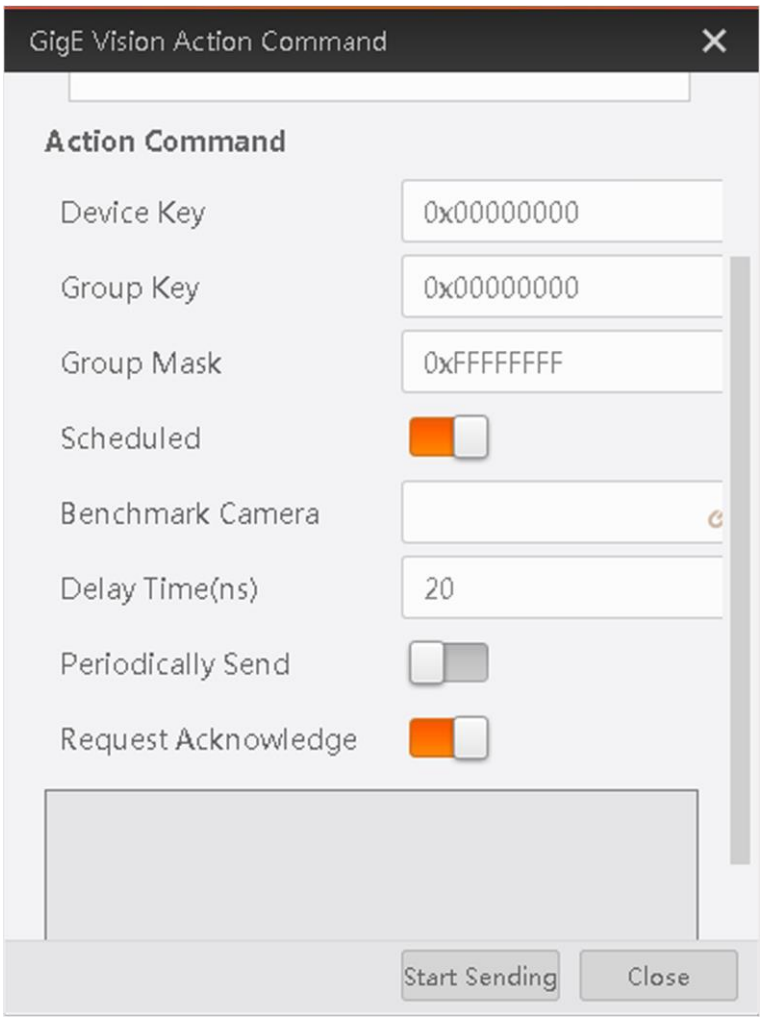


Figure 7-6 GigE Vision Action Command Window

2. Select network interface(s) to set the subnet(s) that the command to be sent to.
3. Enter the device key, group key, and group mask.

Parameter	Requirement
Device Key	Its value should be the same with the value of the ActionDeviceKey feature.
Group Key	Its value should be the same with the ActionGroupKey feature.
Group Mask	The bitwise AND operation of the Group Mask against the ActionGroupMask feature should results in non-zero.

4. Optional: Set in **Scheduled** field to to enable scheduled action command.

Benchmark Camera

The value of the GevTimestampValue feature of the selected camera will be automatically acquired and be used as the start time point for the delay.

Delay Time

The delay time should NOT be shorter than the maximum time required to transmit the command across the network.

When the benchmark camera receives the command, all the cameras will trigger certain actions simultaneously after the specified delay time.

5. Optional: Enable the Software system to send commands periodically.
   1) Enable **Periodically Send**.
   2) Enter the interval for sending the command.

Note

- If you enable **Periodically Send**, **Request Acknowledge** will be disabled, or vice versa.
- The default value is 1000ms, and valid value range is from 1ms to 3600000ms.

6. Optional: Enable **Request Acknowledge** to display the acknowledgment messages.

Note

- If you enable **Request Acknowledge**, **Periodically Send** will be disabled, or vice versa.
- Up to 50 messages can be displayed. Once the message number exceeds 50, the earliest message will be automatically deleted.

7. Click **Start Sending**.

Example

Sample Use Case

To generate slow-motion playback in stadiums for the purpose of viewing and analyzing the athlete's movement details, a group of camera is installed parallel to a race track (see picture below).

When the athlete passes, four cameras (subgroup 1) synchronously execute an action (capture images in this example).

As the athlete advances, the next four cameras (subgroup 2) synchronously capture images. One after the other, the subgroups continue in this way until the athlete has reached the end of the race track. The resulting images can be combined and processed to generate the slow-motion playback in subsequent steps using other technology and programs.

In this sample use case, the followings should be defined.

- Use the **ActionDeviceKey** parameter to authorize the execution of the synchronous image acquisition. The device key should be configured on each camera and it should be same with the device key for the action command protocol message.
- Use the **ActionGroupKey** parameter to define the group of cameras in a network segment that is addressed by the action command (in this use case: group 1).
- Use the **ActionGroupMask** parameter to define the subgroups in the group of cameras that capture images synchronously (in this use case: subgroups 1, 2, and 3).

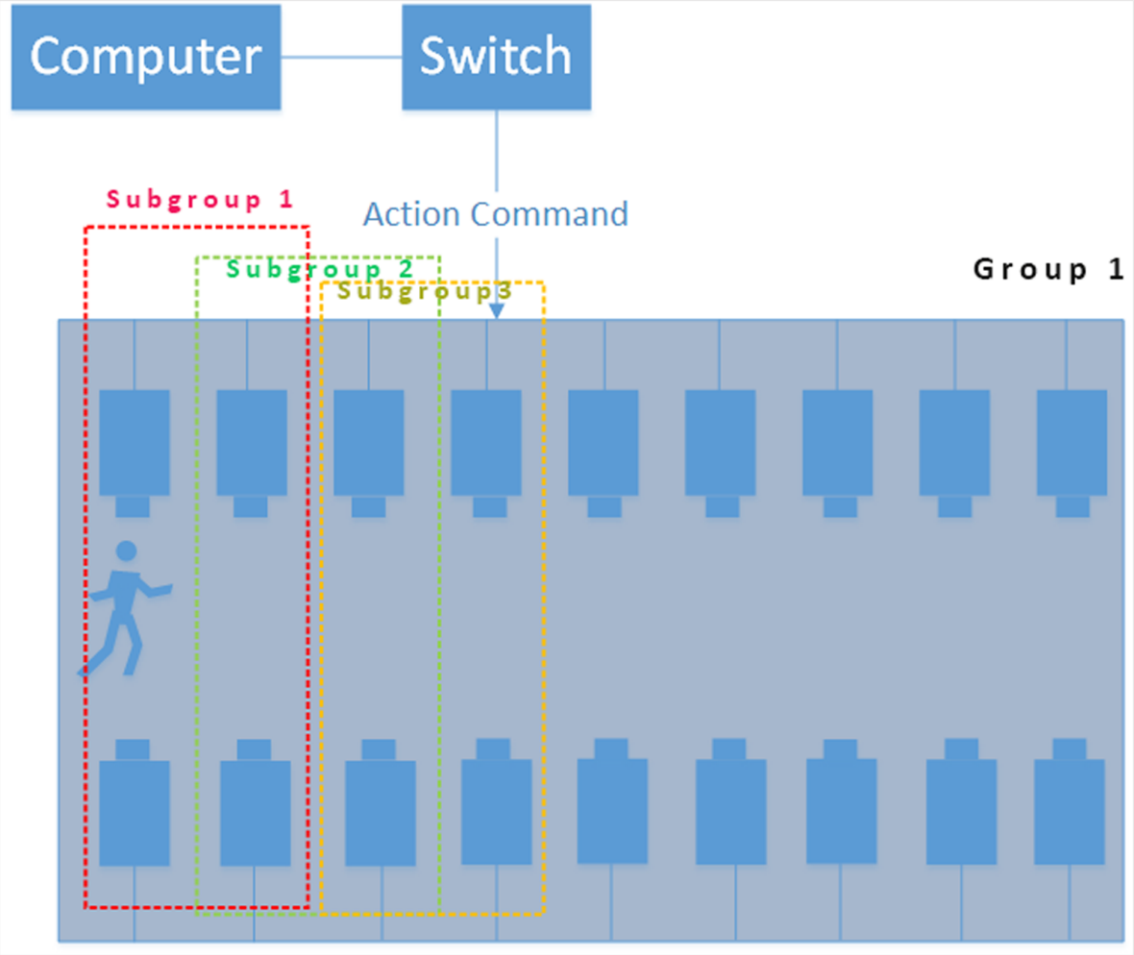


Figure 7-7 Sample Use Case In Stadium

7.5 NIC Configurator

You can use NIC Configurator to configure and apply the parameters of the network interface card (hereafter simplified as NIC).
You can open the NIC Configurator in two ways:

- Search *NIC_Configurator* in the Start menu of the PC and then click the found **NIC_Configurator**.
- In the installation directory of the Client, go to **Application** → **Win32** or **Application** → **Win64**, and then double-click **NIC_Configurator** to view the PC system information.

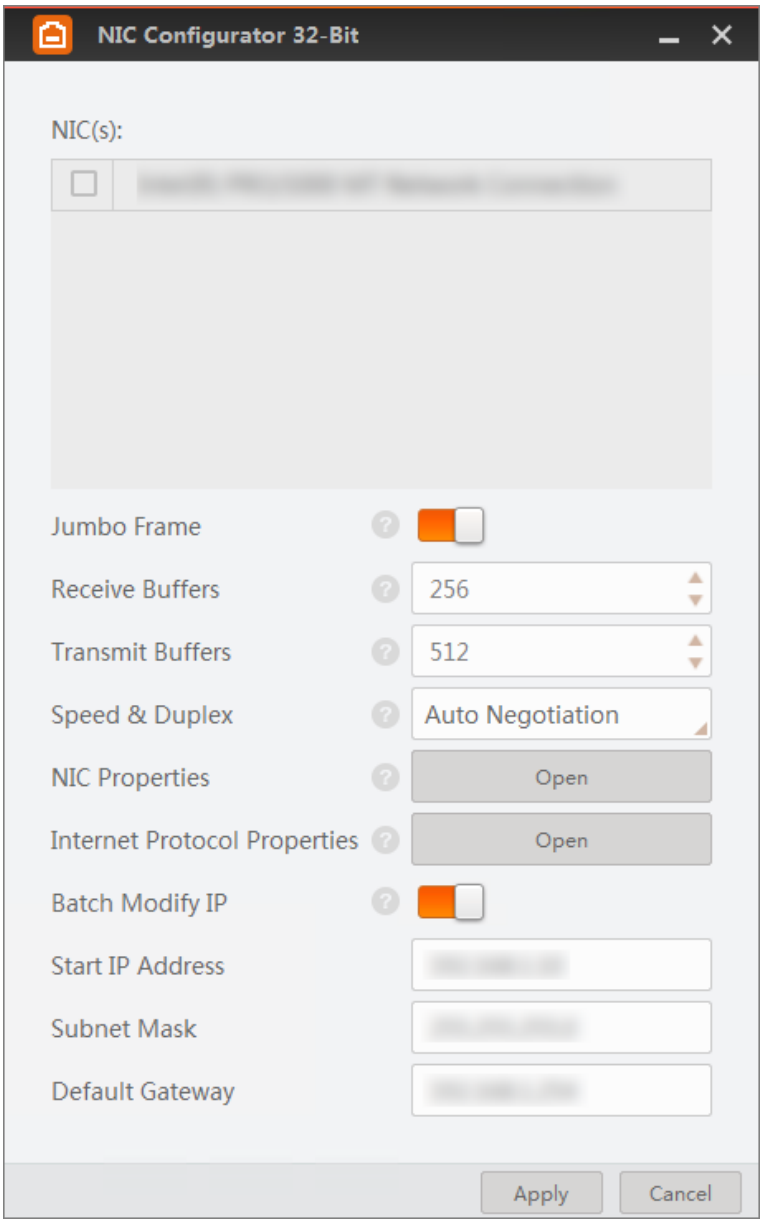


Figure 7-8 NIC Configurator

NIC(S)

Select the PC's NIC.

Jumbo Frame

Check the Enable checkbox to enable the Jumbo Frame function of the NIC. Jumbo Frame function can reduce the CPU usage and improve the data transmission efficiency. After enabling the Jumbo Frame function, the Jumbo Frame value will be set to 9 KB or 9014 Bytes automatically.

Receive Buffers

Set the size of Receive Buffers. Increasing the Receive Buffer size improves receiving

performance while costs more system memory.

Transmit Buffers

Set the size of Transmit Buffers. Increasing the Transmit Buffer size improves data transmission performance while costs more system memory.

Speed and Duplex

Set the speed and duplex mode of the NIC.

NIC Properties

Click **Open** to open the properties page of the selected NIC. You can view and edit the NIC properties if needed.

Internet Protocol Properties

Click **Open** to open the properties page of the internet protocol. You can view and edit the IP address and other network parameters of the current PC.

Batch Modify IP

Switch on to batch modify the IP addresses of the NIC and the cameras connected to it.

Start IP Address

Set the start IP address of the NIC and the cameras connected to it.

Subnet Mask

Set the subnet mask of the NIC and the cameras connected to it.

Default Gateway

Set the default gateway of the NIC and the cameras connected to it.

7.6 Driver Manager

You can use Driver Manager to view the status (installed or uninstalled), and install or uninstall the GigE Vision driver and USB Vision driver.
You can open the Driver Manger in the following ways:

- Search *Driver_Installation_Tool* in the Start menu of the PC, and then click the found **Driver_Installation_Tool** to open the Driver Manager.
- In the installation directory of the Client, go to **Application** → **Win32** or **Application** → **Win64**, and then double-click **Driver_Installation_Tool** to open the Driver Manager.

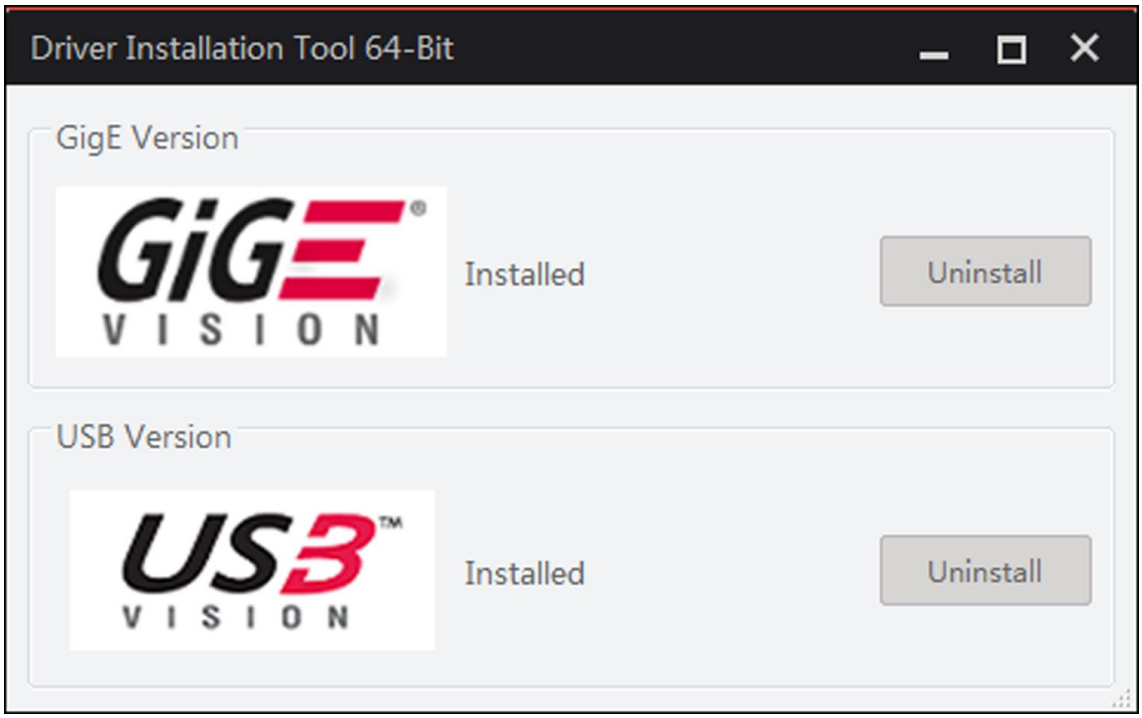


Figure 7-9 Driver

7.7 Diagnostic Tool

You can use the Diagnostic Tool to diagnose the running environment and the secondary development environment, and then optimize the environments basing on the detected exceptions.
Diagnose the running environment first (see *Diagnose Running Environment*), and then optimize the running environment (see *Optimize Environment*, and finally check and resolve specific exception(s) (see *Check and Resolve a Specific Exception*).

Diagnose Running Environment

You can search *Diagnostic_Tool.exe* in the Start menu, and then click the found **Diagnostic_Tool.exe** to run the Diagnostic Tool.

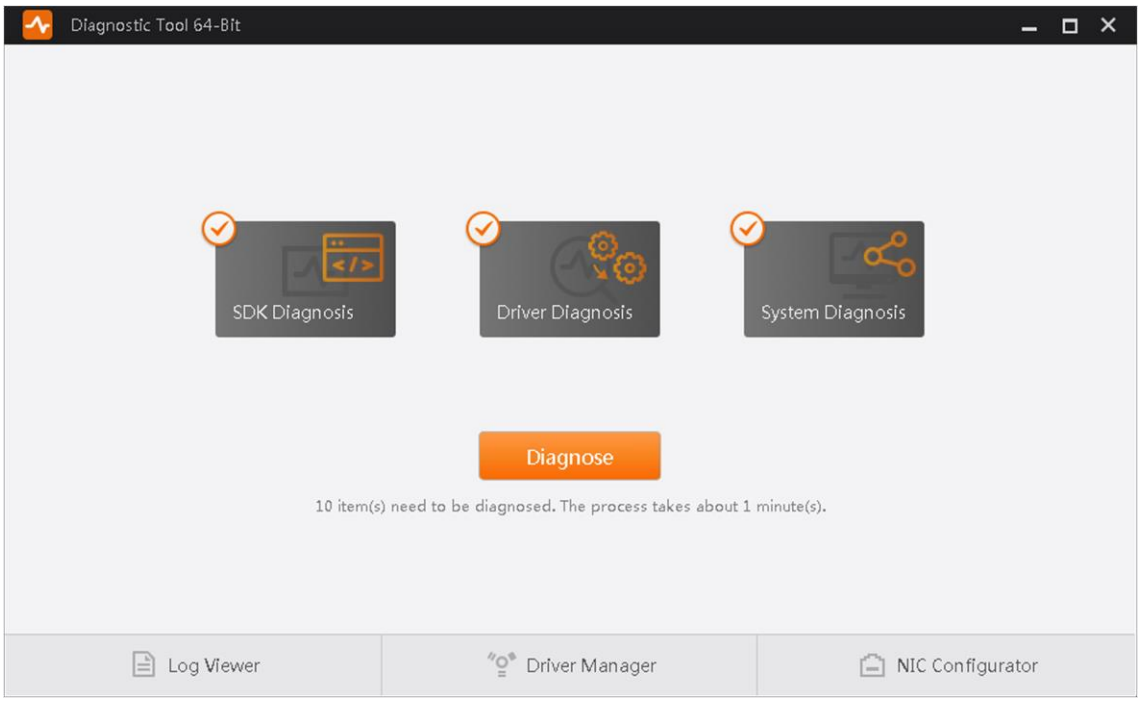


Figure 7-10 Diagnostic Tool

You can select **SDK Diagnosis**, **Driver Diagnosis**, or (and) **System Diagnosis**, and then click **Diagnose** to start diagnosing.

SDK Diagnosis

Diagnose the secondary development environment.

Driver Diagnosis, System Diagnosis

Diagnose the Software running environment.

While diagnosing, you can also click the tool(s) at the bottom of the page to help the diagnostics work.

Log Viewer

View the SDK logs. For details, see ***Log Viewer Tool***.

Driver Manager

Manage the GigE Vision driver and the USB driver. For details, see ***Driver Manager***.

NIC Configurator

Configure the PC's network adapter parameters. For details, see***NIC Configurator***.

When diagnosis ends, the exception number of each type of the diagnosis results (Serious, Fatal, or Normal) will be displayed, and all the exceptions will be displayed by different categories. You can view and handle each one of them respectively.

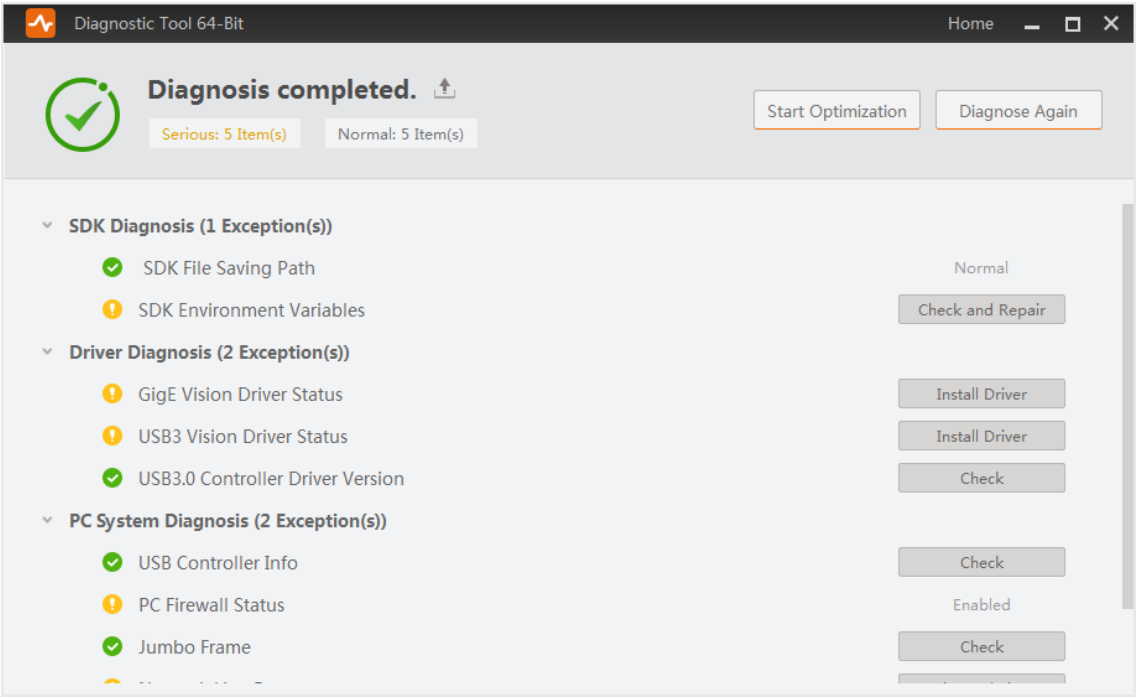


Figure 7-11 Diagnosis Completed

The following table shows the description of each type of diagnosis results. **Table 7-3 Description of Result Type**

Result Type	Description
Fatal	The exceptions that may cause fatal problems such as system crash or secondary development failure.
Serious	The exceptions that may cause serious problems such as streaming failure.
Normal	The item is normal and is marked with ✔.

Optimize Environment

If exception(s) are detected after diagnosis, you can click **Start Optimization** to optimize the Software running environment and the secondary development environment.

Note

After optimization, you may still need to resolve some exceptions manually. Take network line rate exception (lower than 1Gbps) for an example, you need to manually check if the NIC, network or the switch is abnormal.

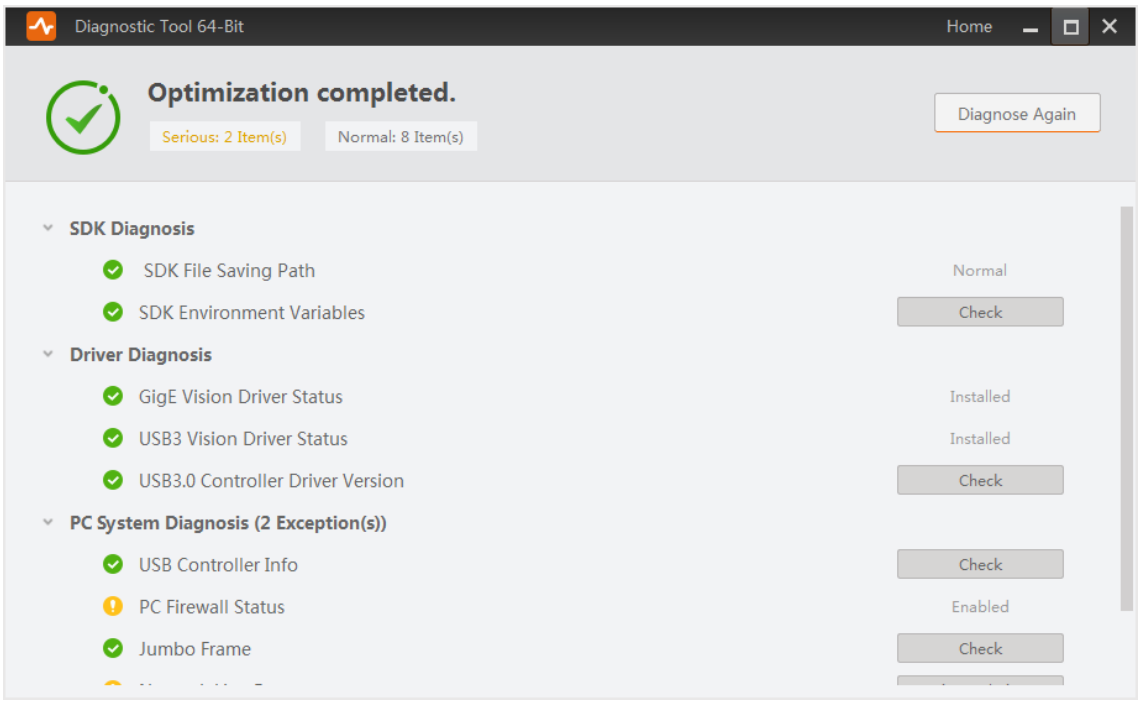


Figure 7-12 Optimization Completed

Check and Resolve a Specific Exception

The Diagnostic Tool can detect various types of exceptions, including the exception that SDK files are copied to multiple saving paths, environment variable exception, driver exception, USB controller exception, Jumbo Frame exception, and network line rate exception.

- For the exception that SDK files are copied to multiple saving paths, you can click **Check**, and then delete a specific SDK file or click **Clear All** to clear all the SDK files.

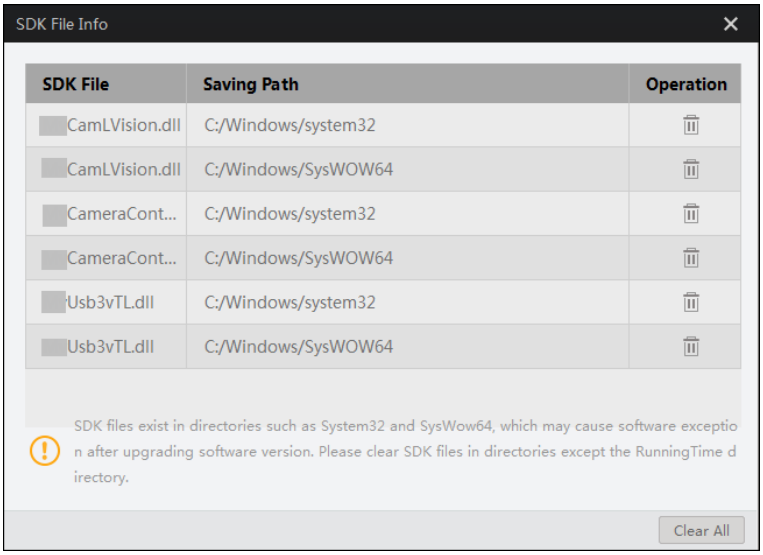


Figure 7-13 SDK Files Copied to Multiple Saving Paths

- For environment variable exception, you can click **Repair** to repair the detected

problems.
If no exception is detected, you can also click **Check** to view the variable information such as variable name and status.

- For driver exception, you can click **Check** to view the driver information such as the driver version and driver's latest update time.
- For USB controller exception, you can click **Check** to view the USB controller information, such as driver key, device ID, and vendor ID.
- For Jumbo Frame exception, you can click **Check** to view whether Jumbo Frame of the network adapter is enabled or not and the Jumbo Frame value (if enabled).

Note

To ensure data transmission efficiency, make sure that Jumbo Frame is enabled.

- For network line rate exception, you can click **View Solution** to view the exception details and solution.

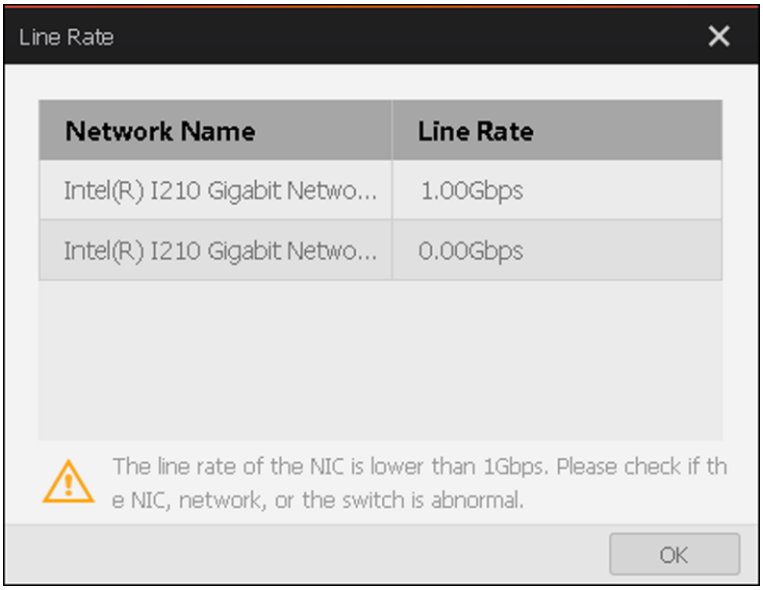


Figure 7-14 Line Rate Exception

7.8 View PC System Information

The Client provides a tool for viewing the PC system information, such as CPU, CPU core number, operating system, screen resolution, etc.
You can open the tool in the following two ways:

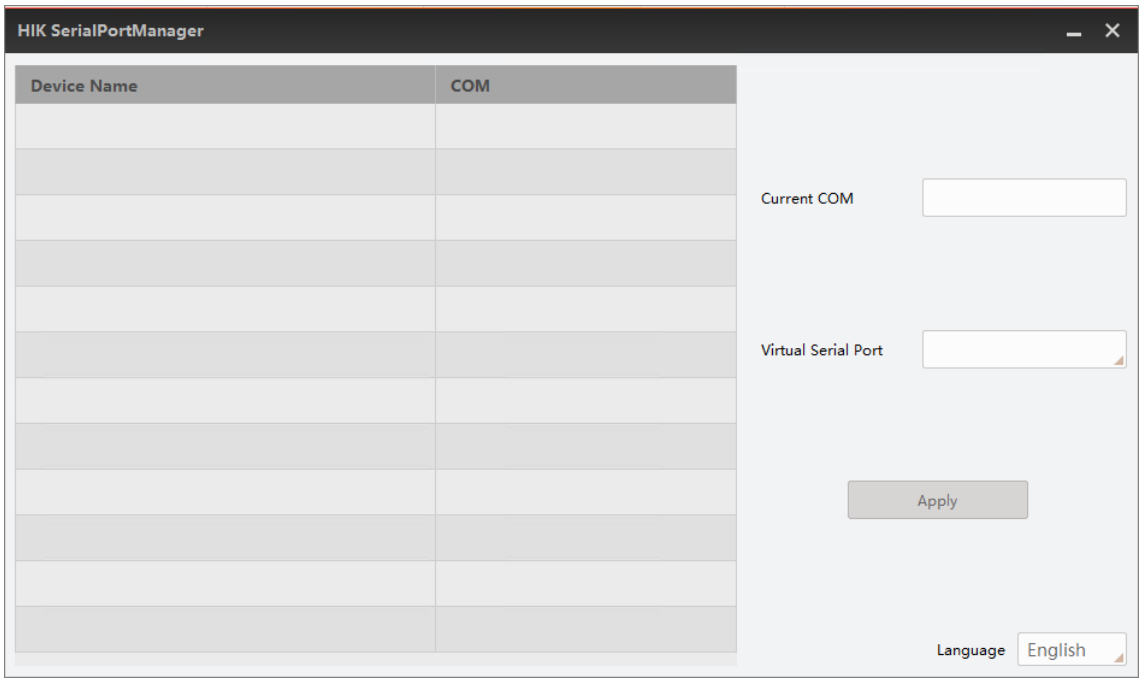
- Search *System_Info* in the Start Menu of the PC, and then click the found **System-Info** to view the PC system information.
- In the installation directory of the Client, go to **Application** → **Win32** or **Application** → **Win64**, and then double-click **System Info** to view the PC system information.

7.9 Customize Frame Grabber's Port

The tool can customize the frame grabber's port.

Steps

1. Go to *C:\Program Files (x86)\MVS\Applications\Win64* on the PC.
2. Find and open the tool for customizing frame grabber's port **SerialPortEnum.exe**.



3. The names and ports of the connected devices will be displayed on the left. Select the frame grabber to be edited, and the COM will be displayed on **Current COM**.

   Only the Hikrobot CML frame grabbers will be displayed.
4. Click ◢ on the lower right of **Virtual Serial Port** to choose a COM from the drop-down list.
5. Click **Apply**.

Chapter 8 Logs

You view both logs about progresses and operations on the Client, and the SDK (Software Development Kit) logs.

8.1 Software Logs

You can view the logs about operations and progresses on the Software.
Click to open the Log Information window.
You can view the information such as importance level, date, content, and source.
You can click **Clear Logs** to clear all the displayed logs.

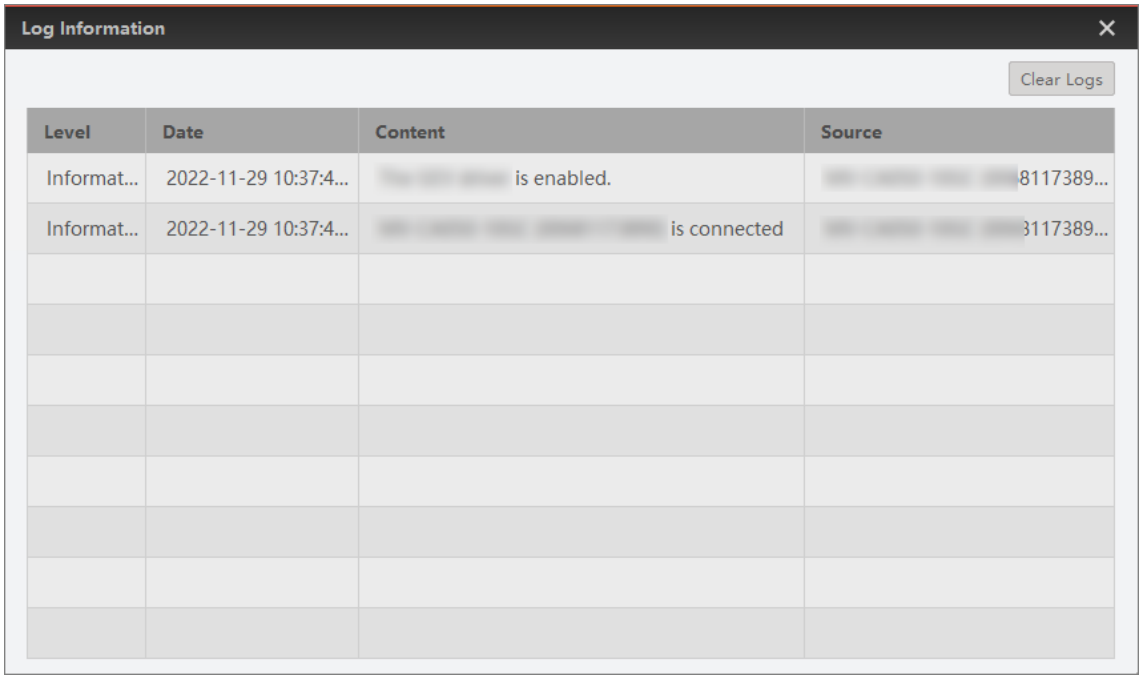


Figure 8-1 Log Information Window

8.2 Log Viewer Tool

You can view the logs of SDK and frame grabbers via the log viewer tool.

8.2.1 View SDK Logs

You can view the SDK logs of the Client. Three types of SDK logs are available, i.e., error, warning, and information. Each log contains the information including log type, log time, log content, process name, etc.

Click **Tool** → **Log Viewer** to open the Log Viewer window. You can choose to view the logs of camera or frame grabber in **LogSource** on the upper left of the window.

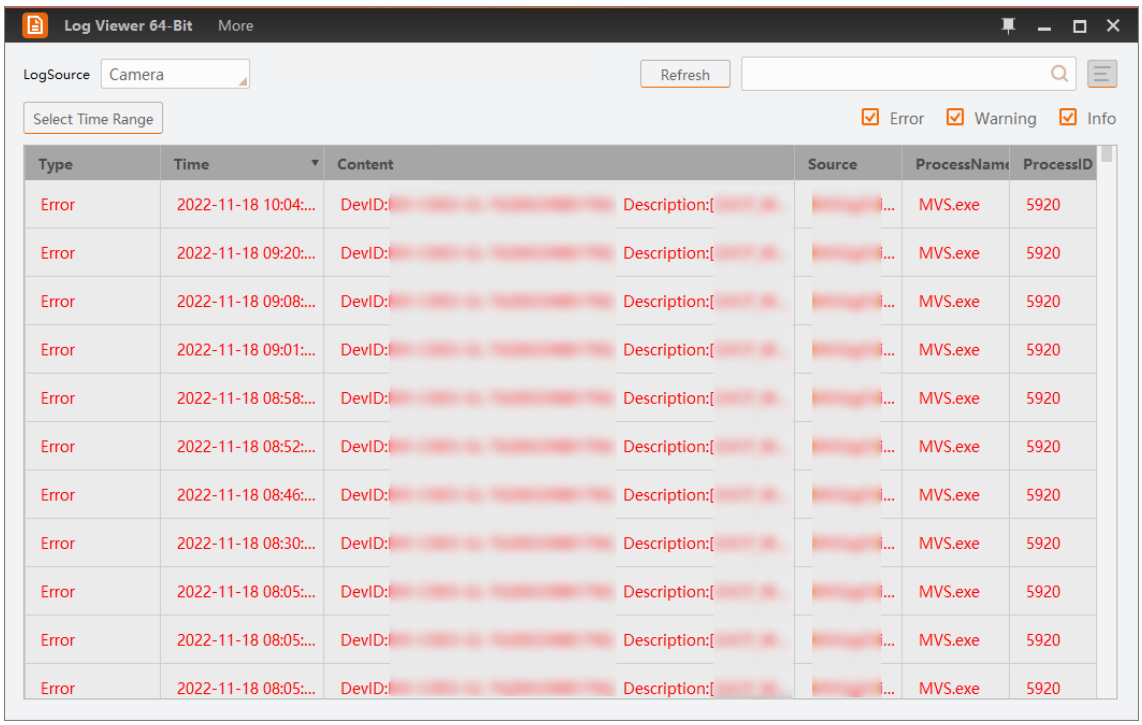


Figure 8-2 Log Viewer

The following table shows the description of the three types of SDK logs.**Table 8-1 Type of SDK Logs**

Log Type	Description
Error	Errors occurred on the Client.
Warning	The warning information sent by the Client when precondition error occurs.
Information	The information about operations.

You can perform the following operations.

Table 8-2 SDK Log Operations

Operation	Description
Export All SDK Logs	Right-click the log list and then click **Export All Logs**.
Export Selected SDK Logs	Press and hold the **Shift** key and left-click the mouse to select multiple SDK logs continuously, and then right-click the log list and click **Export Selected Logs**. Or press and hold the **Ctrl** key and left-click the mouse to select multiple SDK logs, and then right-click the log list and click **Export Selected Logs**.
Search Logs	Enter the keywords to search logs. **Note** You can only search by the keywords of the content of the log. Searching by the keywords of log type, log time, or log source is not supported.
Refresh Logs	Click **Refresh** to refresh logs.
Select Time Range	Click **Select Time Range** to set the time range of the displayed logs.
Copy All SDK Logs	Right-click the log list and then click **Copy All Logs**.
Copy Selected SDK Logs	Press and hold the **Shift** key and left-click the mouse to select multiple SDK logs continuously, and then right-click the log list and click **Copy Selected Logs**. Or press and hold the **Ctrl** key and left-click the mouse to select multiple SDK logs, and then right-click the log list and click **Copy Selected Logs**.
Clear All SDK Logs	Right-click the log list ant then click **Clear Logs**
Stick to the Top or Not	Click to stick the Log Viewer window to the top, click to undo.
Select Displayed Information	Click to select the to-be-displayed information (time, type, content, source, etc.).
Rank Logs	Click the **Time** table header to rank the logs by time (descending order or ascending order).

8.2.2 Configure Logs

Configure log settings of cameras and frame grabbers.

Camera Logs

Select **Camera** in **LogSource**, and you can click **More** on the top of the log viewer window to configure log view settings and log service settings of cameras.

Log View Settings

You can set the DLL(s) to be displayed on Log Viewer.

Select DLL(s)

Check the checkbox(es) to select DLL(s). You can only select MvCameraControl.dll, MVGigEVisionSDK.dll, MvUsb3vTL.dll, and MvCamLVision.dll.

MvCameraControl	Logs about operations on the Software will be displayed (if exist).
MVGigEVisionSDK	Logs about the Software accessing USB3 Vision cameras will be displayed (if exist).
MvUsb3vTL	Logs about the Software accessing USB3 Vision cameras will be displayed (if exist).
MvCamLVision	Logs about the Software accessing Camera Link cameras will be displayed (if exist).

Add DLL(s)

Enter the name of a DLL in the input box, and then click **Add**.

Max. Displayed Logs

Set the maximum number of displayed logs.

Note

The range of maximum displayed logs is from 1 to 100,000 (default value: 1000).

Interval for Update (ms)

Set the time interval (unit: ms) for upgrading the log list.

Note

The range of the time interval is from 100 to 1000,000 (default value: 1000).

Log Service Settings

Max. Storage Size

Set the maximum storage size (unit: MB) for the SDK logs (default value: 10).

Storage Type

The selected type of SDK logs will be stored.

Frame Grabber Logs

Select **FrameGrabber** in **LogSource**, and you can click **More** on the top of the log viewer window to configure log settings of frame grabbers.

Max. Displayed Logs

Set the maximum number of displayed logs.

Note

The range of maximum displayed logs is from 1 to 100,000 (default value: 1000).

Interval for Update

Set the time interval (unit: ms) for upgrading the log list.

Note

The range of the time interval is from 100 to 1000,000 (default value: 1000).

Chapter 9 Error Code List

The error codes of the Software and machine vision camera SDK are as the following.

Software Error Code	Machine Vision Camera SDK Error Code	Description
Normal Code Description		
0x00000000	0x00000000	Succeeded. No error.
General error codes.		
0x90006100	0x80000000	Incorrect or invalid handle.
0x90006101	0x80000001	The function is not supported.
0x90006102	0x80000002	No more cache can be stored.
0x90006103	0x80000003	Function calling order error.
0x90006104	0x80000004	Incorrect parameter.
0x90006105	0x80000006	Applying for resource failed.
0x90006106	0x80000007	No data.
0x90006107	0x80000008	Not prepared, or the running environment has changed.
0x90006108	0x80000009	Versions mismatch.
0x90006109	0x8000000A	No enough storage.
0x9000610A	0x8000000B	Abnormal image. Package missing may cause the abnormality.
0x9000610B	0x8000000C	Importing DLL dynamically failed.
0x9000610C	0x8000000D	No cache can be output.
0x9000610D	0x8000000E	Incorrect file path.
0x900061FF	0x800000FF	Unknown error.
Error codes of GenI cameras.		
0x90006200	0x80000100	General error.
0x90006201	0x80000101	Invalid parameters.

Software Error Code	Machine Vision Camera SDK Error Code	Description
0x90006202	0x80000102	The value exceeds the range.
0x90006203	0x80000103	Incorrect node property.
0x90006204	0x80000104	Running environment error.
0x90006205	0x80000105	Logic error.
0x90006206	0x80000106	Incorrect accessing condition of node.
0x90006207	0x80000107	Timeout.
0x90006208	0x80000108	Conversion exception.
0x900062FF	0x800001FF	Unknown error of GenICam.
Error codes of GigE_STATUS.		
0x90006300	0x80000200	Command not supported by device.
0x90006301	0x80000201	The address to be accessed does not exist.
0x90006302	0x80000202	No data can be written.
0x90006303	0x80000203	No right to access device.
0x90006304	0x80000204	Device is busy, or disconnected from the Software.
0x90006305	0x80000205	Network Package data error.
0x90006306	0x80000206	Network error.
0x90006307	0x80000221	Duplicated device IP.
Error codes of USB_STATUS.		
0x90006400	0x80000300	Reading USB error.
0x90006401	0x80000301	Error occurred when writing the USB.
0x90006402	0x80000302	Device exception.
0x90006403	0x80000303	GenICam error.
0x90006404	0x80000304	Insufficient bandwidth.

Software Error Code	Machine Vision Camera SDK Error Code	Description
0x90006405	0x80000305	Drivers mismatch or no driver.
0x900064FF	0x800003FF	Unknown USB error.
Error codes of upgrade.		
0x90006500	0x80000400	Firmware versions mismatch.
0x90006501	0x80000401	Firmware languages mismatch.
0x90006502	0x80000402	Device upgrade conflict. (The device is already being upgraded.)
0x90006503	0x80000403	Internal error occurred in the camera during upgrade.
0x900065FF	0x800004FF	Unknown error during upgrade.

Chapter 10 FAQ

You can refer to the following information if you encounter the problems described in the following Frequently Asked Questions (FAQ).
Before checking the details of the FAQ, please check the running environment if the software cannot detect the camera, or the camera live view fails. You should make sure:

- The Client is running on a PC or industrial PC with gigabit network interface card.
- The network between the camera and the PC or industrial personal computer is gigabit network.
- The jumbo frame of the PC's network adapter is enabled. If not, please enable the Jumbo Frame function of the network adapter.
- The USB interface of the PC running the client software should be USB3 interface.
- The USB cable which connects the PC and the USB3 Vision camera should meet the USB3 specifications.
- The operation system is Windows XP (32-bit), Windows 7/10 (32/64-bit). Other operation system is not supported currently

If the solutions provided in the FAQ cannot solve your problem, please contact us for support. For details, see *Get Support* for details.

10.1 No GigE Vision camera is enumerated after running the Software.

Question

What can I do if no GigE Vision camera is enumerated after running the Software?

Possible Cause

The camera is not properly started or the network cable not properly connected.

Solution

Check the power supply of the camera (by checking PWR indicator) and network connection (by checking Link light in LAN interface).

10.2 No USB3 Vision camera is enumerated after running the Software.

Question

What should I do if no USB3 Vision camera is enumerated after running the Software?

Possible Cause

The camera is not properly started or USB line wiring exception.

Solution

Check if the LED indicator of the camera is in normal status.

10.3 No Camera Link camera is enumerated after running the Software.

Question

What should I if no Camera Link camera is enumerated after running the Software?

Possible Causes

- Cause 1: The camera is not properly started or the Camera Link wire line not properly connected to the camera.
- Cause 2: Third-party frame grabber exception.

Solutions

- Check if the LED indicator of the camera and the indicator of the third-party frame grabber is in normal status.
- Reinstall the third-party frame grabber. If it still not works, please contact the manufacturer of the frame grabber.

10.4 Runtime error occurred when enumerating Camera Link camera.

Question

What should I do if runtime error (error code: 6304) occurs when enumerating Camera Link camera?

Possible Cause

The environment variables related to the camera are abnormal.

Solution

Use Diagnostic Tool to diagnose the running environment. For details, see *Diagnostic Tool*.

10.5 The Software enumerates a GigE Vision camera, but fails to connect it.

Question

What should I do if the Software enumerates a GigE Vision camera, but fails to connect it?

Possible Causes

- Cause 1: The camera is not on the same LAN with the Software.
- Cause 2: The camera has been connected to other programs.

Solutions

- For Cause 1: Edit the camera IP address. For details, see *IP Configurator*.
- For Cause 2: Disconnect the camera from other programs, and then connect it to the Software.

10.6 The Software enumerates a USB3 Vision camera, but fails to connect it.

Question

What should I do if the Software enumerates a USB3 Vision camera, but fails to connect it?

Possible Causes

- Cause 1: USB3 driver exception.
- Cause 2: The USB3 Vision camera has been connected to another program.

Solution

- For Cause 1: Re-plug the USB3 Vision camera, or reinstall the USB3 driver.
- For Cause 2: Disconnect the camera from other programs and then connect it to the Software.

10.7 The Software enumerates a Camera Link camera, but fails to connect it.

Question

What should I do if the Software enumerates a Camera Link camera, but fails to connect it?

Possible Cause

The Camera Link camera has been connected to another program.

Solution

Disconnect the camera from the program, and then connect it to the Software again.

10.8 Live view shows black image.

Question

What should I do if live view shows black image?

Possible Causes

- Cause 1: Iris of the camera lens is closed.
- Cause 2: Camera exception.

Solutions

- For Cause 1, open the aperture of the lens.
- For Cause 2, power off and reboot the camera.

10.9 Acquisition works fine. But when the trigger signals are provided by external device, no image is triggered.

Question

What should I do if no image is triggered (although acquisition works fine) when the trigger signals are provided by external device?

Possible Causes

- Cause 1: Certain trigger mode is not activated, or the rigger source is incorrectly selected.
- Cause 2: External device wiring error.

Solutions

For Cause 1, check if the camera trigger mode of the current application scenario and the related line input is normal.
For Cause 2, make sure that the wiring of the external device is normal.

Chapter 11 Get Support

If you can't solve your problems with the help of the user manual, please check the detailed information of your current software version and PC system, and then get support from us in the following two ways:

- Official Website: Visit *https://en.hikrobotics.com/* to get other related documents or inquire us online.
- Email: tech_support@hikrobotics.com

Note

- To check out the client software's version information: Click **Help** → **About** on the menu bar.
- To check out the information of the PC system: Click **System_Info** in the installation folder.