HIKROBOT

10 GigE Area Scan Camera

User Manual

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FCC Information

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC compliance: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Conditions

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

EU Conformity Statement

This product and - if applicable - the supplied accessories too are marked with "CE" and comply therefore with the applicable harmonized European standards listed under the EMC Directive 2014/30/EU, the LVD Directive 2014/35/EU, the RoHS Directive 2011/65/EU.

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2006/66/EC (battery directive): This product contains a battery that cannot be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. The battery is marked with this symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling, return the battery to your supplier or to a designated collection point. For more information see: www.recyclethis.info

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Symbol Convention

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

Symbol	Description
NOTE	Provides additional information to emphasize or supplement important points of the main text.
WARNING	Indicates a potentially hazardous situation, which if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
DANGER	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

Available Model

This manual is applicable to the 10 GigE Area Scan Camera.

Safety Instructions

These instructions are intended to ensure that the user can use the device correctly to avoid danger or property loss.

Laws and Regulations

The device should be used in compliance with local laws, electrical safety regulations, and fire prevention regulations.

Power Supply

- When wiring or dismounting, make sure that the device power is cut off, and do not operate under electrification.
- Avoid contact with exposed circuit. When the device is powered on, avoid contact with exposed junctions and parts.
- Use the power adapter provided by the regular manufacturer.
- Do not connect multiple devices to one power adapter, to avoid over-heating or fire hazards caused by overload.
- Make sure the plug is properly connected to the power socket.

Transportation

- The device contains precision optical components and electronic components. During transportation, storage and installation, incorrect operations like heavy pressure and violent vibration should be avoided. Otherwise, the device may be damaged.
- Avoid sudden collision, and pack the device with the accompanied carton and cushioning material or similar package.

Using Environment

- In order to reduce the risk of fire or electric shock, do not let the device get wet or damp.
- Do not drop objects onto the device and avoid vigorous vibration.
- Keep the device away from magnetic interference.
- Do not use the device in extremely heat, extremely cold, dusty environment, corrosive environment or high humidity environment.
- Do not aim the device lens at objects of strong light, such as the sun and incandescent lamp. Otherwise, the lens may be damaged.
- The device should be stored in dry environment without corrosive gas. Avoid placing the device in direct sunlight and poorly ventilated locations, or near heat sources such as heater or heating (ignoring this warning may lead to fire hazards).
- Do not operate in explosive environment.
- Keep the surrounding area well ventilated to avoid heat accumulation. Do not contact the radiator directly to avoid scald.

Electrostatic Protection

- Remove all conductive objects (such as jewelry, watch, etc.) on the device body before touching the device, and touch the grounding metal bracket by hand to release the static electricity.
- It is suggested to wear anti-static suit to prevent damage to the equipment caused by static electricity.
- When installing or maintaining the device, wear anti-static wristband or anti-static gloves. Make sure that the wristband is tightly attached to the skin and is reliably grounded.
- It is forbidden to touch exposed circuit boards with bare hands. Static electricity

generated by human body may damage electrostatic sensitive components on circuit boards.

- When touching electrostatic sensitive components or devices, proper grounding measures must be taken.
- Put electrostatic sensitive components into anti-static bags for protection.
- It is suggested to place humidifier in dry environment to maintain suitable humidity and reduce static electricity generation.

Maintenance

- If the device is not working properly, contact the store or the nearest service center. Do not disassemble or modify the device in any way. (The company does not bear any liability for any problem arising from unauthorized modification or maintenance).
- Properly preserve all the original packaging materials of the device so that when problems arise, the device can be packed with packaging materials and sent to the agent or returned to the manufacturer for processing. The company does not bear any liability for accidental damage during transportation caused by non-original packaging.
- This device is a precision electronic device, no components can be maintained by user, do not disassemble the device arbitrarily.

Cleaning

Do not touch the image sensor directly. If the sensor needs to be cleaned, use a clean rag and wet it with alcohol, then gently wipe off the dirt; if the device is not in use, cover the image sensor with dust cover for protection.

Installation

Do not install the device on vibrating surface or places that are vulnerable to impact.

Personnel Requirement

Quality requirements for installation and maintenance personnel: qualification certificate or working experience in weak current system installation and maintenance, and relevant working experience and qualifications. Besides, the personnel must possess the following knowledge and operation skills:

- The basic knowledge and operation skills of low voltage wiring and low voltage electronic circuit connection.
- The ability to comprehend the contents of this manual.

Contact Information

Hangzhou Hikrobot Co., Ltd.

E-mail: tech_support@hikrobotics.com

Website: https://en.hikrobotics.com/

Table of Contents

Chapter 1 Overview

1.1 Introduction

The 10 GigE area scan camera uses the 10 GigE interface to transmit non-compressed images in real time, and the camera can acquire images and be set parameters via the client software or SDK. The camera is applicable to the automated optical inspection (AOI) for the surface mounted technology and the printed circuit board, electronic semiconductor, factory automation, logistics industry, etc.

1.2 Key Feature

- Supports auto and manual adjustment for gain, exposure time and white balance, manual adjustment for Look-Up Table (LUT), Gamma correction, etc.
- Adopts the image interpolation algorithm for the color reproduction.
- Supports the hardware trigger, software trigger, free run, etc.
- Adopts 10 GigE interface and compatible with GigE interface to transmit data.
- Compatible with the GigE Vision Protocol, the GenlCam Standard, and the third-party software based on the protocol and standard.

NOTE

- The camera functions may differ by camera models.
- For specific camera functions, refer to the camera's user manual.

Chapter 2 Appearance

NOTE

- Appearances here are for reference only. Refer to the camera's specification for detailed dimension information.
- TEC stands for Thermo-Electric Cooler that is able to keep the camera's sensor temperature around environment temperature to ensure the image quality of the camera.

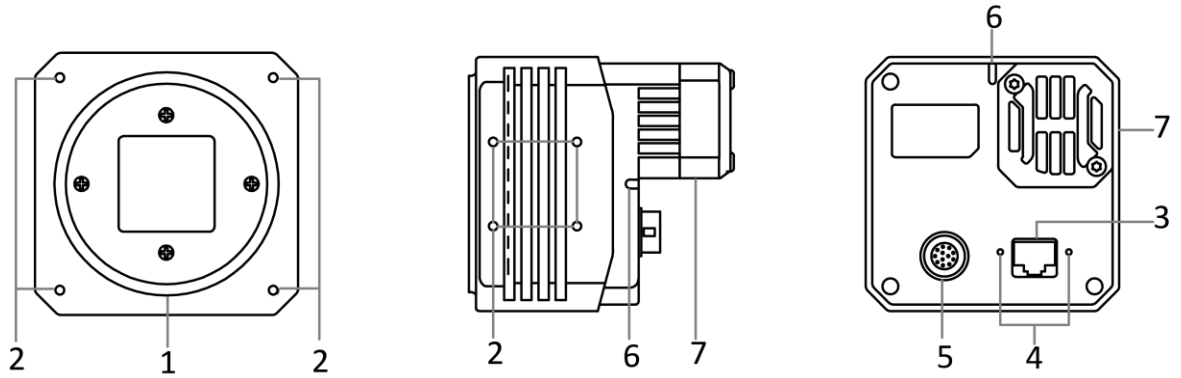

Figure 2-1 Appearance (Type I)

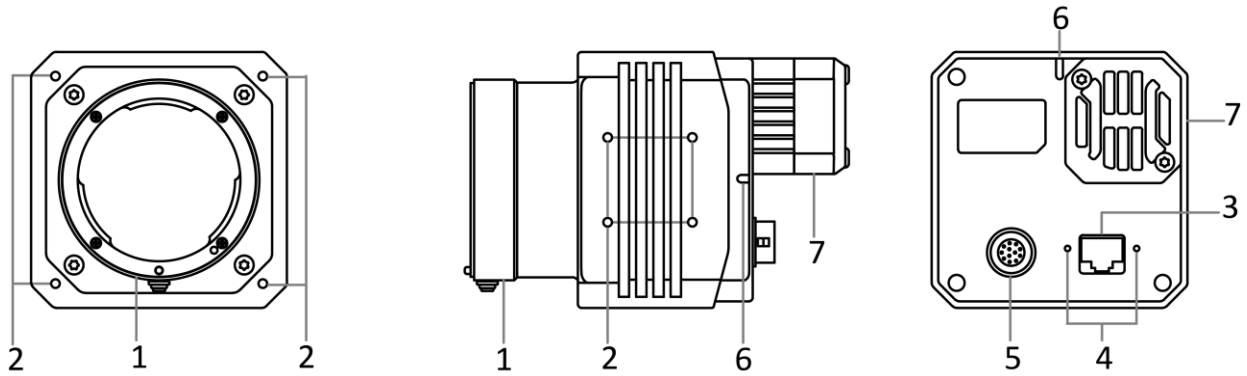

Figure 2-2 Appearance (Type II)

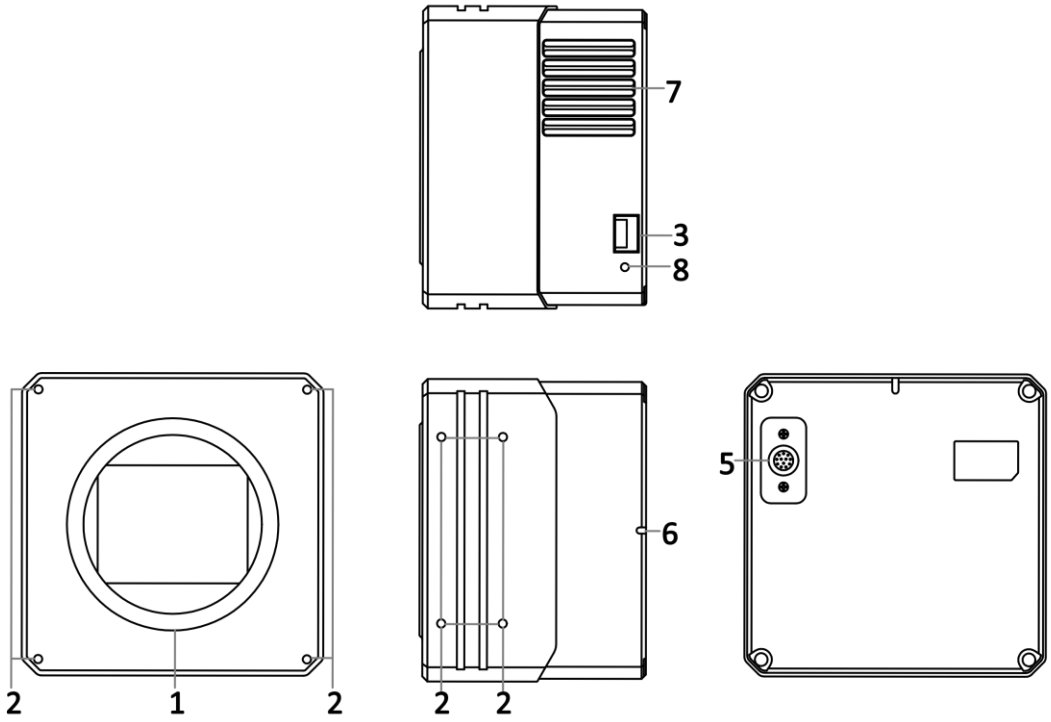

Figure 2-3 Appearance (Type III)

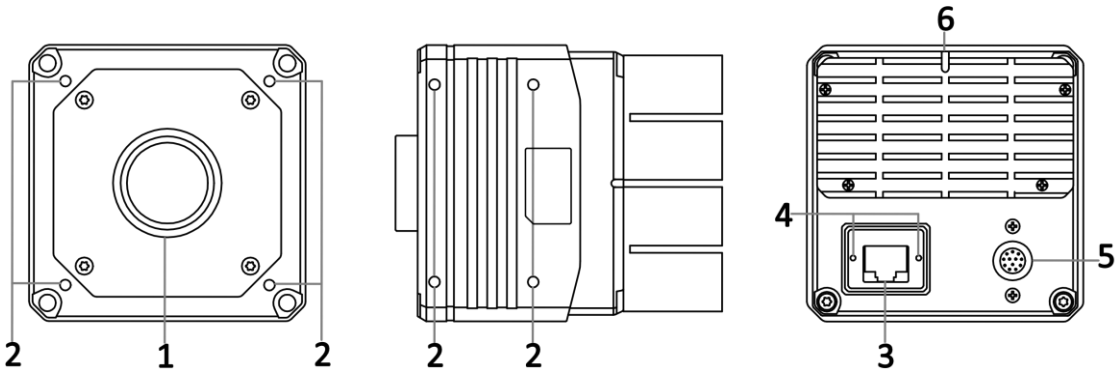

Figure 2-4 Appearance (Type IV)

Table 2-1 Component Description

No.	Name	Description
1	Lens Mount	It is used to install the lens.
2	Screw Hole	It is used to fix the camera to the installation position.
3	10 Gigabit Ethernet Interface	● Type I, type II and type IV devices: It refers to the 10 GigE interface for transmitting data. ● Type III device: It refers to the optical module.

4	Screw Hole	It refers to the M2 screw hole for securing the network cable.
5	Power and I/O Interface	It refers to the power and I/O interface that provides power, input/output signal, serial port, etc.
6	LED Indicator	It indicates the camera's status. Refer to section ***Indicator Description*** for details.
7	Fan/TEC	It is used to cool the camera. Type I and type II cameras use fan to cool the camera, while the type III camera uses TEC instead. **NOTE** Type IV camera does not have a fan or TEC.
8	Optical Fiber Interface Linking Indicator	It indicates the connection and transmission status of the optical fiber linking. ● Solid red: The optical fiber linking is disconnected. ● Solid green: The optical fiber linking is connected. ● Flashing green: The optical fiber linking is transmitting image data.

Chapter 3 Interface and Indicator

3.1 Interface Description

All 10 GigE area scan cameras have the same 12-pin power and I/O interface, as shown below. However, the specific pin definitions are different by camera models.

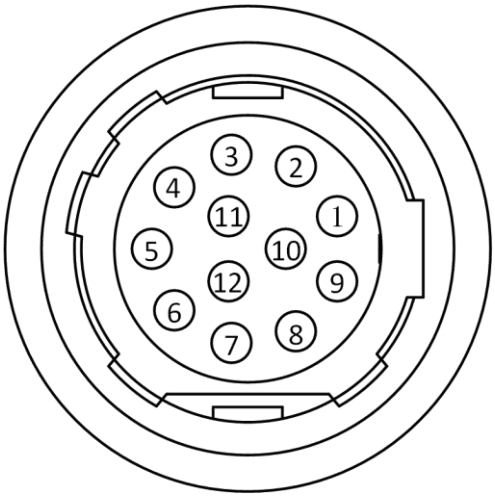

Figure 3-1 12-Pin Interface

3.1.1 First Type of Pin Definitions

Regarding the type I and type II devices, read the table below to get pin definitions.

NOTE

Refer to pin definitions and labels attached to the power and I/O cable to wire the device.

Table 3-1 Pin Definitions (Type I and Type II Devices)

No.	Signal	I/O Signal Source	Description
1	GND	Line 2-	Camera power supply ground
2	DC_PWR	--	Camera power supply
3	Reserved		
4	Reserved		
5	GND_IO	Line 0/1-	Opto-isolated signal ground

No.	Signal	I/O Signal Source	Description
6	Reserved		
7	Reserved		
8	232_RXD	--	RS-232 received data
9	232_TXD	--	RS-232 transmitted data
10	GPIO	Line 2+	Can be configured as input or output
11	OPTO_OUT	Line 1+	Opto-isolated output
12	OPTO_IN	Line 0+	Opto-isolated input

3.1.2 Second Type of Pin Definitions

Regarding the type III and type IV devices, read the table below to get its pin definitions.

NOTE

Refer to pin definitions and labels attached to the power and I/O cable to wire the device.

Table 3-2 Pin Definitions (Type III and Type IV Devices)

No.	Signal	I/O Signal Source	Description
1	GND	Line 2-	Camera power supply ground
2	DC_PWR	--	Camera power supply
3	DC_PWR	--	Camera power supply
4	OPT_IN-	Line 0-	Opto-isolated input signal ground
5	OPT_OUT-	Line 1-	Opto-isolated output signal ground
6	GND	--	Camera power supply ground

No.	Signal	I/O Signal Source	Description
7	GND	--	Camera power supply ground
8	232_RXD	--	RS-232 received data
9	232_TXD	--	RS-232 transmitted data
10	GPIO2	Line 2+	Can be configured as input or output
11	OPT_OUT+	Line 1+	Opto-isolated output
12	OPT_IN+	Line 0+	Opto-isolated input

3.2 Indicator Description

The camera indicator is used to display different camera status.

Table 3-3 Indicator Description

No.	Indicator Color	Status	Description
1	Red	Flashing very slowly	The camera wiring exception occurs.
2	Red	Solid	The camera exception occurs.
3	Blue	Flashing slowly	The camera is acquiring images in trigger mode.
4	Blue	Flashing rapidly	The camera is acquiring images normally.
5	Blue	Solid	The camera is in idle status.
6	Red and blue	Flash alternatively	The function of finding me is executed, or the firmware is updating.

NOTE

- When the indicator is flashing rapidly, flashing slowly, or flashing very slowly, its unlit interval is 0.2 s, 1 s, 2 s respectively.
- The indicator sometimes may show a purple color when red and blue colors flashing at the same time.

Chapter 4 Installation

4.1 Installation Preparation

You need to prepare following accessories before camera installation.

Table 4-1 Accessories

No.	Name	Quantity	Description
1	Power and I/O Cable	1	It refers to the 12-pin power and I/O cable. You need to purchase separately.
2	DC Power Supply	1	You should select suitable power adapter or switch power supply according to the camera power supply and consumption. You need to purchase separately.
3	Network Cable	1	● Type I, type II and type IV devices: It refers to CAT-6e network cable or above. You need to purchase separately. ● Type III device: It refers to the optical fiber and you should select it according to the camera's optical module. You need to purchase separately.
4	10 GigE NIC	1	It refers to the 10 GigE network interface card. You need to purchase separately.
5	Lens	1	It refers to the lens that matches with lens mount of the camera. You need to purchase separately.
6	Lens Adapter	1	If the lens you used does not match with lens mount of the camera, you need to use a lens adapter. You need to purchase separately.
7	Optical Module	1	It includes single module or multiple modules, and you should purchase it separately according to actual demands. **NOTE** Only the type III device needs the optical module.

4.2 Install Camera

Before you start

Make sure that all the related devices are powered off during the installation.

Steps:

1. Fix the camera to the installation position, and install the lens to the camera.
2. Use a suitable network cable to connect the camera to a switch that supports 10 GigE or a 10 GigE NIC or a 10 GigE optical NIC.
3. Use the 12-pin power and I/O cable to connect the camera to a suitable power adapter.

Chapter 5 Camera Connection

Camera connection to the client software is required for camera's configuration and remote operations. This section introduces how to install the client software, set PC and camera network, connect the camera to the client software, etc.

5.1 Install MVS Client

MVS client software is used to connect the camera, set its parameters, etc.

NOTE

- The MVS client software is compatible with 32/64-bit Windows XP/7/10 operating systems.
- The graphic user interface may differ by different versions of the client software you use.
- You can download the MVS client software from *https://en.hikrobotics.com/*.

Steps:

1. Double click the MVS installation package.
2. Select the language.
3. Read and check **Terms of the License Agreement**.

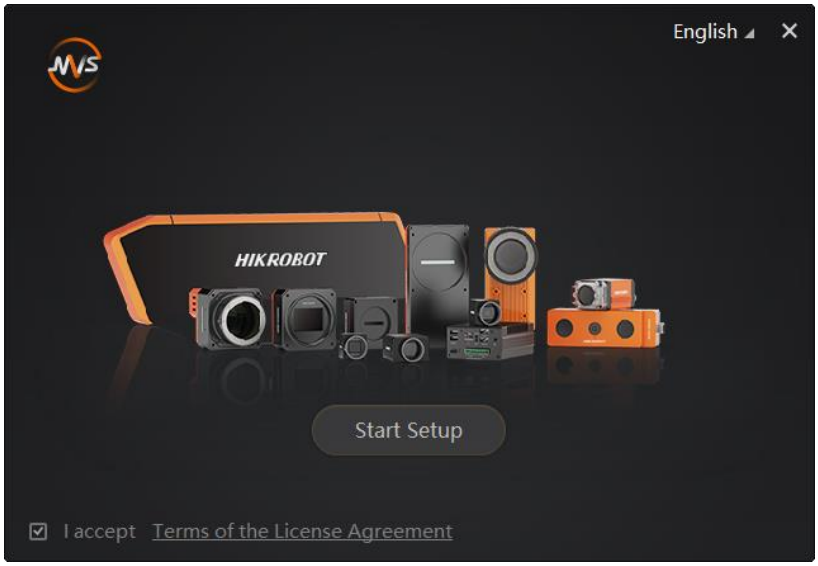

Figure 5-1 Installation Interface

4. Click **Start Setup**.
5. Keep default settings, and click **Next**.

6. Finish the installation according to the interface prompts.

5.2 Turn off Firewall

To ensure stable client running and image transmission, you are recommended turning off Windows firewall before using the client software.

NOTE

For different Windows versions, the path name or interface may differ.

Steps:

1. Go to Windows Firewall.

- Windows XP system: Click **Start** > **Control Panel** > **Security Center** > **Windows Firewall**.
- Windows 7 system: Click **Start** > **Control Panel** > **Windows Firewall**.
- Windows 10 system: Click **Start** > **Control Panel** > **System and Security** > **Windows Defender Firewall**.

2. Click **Turn Windows Defender Firewall on or off** on the left.
3. Select **Turn off Windows Defender Firewall (not recommended)**.

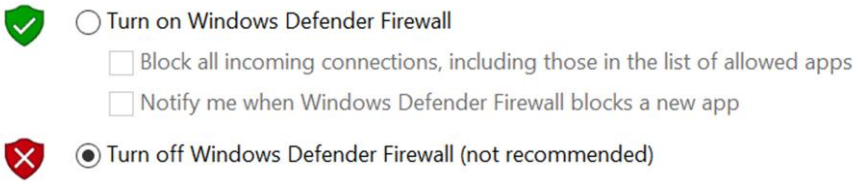

Figure 5-2 Windows Defender Firewall

4. Click **OK**.

5.3 Set PC Network

To ensure stable image transmission and normal communication between the PC and the camera via client software, you need to set the PC network before using the client software.

NOTE

For different Windows versions, the path name or interface may differ.

Steps:

1. Go to PC network settings page: **Start** > **Control Panel** > **Network and Internet** > **Network and Sharing Center** > **Change adapter settings**.
2. Select NIC and set the IP obtainment mode.

- Select **Obtain an IP address automatically** to get an IP address of the PC automatically.
- Select **Use the following IP address** to set an IP address for the PC manually.

3. Set NIC property via the PC.

   1) Go to NIC settings page: **Control Panel** > **Hardware and Sound** > **Device Manager** > **Network Adapter**.

   2) Select corresponding network interface card, and click **Advanced**.

   3) Set **Jumbo Packet** value to 9014 Bytes, **Transmit Buffers** and **Receive Buffers** to 2048, **Interrupt Moderation Rate** to Extremum.

4. (Optional) Set NIC property via the MVS.

   1) Right click the Ethernet, and click **NIC Settings**.

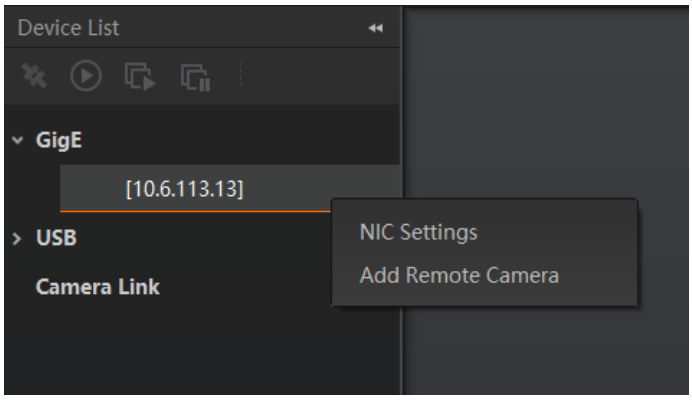

Figure 5-3 NIC Settings

   2) Enable **Jumbo Frame**, and set **Receive Buffers** and **Transmit Buffers** to 2048.

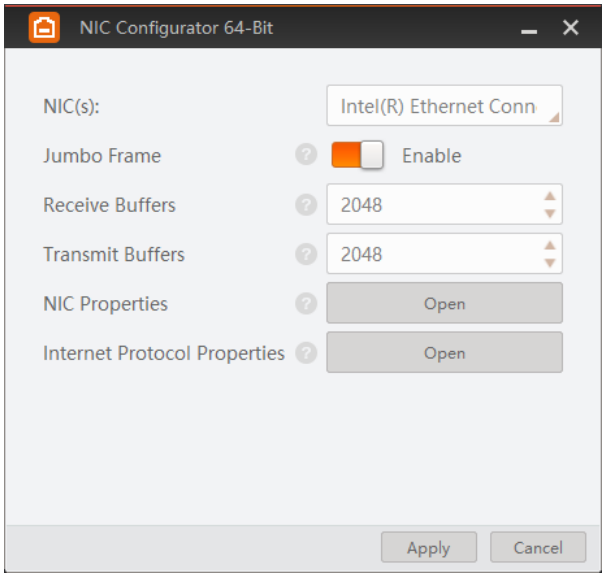

Figure 5-4 NIC Configurator

NOTE

The max. value of receive buffers and transmit buffers may differ by network interface cards.

5.4 Set Camera Network

You can set and operate the camera in the client software only when the camera is in the same network segment with the PC where the client software is installed.

Steps:

1. Double click the client software to run it.
2. Click in device list to search the device.
3. Select a device to be connected.
4. Right click the device, and click **Modify IP**.
5. Set the IP address of the device in the same network segment with the PC
6. Click **OK**.

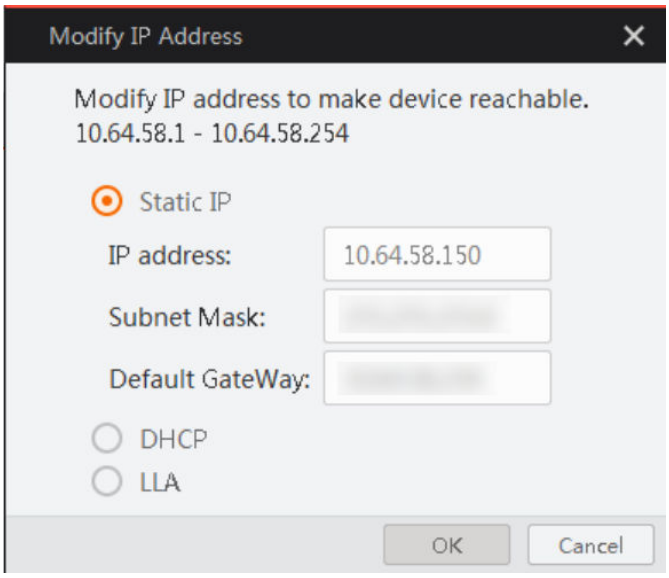

Figure 5-5 Modify Device IP Address

5.5 Connect Camera to Client Software

Make sure your device IP address is in the same network segment with the PC where you installed the client software before connecting the device to it.

Double click the device name in device list, or click to connect the device to the client.

Chapter 6 Client Software Layout

After connecting to the camera, the client software can read the camera attributes and display them.

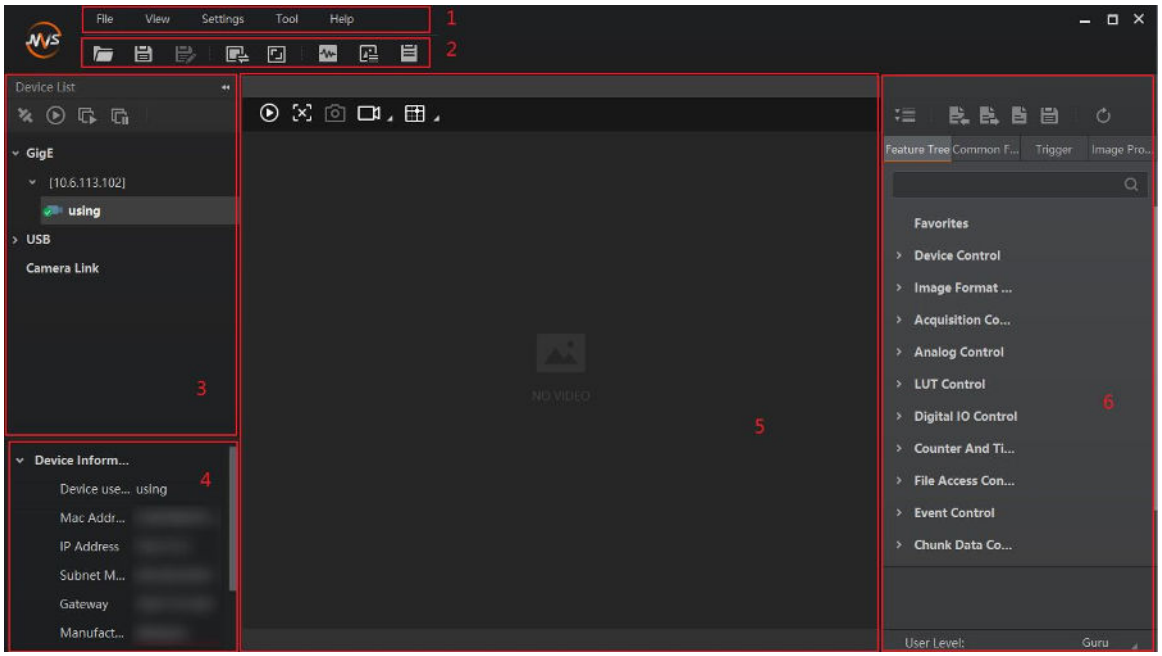

Figure 6-1 Main Window

NOTE

For specific main window of the client software, please refer to the actual one you got.

Table 6-1 Main Window Description

No.	Area Name	Description
1	Menu Bar	The menu bar displays function modules, including File, View, Settings, Tool, and Help.
2	Control Toolbar	The control toolbar provides quick operations for the device.
3	Device List Panel	This panel displays device list, and you can connect or disconnect device, modify device IP address, etc.
4	Device Information Panel	This panel displays the detailed device information.

No.	Area Name	Description
5	Display Window	This area displays the acquisition images in real-time. You can click different icons to capture and save image, record, etc.
6	Feature Panel	You can view and set features of the selected camera, and perform operations such as importing, exporting, and saving features.

Click ▶ in the camera's feature panel to unfold the specific camera parameters, and set them according to actual demands.

NOTE

The camera’s feature tree and parameters may differ by camera models.

Table 6-2 Feature Tree Description

Attribute	Description
Device Control	You can view the device information, edit its name, reset the device, etc.
Image Format Control	You can view and set the device’s resolution, image reverse function, pixel format, region of interest, test pattern, etc.
Acquisition Control	You can view and set the device’s acquisition mode, frame rate, trigger mode, exposure time, etc.
Analog Control	You can view and set the device’s gain, black level, Gamma correction, sharpness, etc.
Color Transformation Control	You can view and set the device’s color transformation related parameters like hue and saturation.
LUT Control	You can view the Look-Up Table (LUT), and set its index and value.
Shading Correction	You can set shading correction to correct shade.
Digital IO Control	You can set the different input and output signals.
Counter And Timer Control	You can view and set the counter related parameters.

Attribute	Description
File Access Control	You can view and set the device's file access control related parameters.
Event Control	You can view and set the device's event control related parameters to let the device generate an event and transmit a related event message to the computer.
Transport Layer Control	You can view and set the parameters of the device's transport layer.
User Set Control	You can save or load the device's parameters.

Chapter 7 Camera Features

7.1 Global Shutter

For camera that supports global shutter, its exposure starts and ends in each line simultaneously. After the exposure, data readout starts line by line. All pixels expose at the same time, then readout at different time, as shown below.

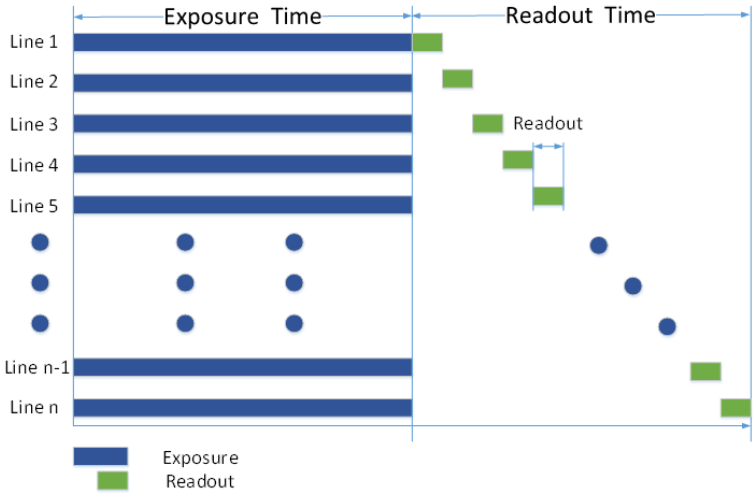

Figure 7-1 Global Shutter

7.2 Rolling Shutter

For cameras that support rolling shutter, after the first line of exposure starts, and the next line starts to exposure after the time interval, and so on, and the exposure time of each line is the same. After the exposure of each line ends, the camera will immediately read out the data, and the readout time for each line is readout, as shown below.

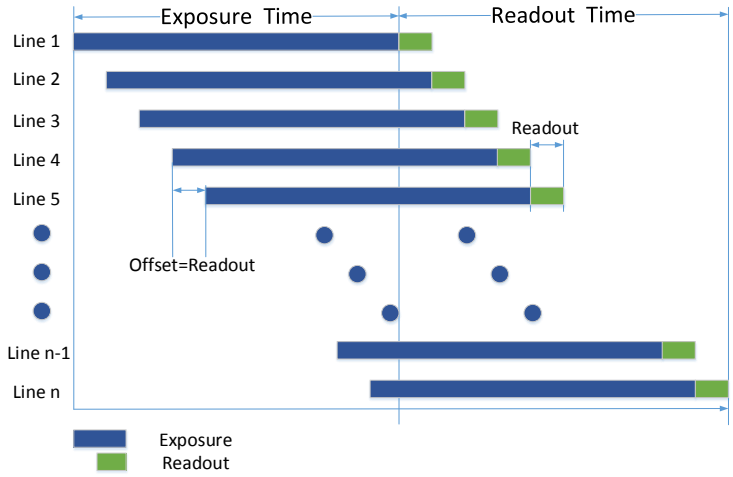

Figure 7-2 Rolling Shutter

7.3 Sensor Shutter Mode

NOTE

Only some models of cameras with rolling shutter and corresponding firmware support the sensor shutter mode. The actual product you purchased should prevail.

The sensor shutter mode allows you to set the operating mode of the camera's electronic shutter. The shutter mode refers to the way in which the image data is captured and processed.

In general, there are 3 sensor shutter modes, including **Global Reset**, **Rolling** and **Trigger Rolling**.

Global reset means that all of the sensor's pixels start exposing at the same time, but stop exposing at different time.

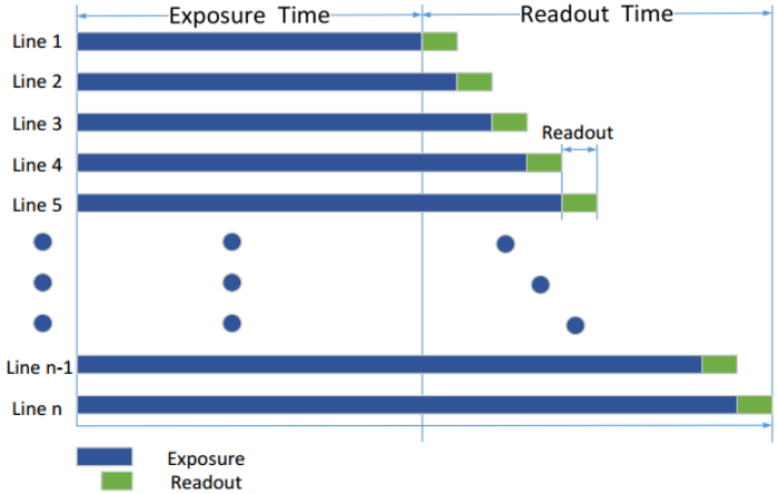

Figure 7-3 Global Reset

Rolling means that the camera exposes the pixel rows one after the other, and it supports sensor's pixels exposure and pixel data readout proceeding at the same time. While trigger rolling does not support that sensor's pixels exposure and pixel data readout proceed at the same time.

You can go to **Acquisition Control** > **Sensor Shutter Mode**, and select **Sensor Shutter Mode** according to actual demands.

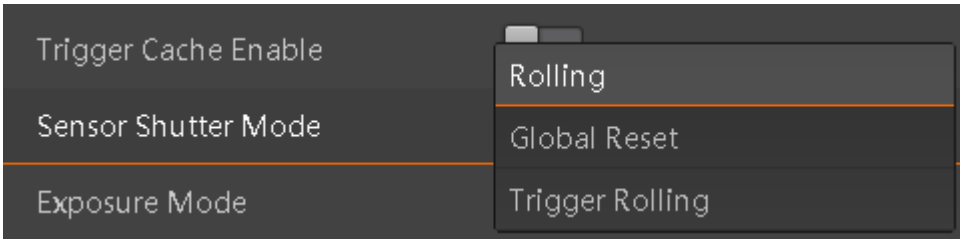

Figure 7-4 Sensor Shutter Mode

NOTE

Stopping the real-time acquisition is required before setting the sensor shutter mode.

7.4 Non-Overlap Exposure and Overlap Exposure

The process that camera captures one frame of image includes two stages, exposure and readout. According to the overlap relation between the exposure time and the readout time, cameras with different sensors can be divided into overlap exposure and non-overlap exposure.

7.4.1 Non-Overlap Exposure

After completing the current frame's exposure and readout, the next frame starts to expose and read out. This process is called non-overlap exposure. The non-overlap exposure's frame period is larger than the sum of the exposure time and the readout time, as shown below.

- **Non-overlap Exposure under Internal Trigger Mode**

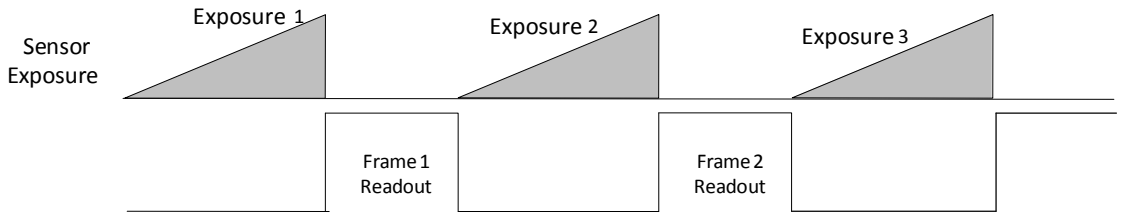

Figure 7-5 Internal Trigger Non-Overlap Exposure

- **Non-overlap Exposure under External Trigger Mode**

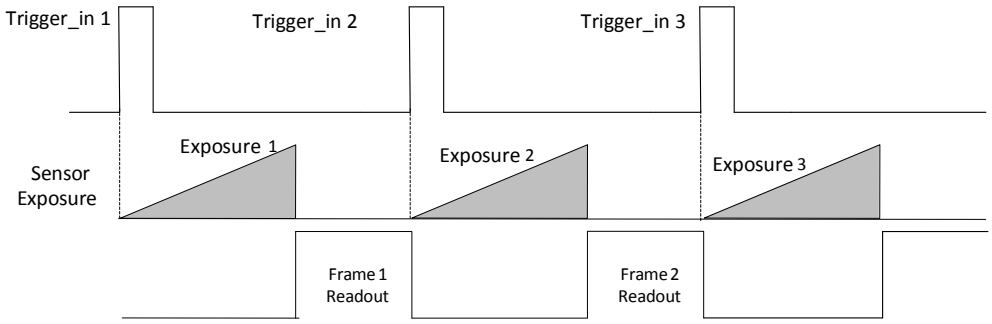

Figure 7-6 External Trigger Non-Overlap Exposure

NOTE

The camera will ignore the external signal in the readout section under this mode.

7.4.2 Overlap Exposure

Overlap exposure refers to the overlap between the current frame exposure and the previous frame readout. In other words, when the previous frame starts to read out, the current frame starts to expose simultaneously, as shown below.

- **Overlap Exposure under Internal Trigger Mode**

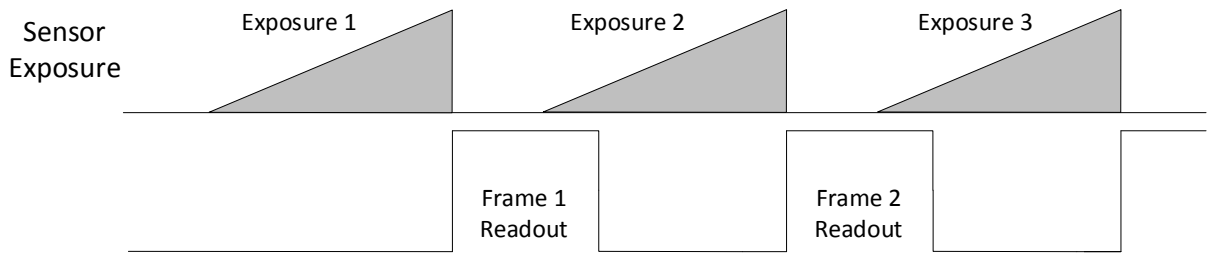

Figure 7-7 Internal Trigger Overlap Exposure

- **Overlap Exposure under External Trigger Mode**

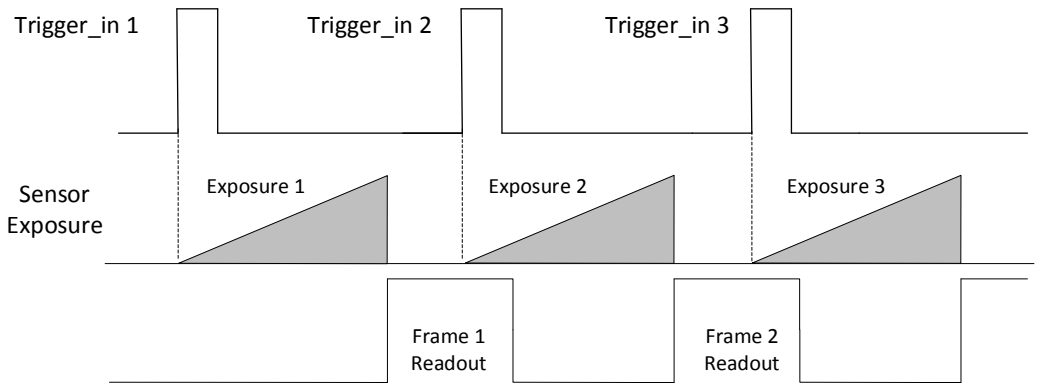

Figure 7-8 External Trigger Overlap Exposure

NOTE

The camera will ignore the external signal in the readout section under this mode.

Chapter 8 Image Acquisition

8.1 Set Frame Rate

Frame rate refers to the image number that is acquired by the camera per second. The higher frame rate, and shorter time used for image acquisition will be. The following 4 factors determine the camera's frame rate in real-time.

- Frame readout time: The frame readout time is related with camera's sensor performance and image height. The lower the image height and less the frame readout time, and the higher the frame rate will be.
- Exposure time: If the reciprocal of max. frame rate that the camera supports is t, and when the configured exposure time is larger than t, the less the exposure time, the higher the frame rate will be. When the configured exposure time is less than or equal to t, exposure time will not influence the frame rate.
- Bandwidth: The larger the bandwidth, the higher the frame rate will be.
- Pixel format: The more bytes pixel format occupy, the lower the frame rate will be.

Click **Acquisition Control** > **Acquisition Frame Rate**, enter **Acquisition Frame Rate** according to actual demands, and enable **Acquisition Frame Rate Control Enable**.

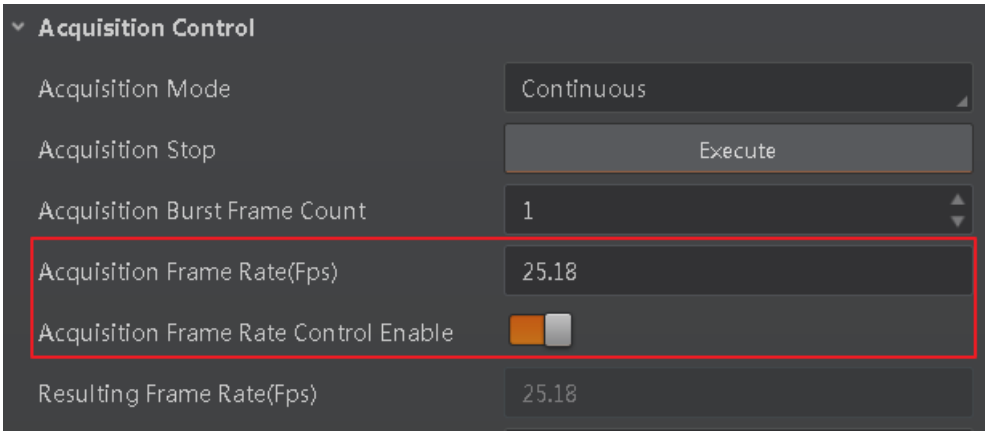

Figure 8-1 Set Frame Rate

You can refer to **Resulting Frame Rate** to view the camera's resulting frame rate.

NOTE

- If the current real-time frame rate is smaller than configured frame rate, the camera acquires images according to the real-time frame rate.
- If the current real-time frame rate is larger than configured frame rate, the camera acquires images according to the configured frame rate.

8.2 Set Acquisition Mode

The camera has 2 types of acquisition modes, including **SingleFrame** mode and **Continuous** mode.

- SingleFrame mode: When camera starts image acquisition, it acquires one image only, and then stops.
- Continuous mode: When camera starts image acquisition, it acquires images continuously. Real-time frame rate decides the acquisition frame number per second. You can stop camera image acquisition manually.

Click **Acquisition Control** > **Acquisition Mode**, and select **Continuous** or **SingleFrame** according to actual demands.

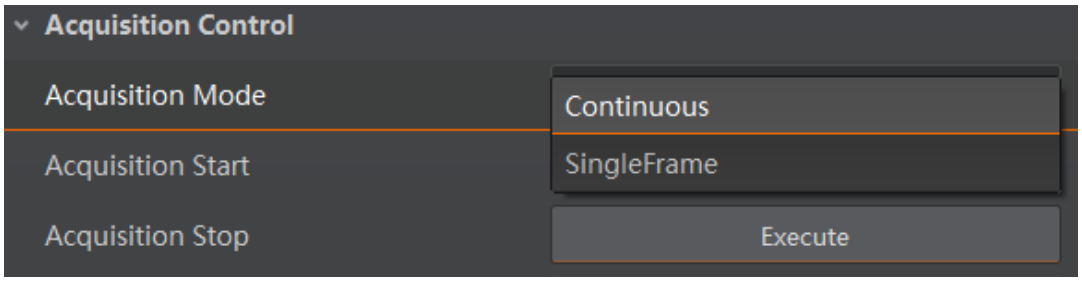

Figure 8-2 Set Acquisition Mode

8.3 Set Trigger Mode

The camera has 2 types of trigger mode, including internal trigger mode and external trigger mode.

- Internal trigger mode: The camera acquires images via its internal signals.
- External trigger mode: The camera acquires images via external signals. These signals can be software signal and hardware signal, including software trigger, hardware trigger, counter trigger, etc.

Click **Acquisition Control** > **Trigger Mode**, and select **Off** or **On** as **Trigger Mode** according to actual demands.

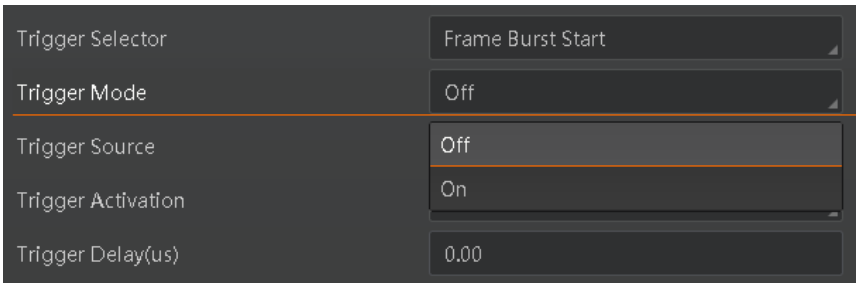

Figure 8-3 Set Trigger Mode

NOTE

Off refers to the internal trigger mode, and **On** refers to the external trigger mode.

8.4 External Trigger Mode

8.4.1 Set External Trigger Source

There are 4 types of external trigger sources, including software trigger, hardware trigger, counter trigger, and anyway. Their principle and parameter setting are shown below.

Table 8-1 Principle and Parameter of External Trigger Mode

External Trigger Source	Parameter	Parameter Value	Principle
Software trigger	Acquisition Control > Trigger Source	Software	The software sends trigger signal to the camera via 10 GigE interface to acquire images.
Hardware trigger	Acquisition Control > Trigger Source	Line 0, Line 2	External device connects camera via camera I/O interface. External device sends trigger signal to camera to acquire images.
Counter trigger	Acquisition Control > Trigger Source	Counter 0	The counter sends trigger signal to the camera to acquire images.
Software trigger hardware trigger, counter trigger	Acquisition Control > Trigger Source	Anyway	Use software trigger, hardware trigger or counter trigger to send trigger signal to the camera to acquire images.

Click **Acquisition Control** > **Trigger Source**, and select **Trigger Source** according to actual demands.

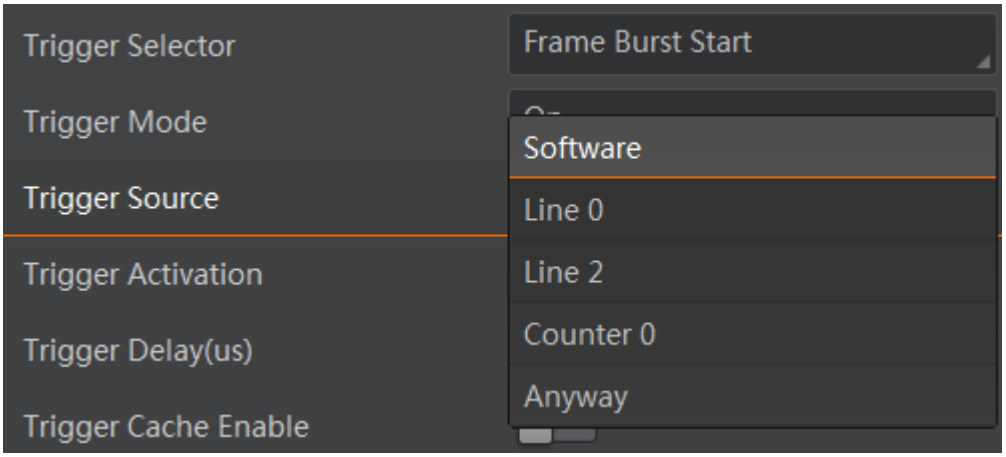

Figure 8-4 Set Trigger Source

NOTE

These 4 external trigger sources are valid only when the **Trigger Mode** is **On**.

8.4.2 Set Software Trigger

Steps:

1. Click **Acquisition Control** > **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Software** as **Trigger Source**, and click **Execute** in **Trigger Software** to send trigger commands.

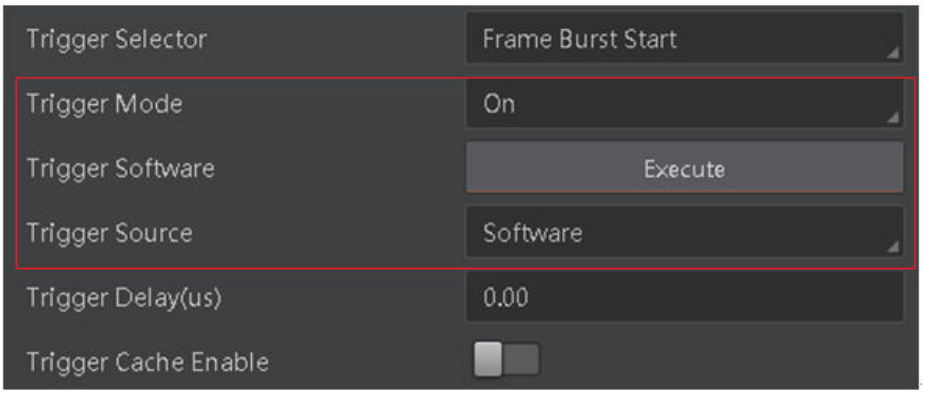

Figure 8-5 Set Software Trigger

8.4.3 Set Hardware Trigger

The camera has one opto-isolated input (Line 0), and one bi-directional I/O (Line 2) that can be configured as input signal.

NOTE

Here we take Line 2 as an example to introduce the hardware trigger settings. You select Line 0 or Line 2 as trigger source to set hardware trigger according to actual demands.

Steps:

1. Click **Digital IO Control**.
2. Select **Line 2** as **Line Selector**, and **Input** as **Line Mode** to set line 2 as input signal.

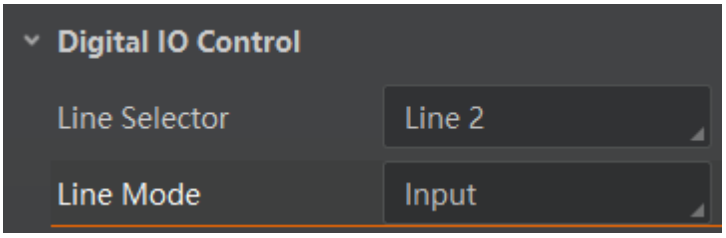

Figure 8-6 Set Line2 as Input Signal

3. Select **Line 0**, or **Line 2** as **Trigger Source**.

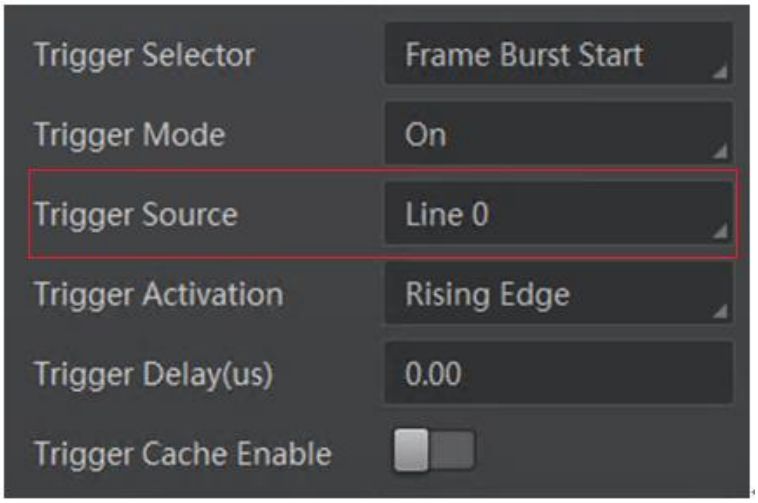

Figure 8-7 Set Hardware Trigger

8.4.4 Set Counter Trigger

The counter trigger provides frequency division to the external trigger signal. You can set counter trigger as shown below.

Steps:

1. Click **Acquisition Control** > **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Counter 0** as **Trigger Source**.

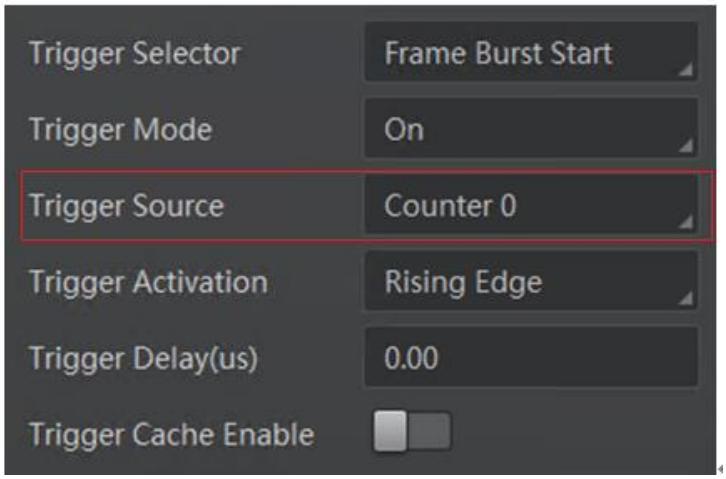

Figure 8-8 Set Counter Trigger

When using counter as trigger source, you need to set relevant parameters under **Counter And Timer Control**. For specific parameter function and setting, please refer to the following table.

Table 8-2 Description of Counter And Timer Control

Parameter	Read/Write	Description
Counter Selector	Read and write	It selects counter source. Counter 0 is available only at present.
Counter Event Source	Read and write	It selects the signal source of counter trigger. **Line 0** and **Line 2** are available. It is disabled by default.
Counter Reset Source	Read and write	It selects the signal source of resetting counter. **Software** is available only. It is disabled by default.
Counter Reset	Write is available under certain condition	It resets counter and it can be executed when selecting **Software** as **Counter Reset Source**.
Counter Value	Read and write	It is the counter value with the range of 1 to 1023.
Counter Current Value	Read only	It displays the number of executed external trigger.

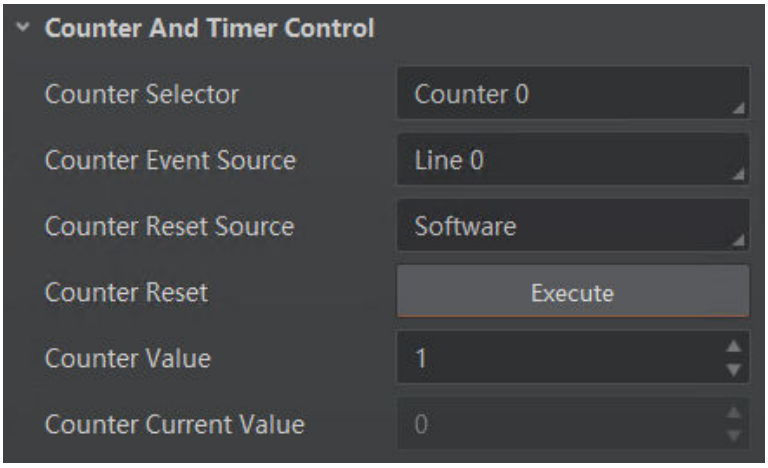

Figure 8-9 Counter Trigger Parameters

8.4.5 Set Free Trigger

In the free trigger mode, the camera can receive signals from software trigger, hardware trigger, and counter trigger.

Steps:

1. Click **Acquisition Control** > **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Anyway** as **Trigger Source**.

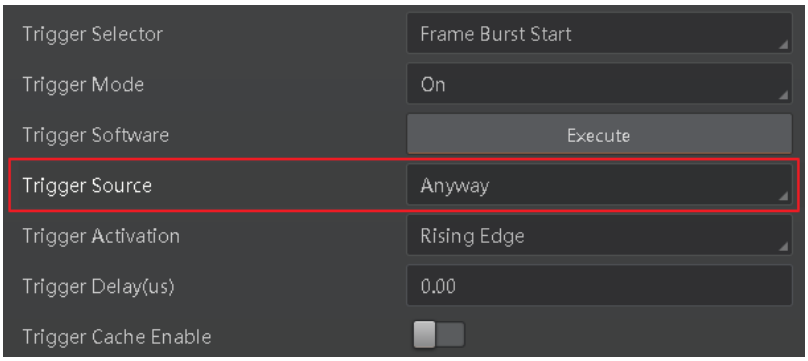

Figure 8-10 Set Free Trigger

8.5 Trigger Related Parameters

Under external trigger mode, you can set burst frame count, trigger delay, trigger cache enable, trigger activation and trigger debouncer. Different trigger sources can set various trigger parameters, and their relation is shown below.

Table 8-3 Trigger Source and Trigger Parameter

Sources / Parameters	Software Trigger	Hardware Trigger	Counter Trigger	Any Trigger
Burst Frame Count	√	√	√	√
Trigger Delay	√	√	√	√
Trigger Cache Enable	√	√	√	√
Trigger Activation	×	√	√	√
Trigger Debouncer	×	√	√	√

8.5.1 Set Burst Frame Count

Under external trigger mode, you can set burst frame count as shown below.

Click **Acquisition Control** > **Acquisition Burst Frame Count**, and enter **Acquisition Burst Frame Count** according to actual demands. Its range is from 1 to 1023.

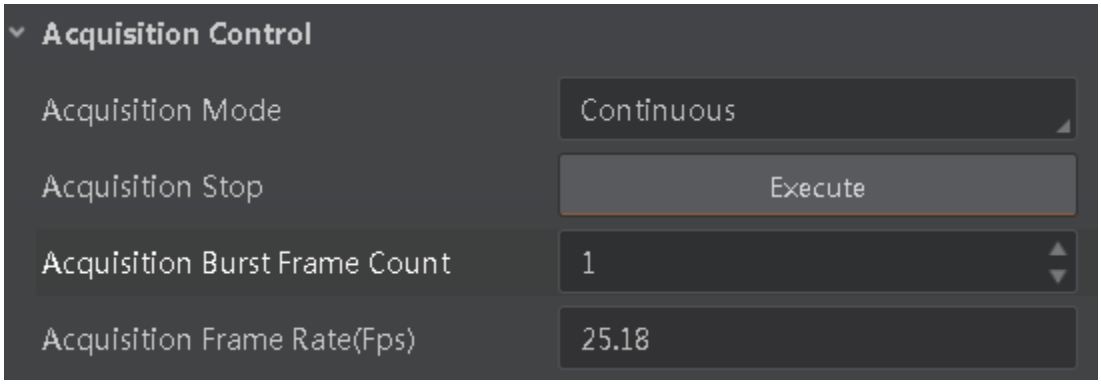

Figure 8-11 Set Burst Frame Count

When **Acquisition Burst Frame Count** is 1, it is in single frame trigger mode. When **Acquisition Burst Frame Count** is larger than 1, it is in multi-frame trigger mode. If **Acquisition Burst Frame Count** is n and when inputting 1 trigger signal, the camera stops acquiring images after exposing n times and outputs n frame images. The sequence diagram of burst frame count is shown below.

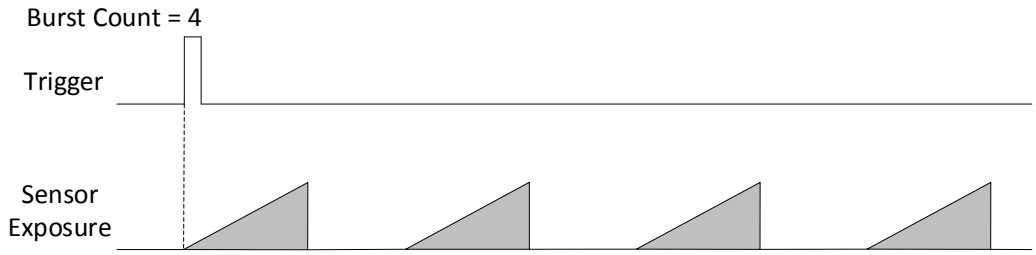

Figure 8-12 Sequence Diagram of Burst Frame Count

8.5.2 Set Trigger Delay

From camera receiving signal and responding, this period is trigger delay. Its sequence diagram is shown below, and you can set **Trigger Delay** according to actual demands.

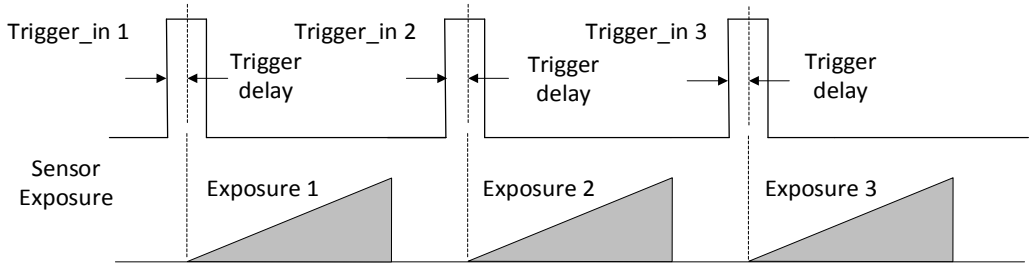

Figure 8-13 Signal Delay Sequence Diagram

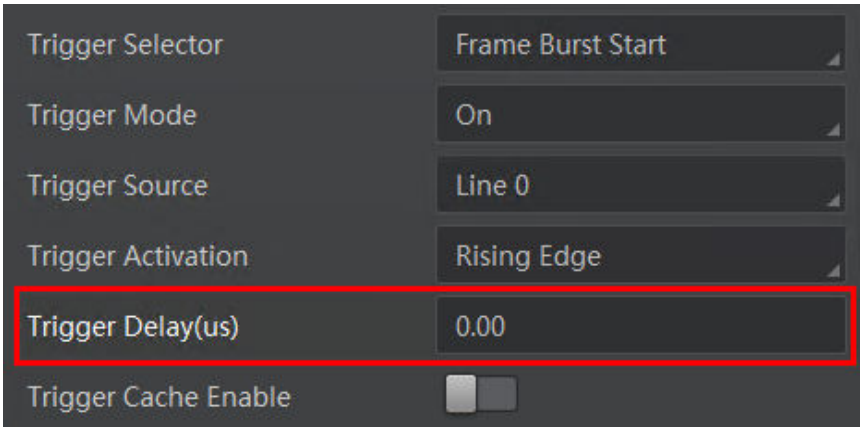

Figure 8-14 Set Trigger Delay

8.5.3 Set Trigger Cache Enable

The camera has the function of Trigger Cache Enable. During the triggering process, if the camera receives new trigger signal, it will save and process the signal if you enable this function. Trigger cache enable can save up to 2 trigger signals.

Click **Acquisition Control > Trigger Cache Enable**, and enable **Trigger Cache Enable**.

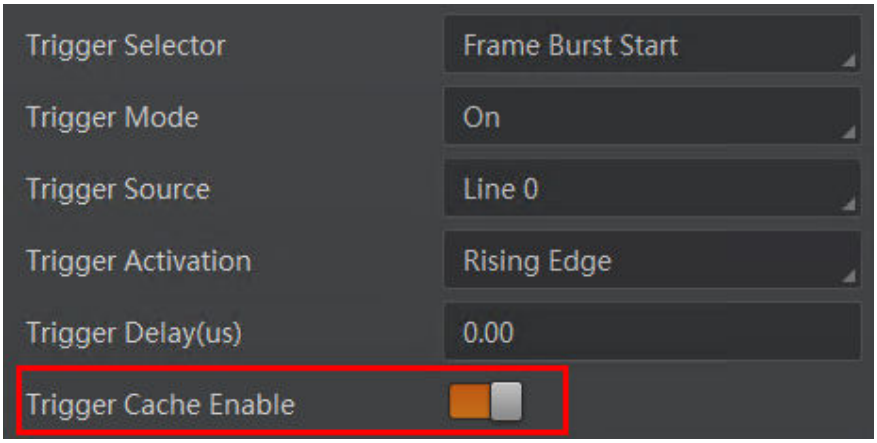

Figure 8-15 Enable Trigger Cache Enable

If the camera receives the 1st trigger signal first, and the camera receives the 2nd trigger signal during processing the 1st trigger signal.

- Disable Trigger Cache Enable: the 2nd trigger signal will be filtered without processing.
- Enable Trigger Cache Enable: the 2nd trigger signal will be saved.

If the 1st frame image's exposure time of the 2nd trigger signal is not earlier than the camera's last frame creation time of the 1st trigger signal, and then the 2nd trigger signal's 1st frame image is created normally.

If the 1st frame image's exposure time of the 2nd trigger signal is earlier than the camera's last frame creation time of the 1st trigger signal, and then the camera will delay this exposure time. Thus making sure this exposure time is not earlier than the camera's last frame creation time of the 1st trigger signal.

8.5.4 Set Trigger Activation

The camera supports trigger acquisition in the rising edge, falling edge, level high, level low or any edge of the external signal. The principle and parameter of trigger activation are shown below.

Click **Acquisition Control > Trigger Activation**, and select **Trigger Activation** according to actual demands.

Table 8-4 Trigger Activation Principle and Parameter

Trigger Activation	Parameter	Parameter Value	Principle
Rising Edge	Acquisition Control > Trigger Activation	Rising Edge	If level signal given by external devices is in rising edge, the camera receives the trigger signal and starts acquisition.

Trigger Activation	Parameter	Parameter Value	Principle
Falling Edge	Acquisition Control > Trigger Activation	Falling Edge	If level signal given by external devices is in falling edge, the camera receives the trigger signal and starts acquisition.
Any Edge	Acquisition Control > Trigger Activation	Any Edge	If level signal given by external devices is in rising or falling edge, the camera receives the trigger signal and starts acquisition.
Level High	Acquisition Control > Trigger Activation	Level High	If level signal given by external devices is in level high, the camera is in image acquisition status.
Level Low	Acquisition Control > Trigger Activation	Level Low	If level signal given by external devices is in level low, the camera is in image acquisition status.

Click **Acquisition Control > Trigger Activation**, and select **Rising Edge**, **Falling Edge**, **Level High** or **Level Low** as **Trigger Activation** according to actual demands.

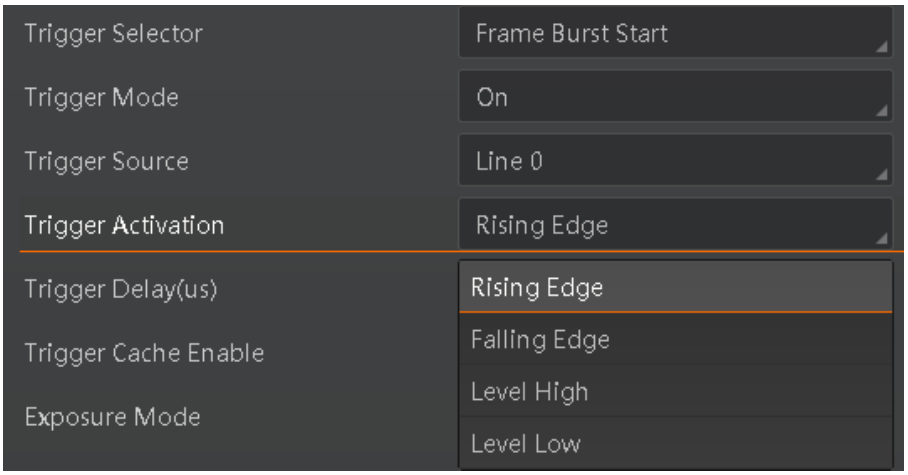

Figure 8-16 Set Trigger Activation

8.5.5 Set Trigger Debouncer

The external trigger input signal of the camera may have signal bounce that may cause false trigger. Thus, it is necessary to debounce the external trigger signal, and its sequence diagram is shown below.

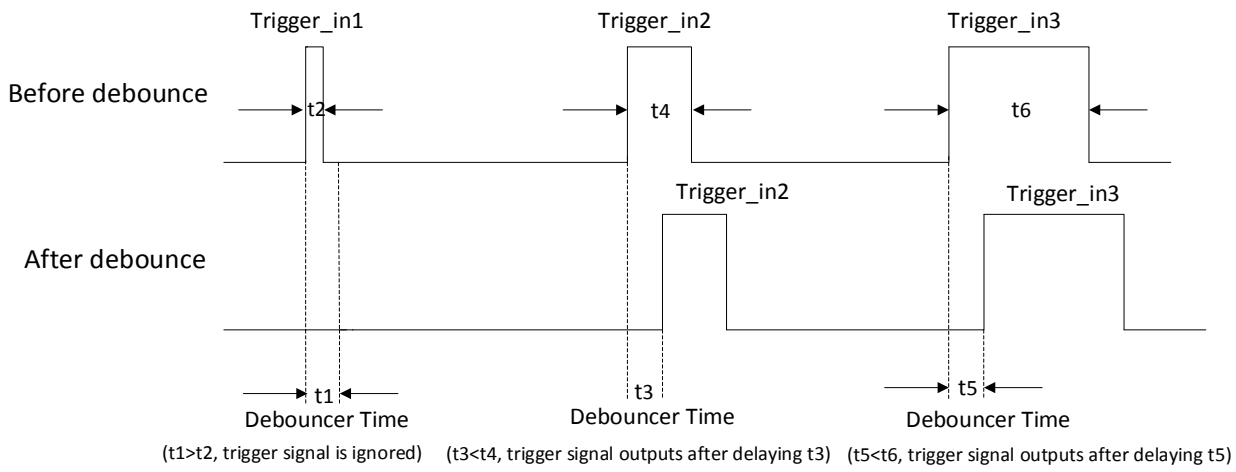

Figure 8-17 Trigger Debouncer Sequence Diagram

Click **Digital IO Control > Line Debouncer Time**, and enter **Line Debouncer Time** according to actual demands.

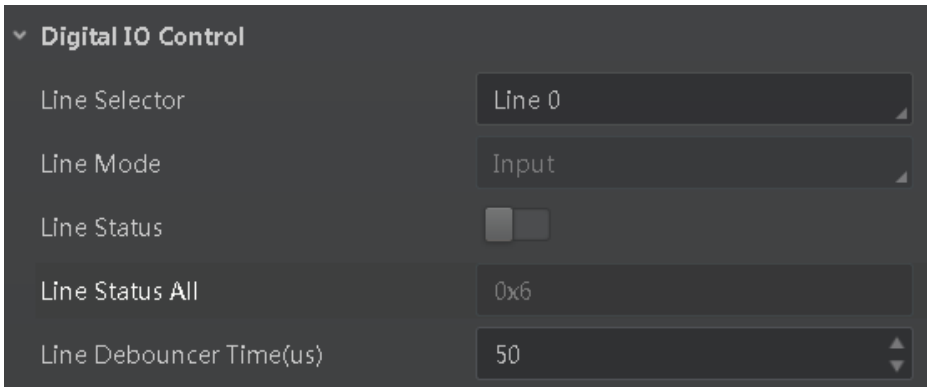

Figure 8-18 Set Trigger Debouncer

Chapter 9 I/O Output

9.1 Select Output Signal

The camera has one opto-isolated output (Line 1), and one bi-directional I/O (Line 2) that can be configured as output signal.

NOTE

Here we take Line 2 as an example to introduce how to select output signal. You select Line 1 or Line 2 as line selector according to actual demands.

Click **Digital IO Control**, select **Line 2** as **Line Selector**, and select **Strobe** as **Line Mode** to set line 2 as output signal.

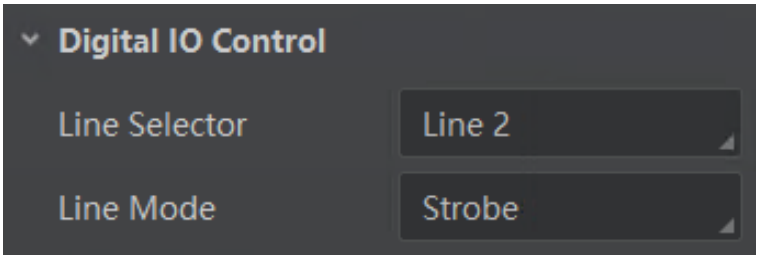

Figure 9-1 Set Line 2 as Output Signal

9.2 Set Output Signal

The output signal of the camera is switch signal that can be used to control external devices such as light source, PLC, etc.

9.2.1 Enable Level Inverter

The line inverter function allows the camera to invert the electrical signal level of an I/O line, and meets requirements of different devices for high or low electrical signal level. All high signals are converted to low signals and vice versa.

Click **Digital IO Control** > **Line Selector**, select line for **Line Selector**, and enable **Line Inverter**.

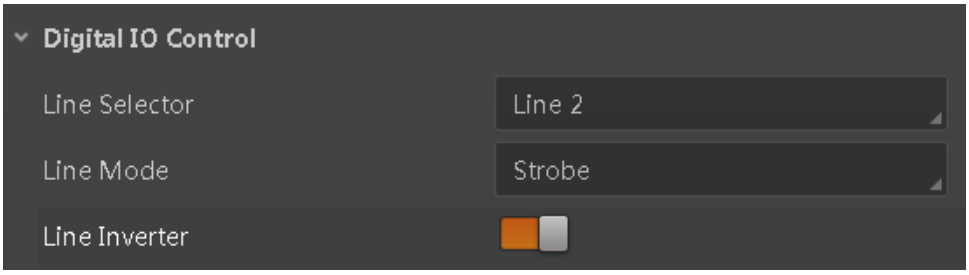

Figure 9-2 Enable Line Inverter

NOTE

The **Line Inverter** parameter is disabled by default.

9.2.2 Enable Strobe Signal

The strobe signal is used to directly output I/O signal to external devices when camera's event source occurs.

Click **Digital IO Control**, select different output events as **Line Source**, and enable **Strobe Enable**.

NOTE

The specific line source may differ by camera models.

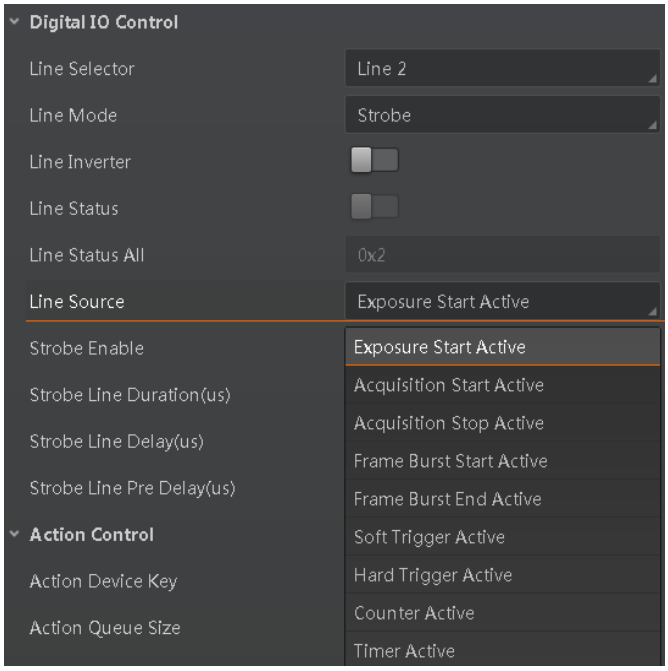

Figure 9-3 Set Line Source

For specific **Line Source**, please refer to following table for details.

Table 9-1 Line Source

No.	Name	Description
1	Exposure Start Active	It refers to output one I/O edge signal when starting exposure.
2	Acquisition Start Active	It refers to output one I/O edge signal when starting acquisition.

No.	Name	Description
3	Acquisition Stop Active	It refers to output one I/O edge signal when stopping acquisition.
4	Frame Burst Start Active	It refers to output one I/O edge signal when starting triggering and acquiring images under Burst mode.
5	Frame Burst End Active	It refers to output one I/O edge signal when stopping triggering and acquiring images under Burst mode.
6	Soft Trigger Out	It refers to output one I/O edge signal when software trigger acquisition.
7	Hard Trigger Active	It refers to output one I/O edge signal when hardware trigger acquisition.
8	Count Active	It refers to output one I/O edge signal when counter output is enabled.
9	Timer Active	It refers to output one I/O edge signal when timer output is enabled.

Regarding strobe signal, you can also set its duration, delay and pre delay.

- **Set Strobe Line Duration**

After enabling strobe signal, you can set its duration. Click **Digital IO Control** > **Strobe Line Duration**, and enter **Strobe Line Duration**.

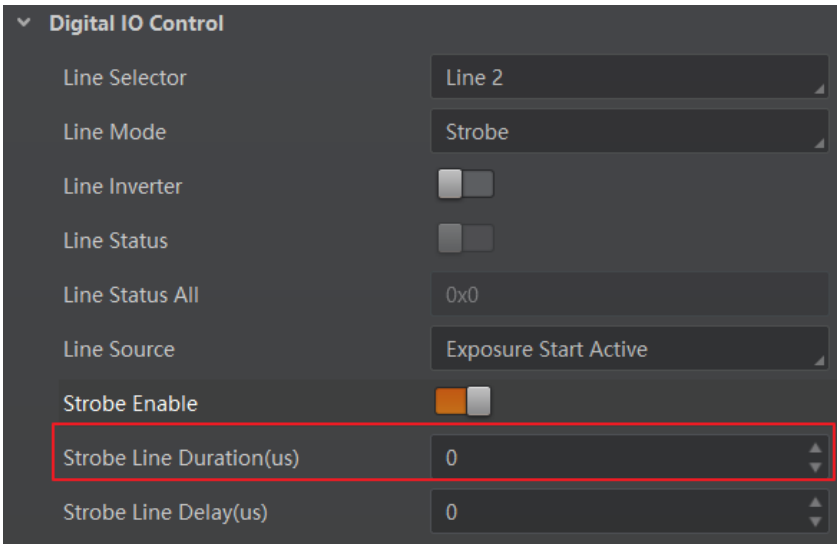

Figure 9-4 Set Strobe Line Duration

NOTE

When the **Strobe Line Duration** value is 0, the strobe duration is equal to the exposure time. When the **Strobe Line Duration** value is not 0, the strobe duration is equal to **Strobe Line Duration** value.

- **Set Strobe Line Delay**

The camera supports setting strobe line delay to meet actual demands. When exposure starts, the strobe output doesn't take effect immediately. Instead, the strobe output will delay according to the strobe line delay setting.

Click **Digital IO Control** > **Strobe Line Delay**, and enter **Strobe Line Delay** according to actual demands.

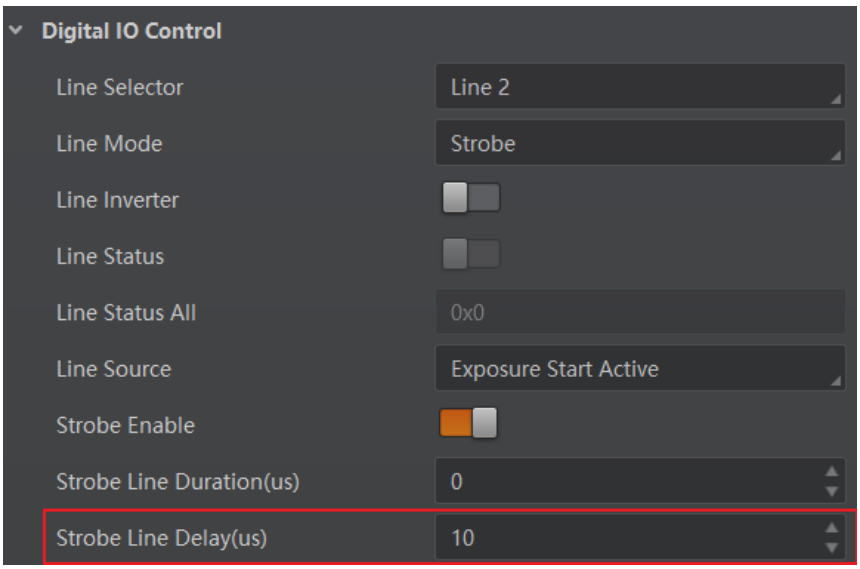

Figure 9-5 Set Strobe Line Delay

The sequence diagram of strobe line delay is shown below.

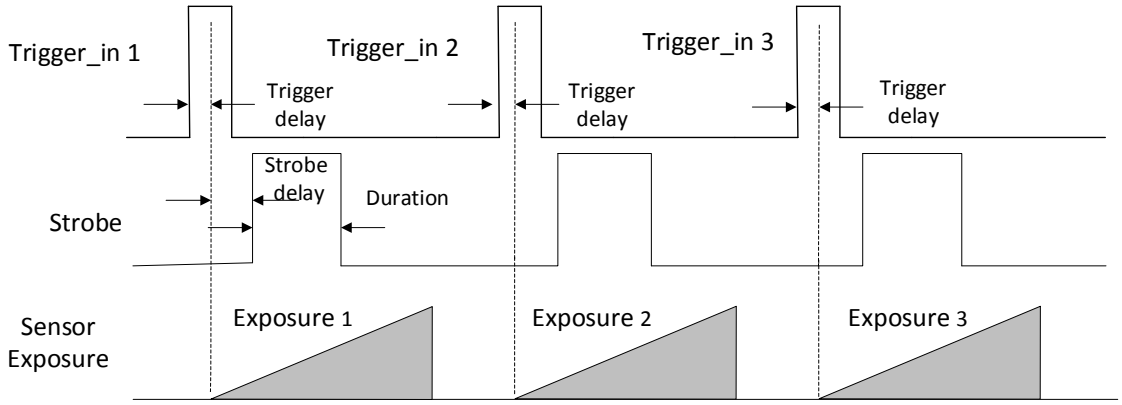

Figure 9-6 Sequence Diagram of Strobe Line Delay

- **Set Strobe Line Pre Delay**

The camera also supports the function of strobe line pre delay, which means that the strobe signal takes effect early than exposure. This function is applied to the external devices that have slow response speed.

Click **Digital IO Control** > **Strobe Line Pre Delay**, and enter **Strobe Line Pre Delay** according to actual demands.

Figure 9-7 Set Strobe Line Pre Delay

The sequence diagram of strobe line pre delay is shown below.

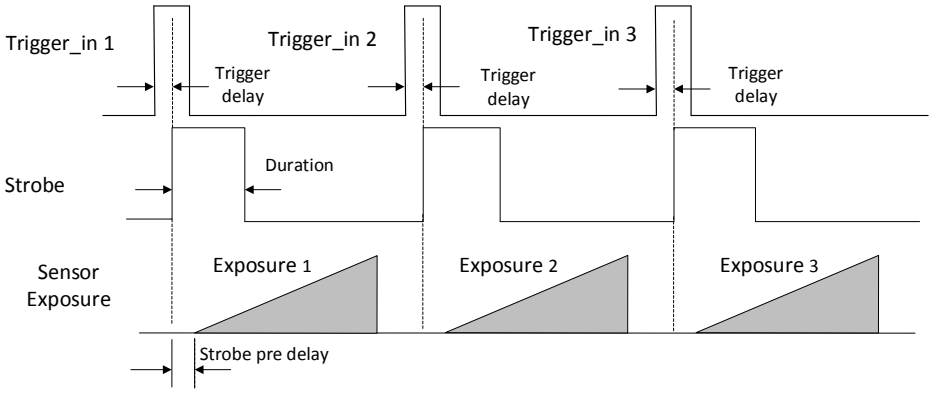

Figure 9-8 Sequence Diagram of Strobe Line Pre Delay

Chapter 10 I/O Electrical Feature and Wiring

10.1 I/O Electrical Feature

10.1.1 Line 0 Opto-isolated Input Circuit

The Line 0 opto-isolated input circuit in camera I/O control is shown below.

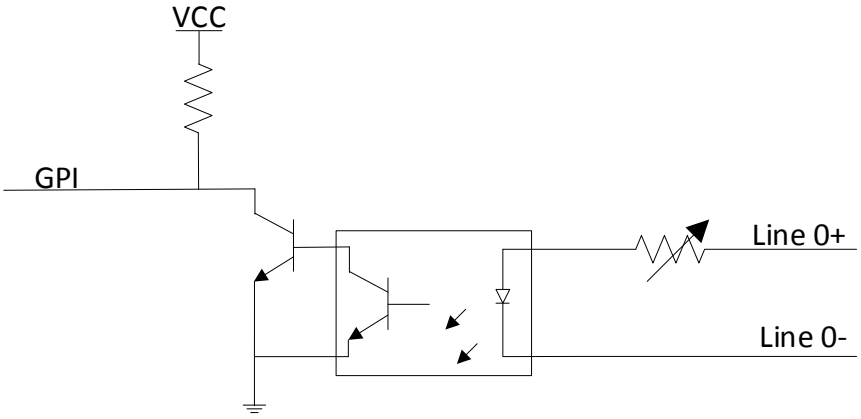

Figure 10-1 Line 0 Internal Circuit

NOTE

The maximum input current of Line 0 is 25 mA.

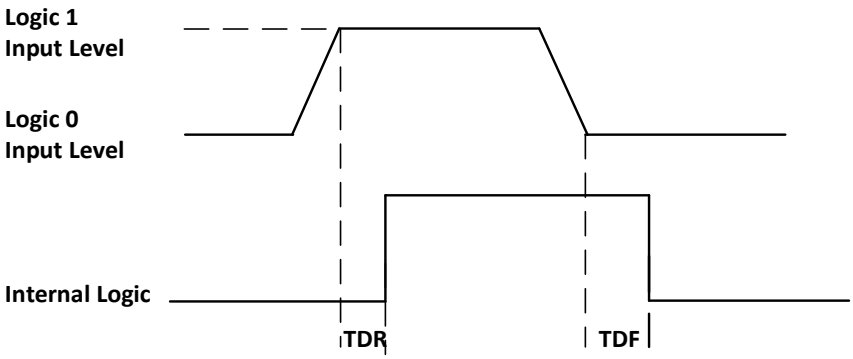

Figure 10-2 Input Logic Level

Table 10-1 Input Electrical Feature

Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	0 VDC to 1 VDC

Parameter Name	Parameter Symbol	Value
Input Logic Level High	VH	3.3 VDC to 24 VDC
Input Rising Delay	TDR	1.8 μs to 4.6 μs
Input Falling Delay	TDF	16.8 μs to 22 μs

NOTE

- Make sure the input voltage is not from 1 VDC to 3.3 VDC as the electric status between these two values are not stable.
- The breakdown voltage is 30 VDC, and keep voltage stable.

10.1.2 Line 1 Opto-isolated Output Circuit

The Line 1 opto-isolated output circuit in camera I/O control is shown below.

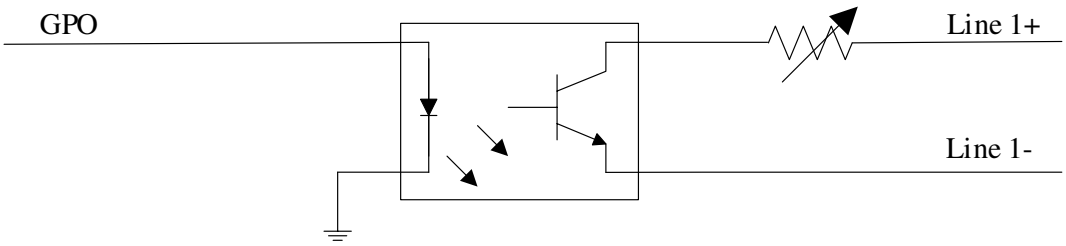

Figure 10-3 Line 1 Internal Circuit

NOTE

The maximum output current of Line 1 is 25 mA.

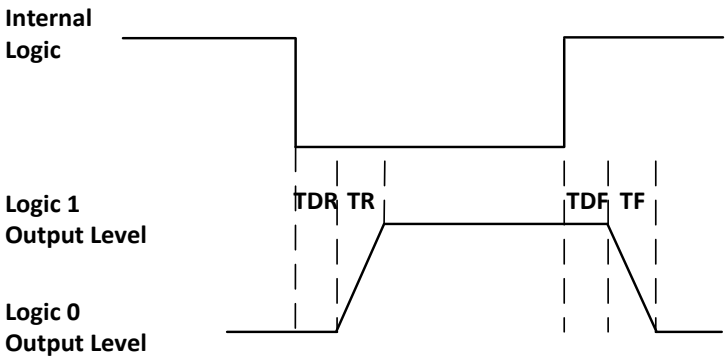

Figure 10-4 Output Logic Level

Opto-isolated output electric feature is shown in below (when the external voltage is 3.3 VDC and the external resistance is 1 KΩ).

Table 10-2 Output Electric Feature

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	575 mV
Output Logic Level High	VH	3.3 V
Output Rising Time	TR	8.4 μs
Output Falling Time	TF	1.9 μs
Output Rising Delay	TDR	15 μs to 60 μs
Output Falling Delay	TDF	3 μs to 6 μs

With different external voltage and resistance, the corresponding current and the parameter of output logic level low are shown below.

Table 10-3 Parameter of Output Logic Level Low

External Voltage	External Resistance	VL	Output Current
3.3 VDC	1 KΩ	575 mV	2.7 mA
5 VDC	1 KΩ	840 mV	4.1 mA
12 VDC	2.4 KΩ	915 mV	4.6 mA
24 VDC	4.7 KΩ	975 mV	4.9 mA

10.1.3 Line 2 Bi-direction I/O Circuit

The Line 2 bi-direction I/O circuit in camera I/O control is shown below. The Line 2 can be configured as input signal or as output signal.

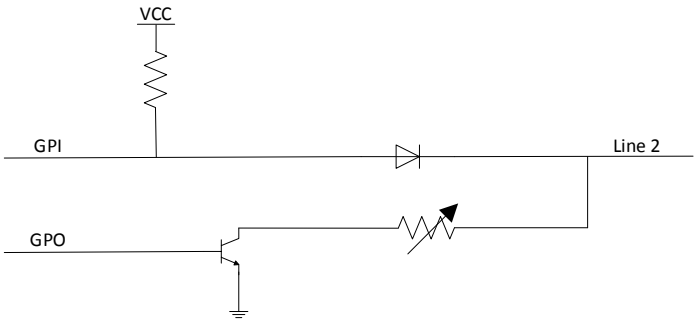

Figure 10-5 Line 2 Internal Circuit

Line 2 Configured as Input

With the condition of 100 Ω and 5 VDC, the logic level and electrical feature of configuring Line 2 as input are shown below.

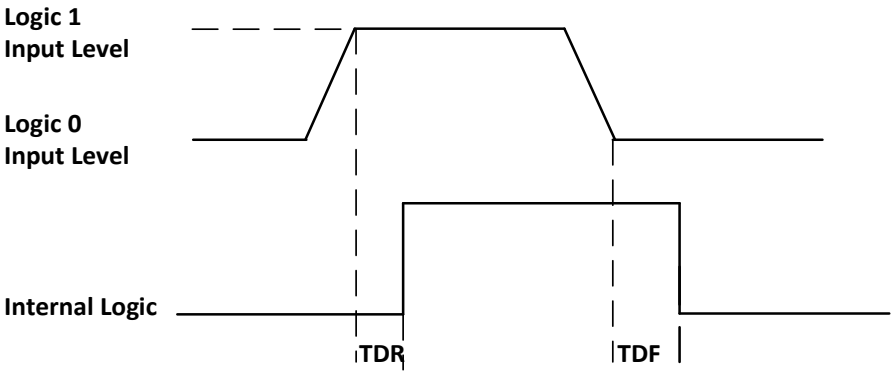

Figure 10-6 Input Logic Level

Table 10-4 Electrical Feature of Line 2 Input

Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	0 VDC to 0.3 VDC
Input Logic Level High	VH	3.3 VDC to 24 VDC
Input Rising Time	TDR	< 1 μs
Input Falling Time	TDF	< 1 μs

NOTE

- Make sure the input voltage is not from 0.3 VDC to 3.3 VDC as the electric status between these two values are not stable.

- The breakdown voltage is 30 VDC, and keep voltage stable.
- To prevent damage to the GPIO pin, please connect GND first and then input voltage in Line 2.

Line 2 Configured as Output

When the environment temperature is 25 °C (77 °F), the relation among external voltage, resistance and the output level low is shown below.

Table 10-5 Parameter of Output Logic Level Low

External Voltage	External Resistance	VL (GPIO2)
3.3 V	1 KΩ	160 mV
5 V	1 KΩ	220 mV
12 V	1 KΩ	460 mV
24 V	1 KΩ	860 mV
30 V	1 KΩ	970 mV

NOTE

The maximum current is 25 mA and the output impedance is 40 Ω.

When the voltage of external resistance (1 KΩ) is pulled up to 5 VDC, the logic level and electrical feature of configuring Line 2 as output are shown below.

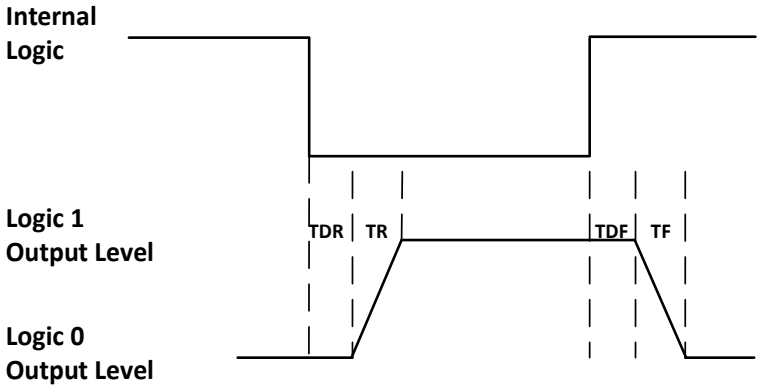

Figure 10-7 Output Logic Level

Table 10-6 Electrical Feature of Line 2 Output

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	220 mV
Output Logic Level High	VH	4.75 VDC
Output Rising Time	TR	0.06 μs
Output Falling Time	TF	0.016 μs
Output Rising Delay	TDR	0 μs to 4 μs
Output Falling Delay	TDF	< 1 μs

10.2 I/O Wiring

The camera has different appearance with varied models. Here we take type I camera as an example to introduce I/O wiring.

NOTE

For specific camera appearance, cable color and I/O wiring, please refer to the actual one you got.

10.2.1 Line 0 Wiring

When the camera uses Line 0 as hardware trigger source, wirings are different with different external devices of input signal.

- PNP Device

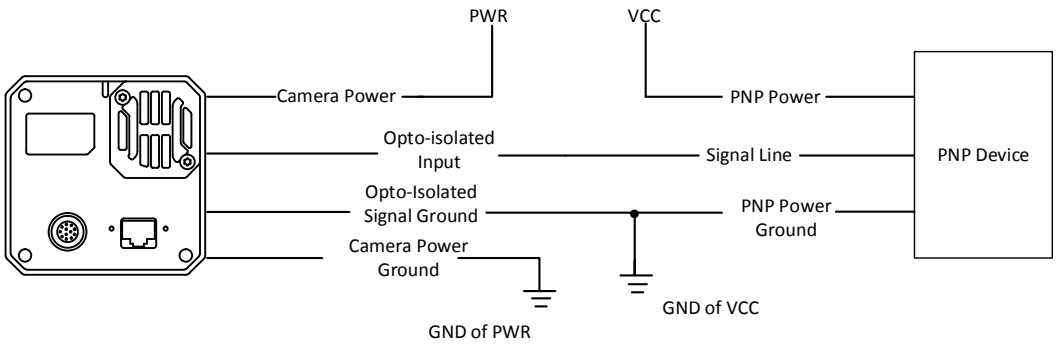

Figure 10-8 Line 0 Connecting to PNP Device

- NPN Device

If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 KΩ pull-up resistor.

If the VCC of NPN device is 12 VDC, and it is recommended to use 1 KΩ pull-up resistor.

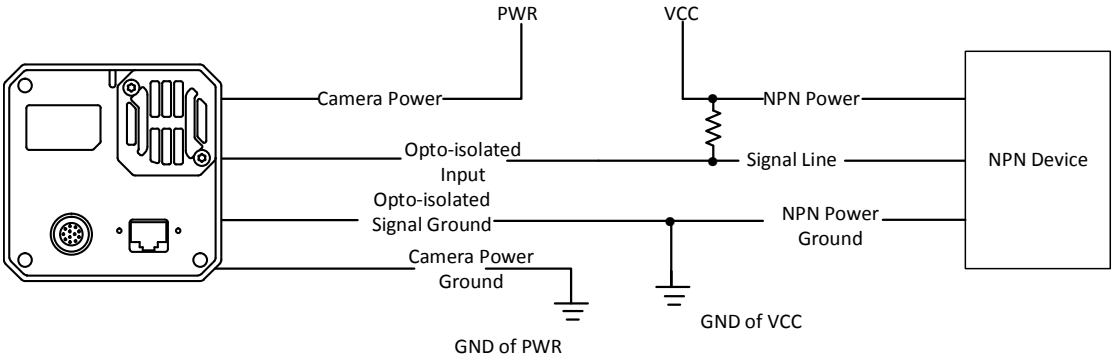

Figure 10-9 Line 0 Connecting to NPN Device

- Switch

If the VCC of switch is 24 VDC, and it is recommended to use 4.7 KΩ resistor to protect circuit.

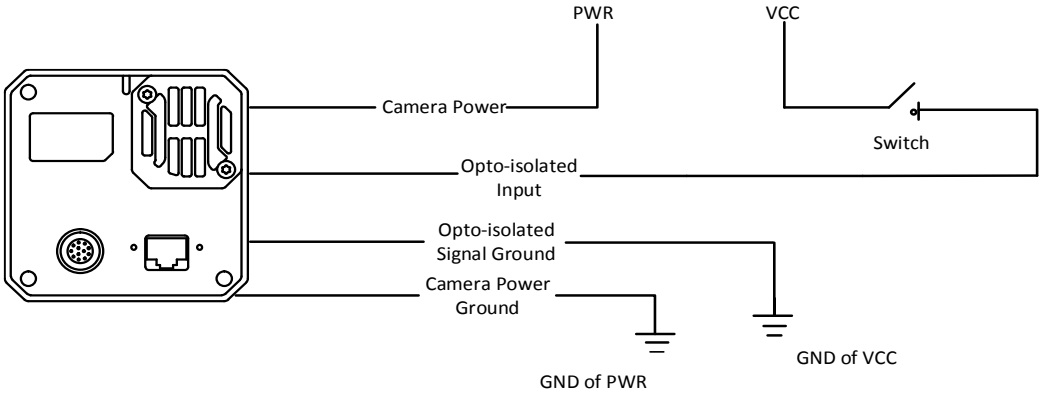

Figure 10-10 Line 0 Connecting to a Switch

10.2.2 Line 1 Wiring

When the camera uses Line 1 as output signal, wirings are different with different external devices.

- PNP Device

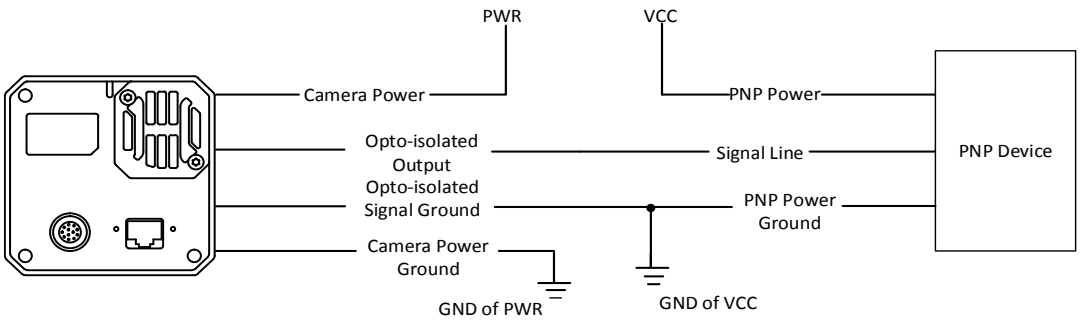

Figure 10-11 Line 1 Connecting to PNP Device

- NPN Device

If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 KΩ pull-up resistor.

If the VCC of NPN device is 12 VDC, and it is recommended to use 1 KΩ pull-up resistor.

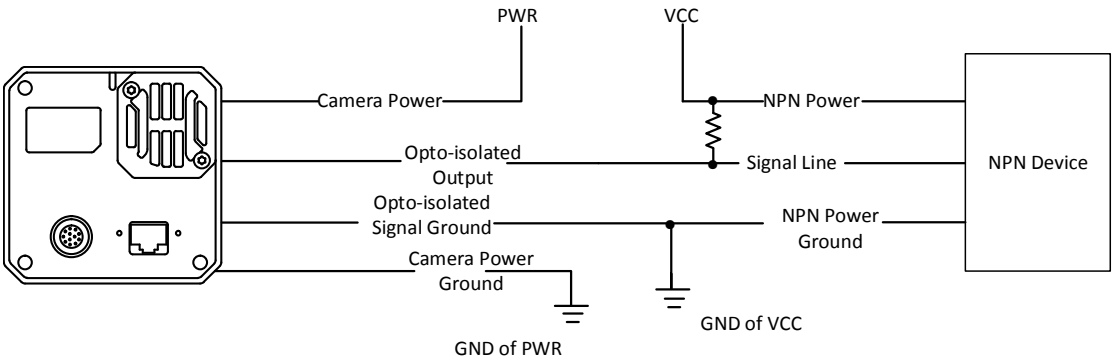

Figure 10-12 Line 1 Connecting to NPN Device

10.2.3 Line 2 Wiring

As bi-direction I/O Circuit, Line 2 can be used as both input signal and output signal.

Line 2 Configured as Input

When the camera uses Line 2 as hardware trigger source, wirings are different with different external devices of input signal.

- PNP Device

It is recommended to use 330 Ω pull-down resistor.

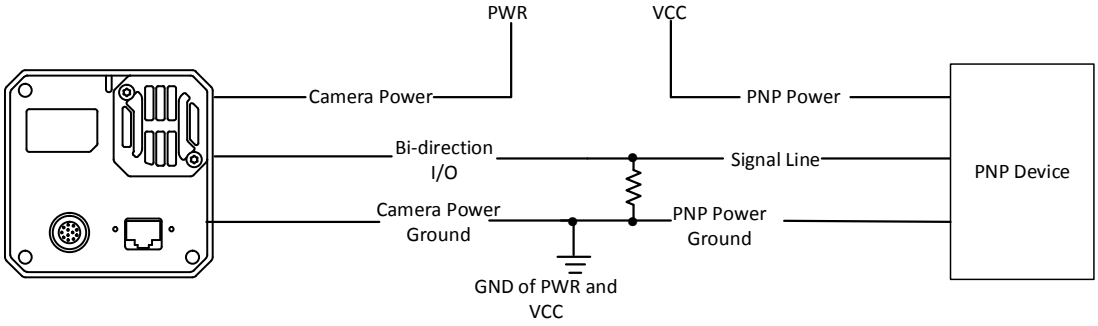

Figure 10-13 Line 2 Connecting to PNP Device as Input

- NPN Device

If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 KΩ pull-up resistor.

If the VCC of NPN device is 12 VDC, and it is recommended to use 1 KΩ pull-up resistor.

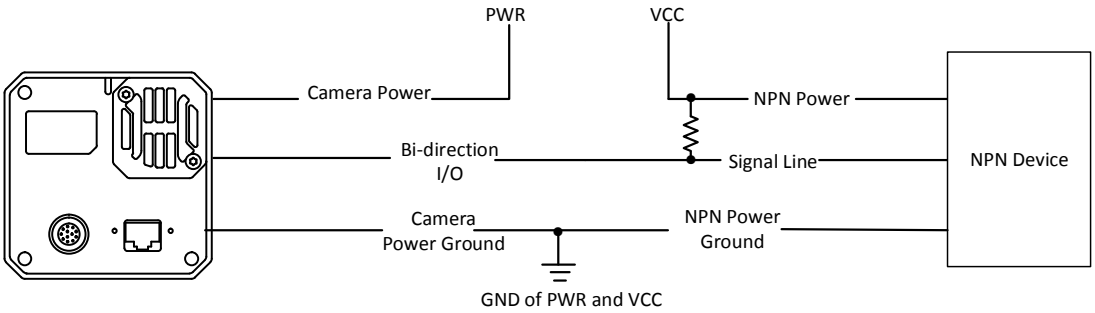

Figure 10-14 Line 2 Connecting to NPN Device as Input

- Switch

The switch value can provide low electrical level to trigger line 2.

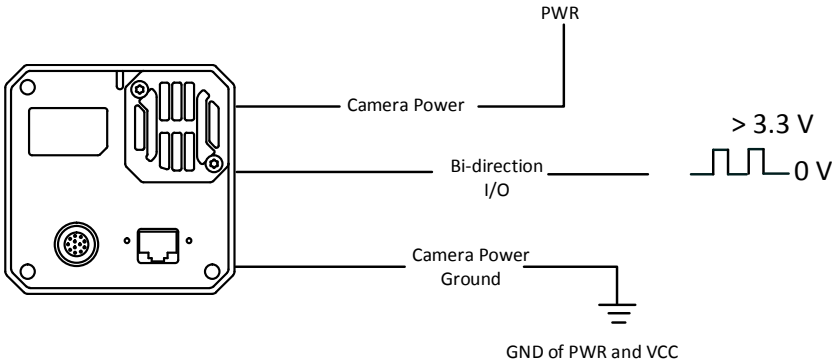

Figure 10-15 Line 2 Connecting to a Switch as Input

Line 2 Configured as Output

When the camera uses Line 2 as output signal, wirings are different with different external devices.

- PNP Device

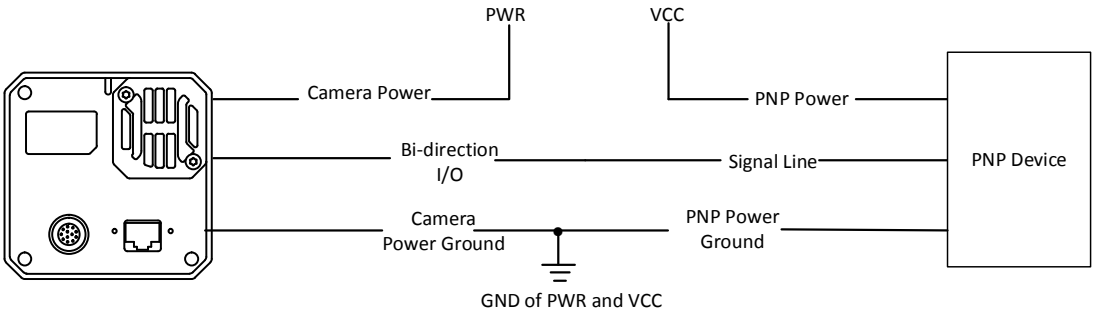

Figure 10-16 Line 2 Connecting to PNP Device as Output

- NPN Device

If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 KΩ pull-up resistor.

If the VCC of NPN device is 12 VDC, and it is recommended to use 1 KΩ pull-up resistor.

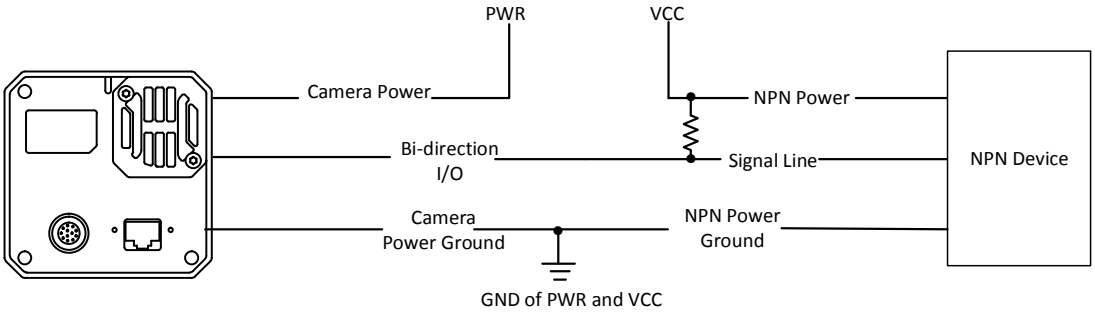

Figure 10-17 Line 2 Connecting to NPN Device as Output

Chapter 11 Image Parameter

11.1 View Resolution

Click **Image Format Control**, and view **Width Max** and **Height Max**. **Width Max** stands for the max. pixels per inch in width direction and **Height Max** stands for the max. pixels per inch in height direction.

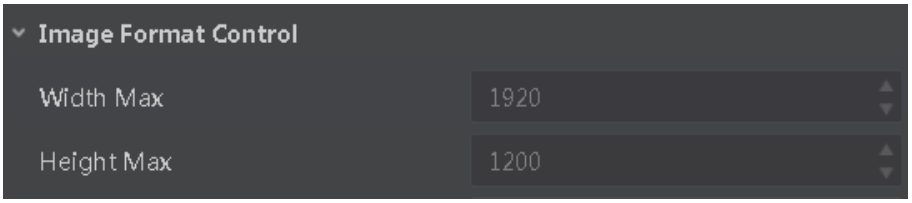

Figure 11-1 View Resolution

NOTE

The camera displays the image with max. resolution by default.

11.2 Set ROI

If you are only interested in a certain region of the image, you can set a Region of Interest (ROI) for the camera. Setting Region of Interest can reduce the bandwidth of the image being transmitted. Thus increasing the frame rate to some extent.

NOTE

- The camera currently supports 1 ROI only, that is, there is **Region 0** for **Region Selector** parameter only.
- Region of interest can be set only when you stop real-time acquisition.

Click **Image Format Control** > **Region Selector**, and enter **Width**, **Height**, **Offset X**, and **Offset Y**.

- Width: it stands for horizontal resolution in ROI area.
- Height: it stands for vertical resolution in ROI area.
- Offset X: it refers to the horizontal coordinate of the upper left corner of the ROI.
- Offset Y: it refers to the vertical coordinate of the upper left corner of the ROI.

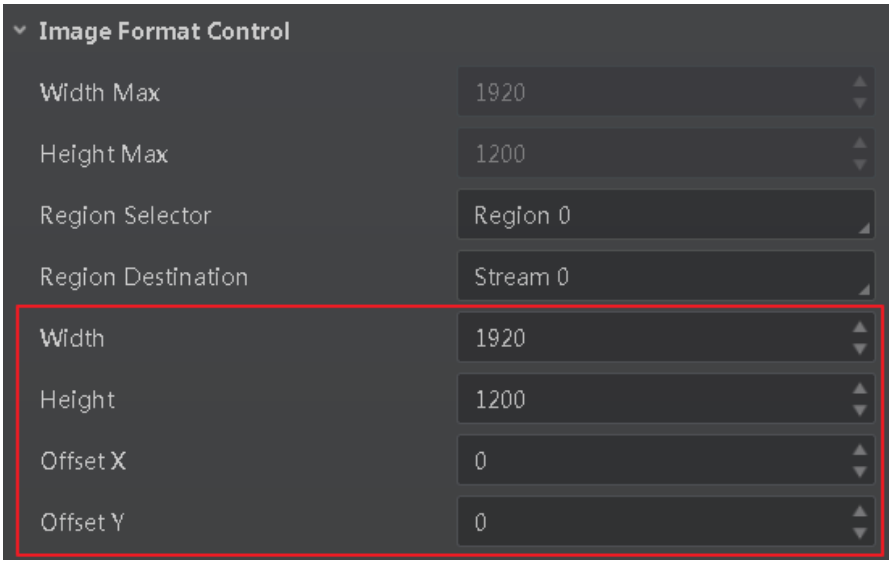

Figure 11-2 Set ROI

NOTE

- The **Width** value plus **Offset X** value should not be larger than **Width Max** parameter value, **Height** value plus **Offset Y** value should not be larger than **Height Max** parameter value
- The ROI function may differ by camera models.

11.3 Set Image Reverse

NOTE

The image reverse function may differ by camera models.

Reverse X refers to the image reverses in a horizontal way, and **Reverse Y** refers to the image reverses in a vertical way.

You can click **Image Format Control**, and enable **Reverse X** or **Reverse Y** according to actual demands.

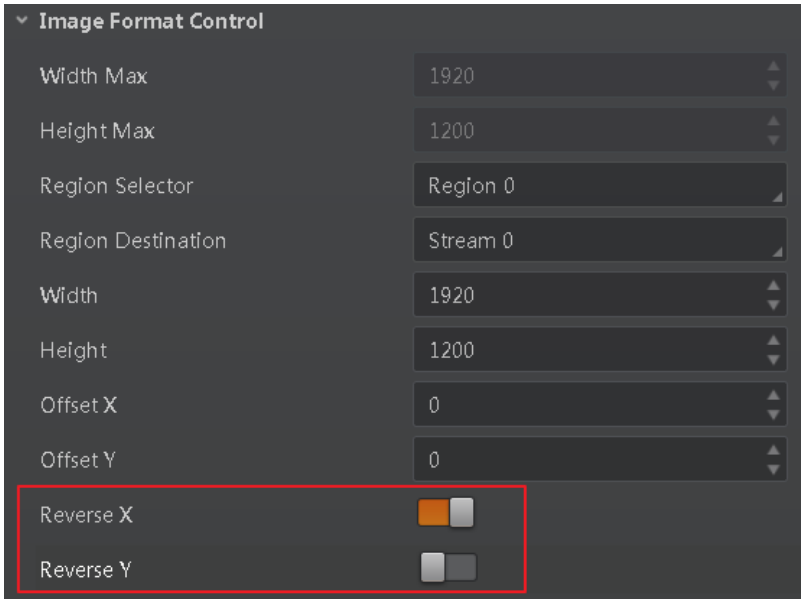

Figure 11-3 Set Image Reverse

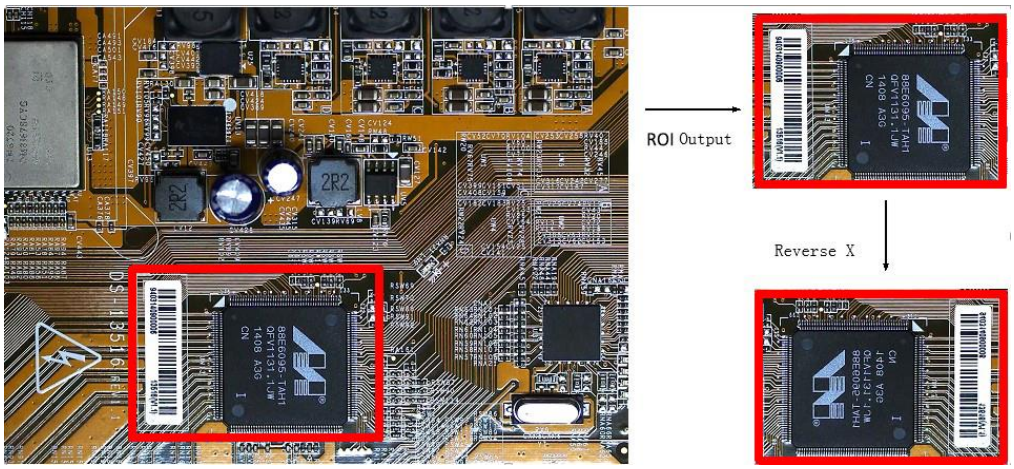

Figure 11-4 Image Reverse Comparison

11.4 Set Pixel Format

NOTE

The pixel format may differ by camera models.

Table 11-1 Pixel Size of Different Pixel Formats

Pixel Format	Pixel Size (Bits/Pixel)
Mono 8, Bayer 8	8
Mono 10 Packed, Mono 12 Packed, Bayer 10 Packed, Bayer 12 Packed	12

Pixel Format	Pixel Size (Bits/Pixel)
Mono 10/12, Bayer 10/12, YUV422Packed, YUV 422 (YUYV) Packed	16
RGB 8, BGR 8	24

Click **Image Format Control** > **Pixel Format**, and set **Pixel Format** according to actual demands.

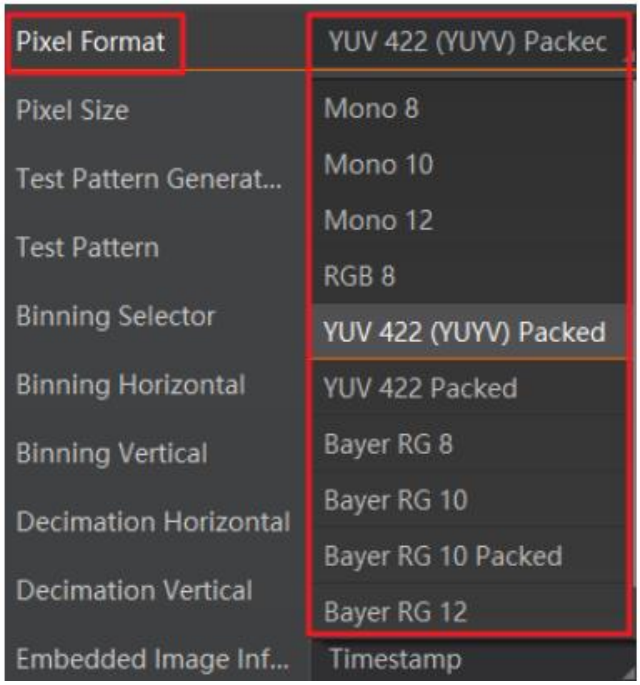

Figure 11-5 Set Pixel Format

11.5 Set Test Pattern

NOTE

The test pattern may differ by camera models.

The camera supports test pattern function. When there is exception in real-time image, you can check whether image of test mode have similar problem to determine the reason. This function is disabled by default, and at this point, the outputted image by the camera is real-time image. If this function is enabled, the outputted image by the camera is test image.

Click **Image Format Control** > **Test Pattern**, and set **Test Pattern** according to actual demands

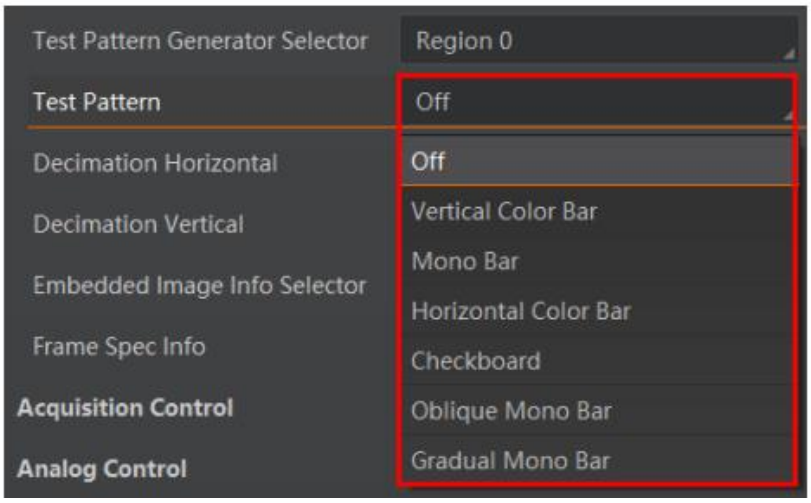

Figure 11-6 Set Test Pattern

The mono camera offers 5 test patterns, including **Mono Bar**, **Checkboard**, **Oblique Mono Bar**, **Gradual Mono Bar**, and **Test Image** 1.

The color camera offers 7 test patterns, including **Mono Bar**, **Checkboard**, **Oblique Mono Bar**, **Gradual Mono Bar**, **Vertical Color Bar**, **Horizontal Color Bar**, and **Test Image** 1.

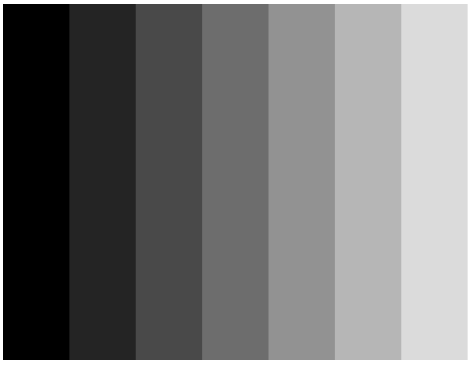

Figure 11-7 Mono Bar

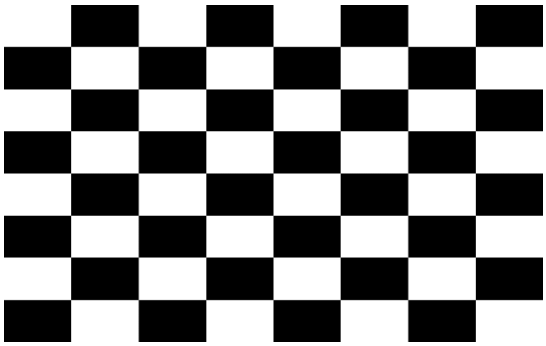

Figure 11-8 Checkboard

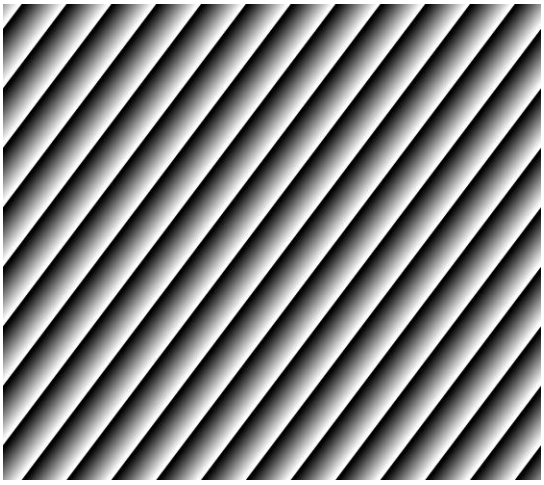

Figure 11-9 Oblique Mono Bar

Figure 11-10 Gradual Mono Bar

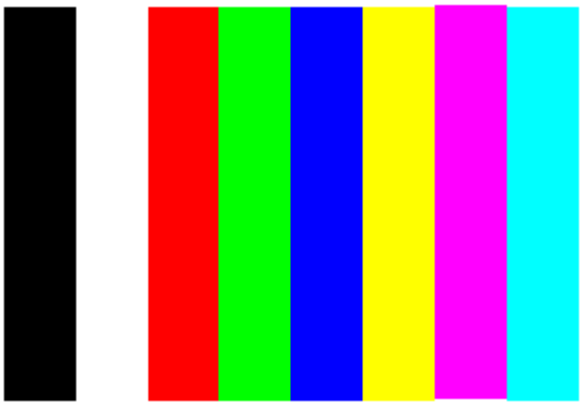

Figure 11-11 Vertical Color Bar

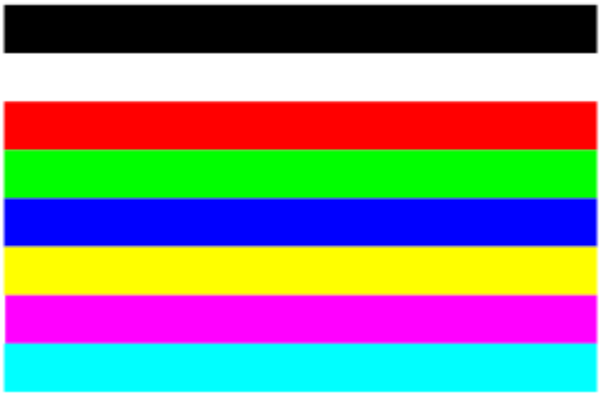

Figure 11-12 Horizontal Color Bar

Figure 11-13 Test Image 1

NOTE

The pattern of the test image 1 may differ by camera models.

11.6 Set Binning

The purpose of setting binning is to enhance sensibility. With binning, multiple sensor pixels are combined as a single pixel to reduce resolution and improve image brightness.

Click **Image Format Control**, and set **Binning Horizontal** and **Binning Vertical** according to actual demands.

Figure 11-14 Set Binning

NOTE

- **Binning Horizontal** refers to the image's width, and **Binning Vertical** refers to the image's height.
- The binning function may differ by camera models.

11.7 Set Decimation

The decimation feature allows you to reduce the number of sensor pixel columns or rows that are transmitted by the camera. This procedure is also known as "subsampling". It reduces the amount of data to be transferred and may increase the camera's frame rate.

Click **Image Format Control**, and set **Decimation Horizontal** and **Decimation Vertical** according to actual demands.

Figure 11-15 Set Decimation

NOTE

- **Decimation Horizontal** refers to the image's width, and **Decimation Vertical** refers to the image's height.
- The decimation function may differ by camera models.

11.8 Set Exposure Mode

NOTE

The exposure mode may differ by camera models.

Generally, the camera offers two exposure modes, including **Timed** and **Trigger Width**.

- **Timed**: Timed exposure. The exposure duration time is set using the **Exposure Time** or **Exposure Auto** features and the exposure starts with the **Frame Start**.

- **Trigger Width**: Uses the width of the current frame signal (s) pulse (e.g., Line 0/2) to control the exposure duration.

NOTE

If the trigger activation is rising edge or level high, the exposure duration will be the time the trigger stays high. If trigger activation is falling edge or level low, the exposure time will last as long as the trigger stays Low.

11.9 Set Exposure Time Mode

NOTE

The exposure time mode may differ by camera models.

The camera offers 2 types of exposure time modes, including **Ultrashort** mode and **Standard** mode. Click **Acquisition Control** > **Exposure Time Mode**, and set **Exposure Time Mode** according to actual demands.

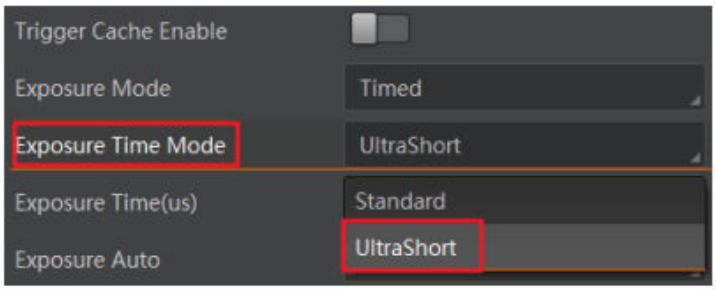

Figure 11-16 Set Exposure Time Mode

NOTE

If the camera you got does not support **Ultrashort** exposure time mode, and then there is no **Exposure Time Mode** parameter, and your camera supports **Standard** exposure time mode only by default.

11.10 Set Exposure Auto

Under the ultrashort exposure time mode, the camera exposes within an ultrashort time. The camera supports **Off** exposure mode only, you can adjust **Exposure Time** manually only.

Under the standard exposure time mode, the camera supports 3 types of exposure methods: **Off**, **Once** and **Continuous**. Click **Acquisition Control** > **Exposure Auto**, and select **Exposure Auto** according to actual demands. The exposure method and principle are shown below.

Table 11-2 Exposure Method and Principle

Exposure Method	Principle
Off	The camera exposures according to the value configured by user in **Exposure Time**.
Once	Adjust the exposure time automatically according to the image brightness. After adjusting, it will switch to **Off** Mode.
Continuous	Adjust the exposure time continuously according to the image brightness.

When the **Exposure Auto** is set as **Off**, you can enter **Exposure Time** manually. When the **Exposure Auto** is set as **Once** or **Continuous**, the exposure time should be within the range of **Auto Exposure Time Lower Limit** and **Auto Exposure Time Upper Limit**.

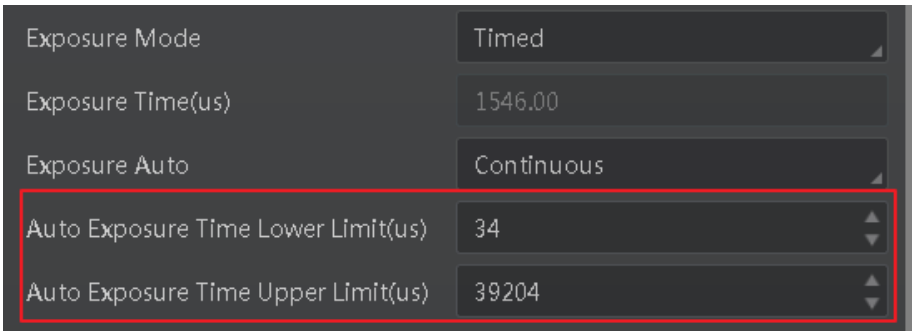

Figure 11-17 Set Exposure Time under Once or Continuous Mode

NOTE

If the camera is under **Continuous** exposure method, once external trigger mode is enabled, the camera will automatically switch to **Off** exposure mode.

11.11 Set HDR

NOTE

The HDR function may differ by camera models.

The camera supports HDR (High Dynamic Range) function that the camera acquires images based on 4 sets of settings, and each with its own exposure time and gain.

Click **Acquisition Control**, enable **HDR Enable**, select **0**, **1**, **2** or **3** as **HDR Selector**, and set corresponding **HDR Shutter** and **HDR Gain**.

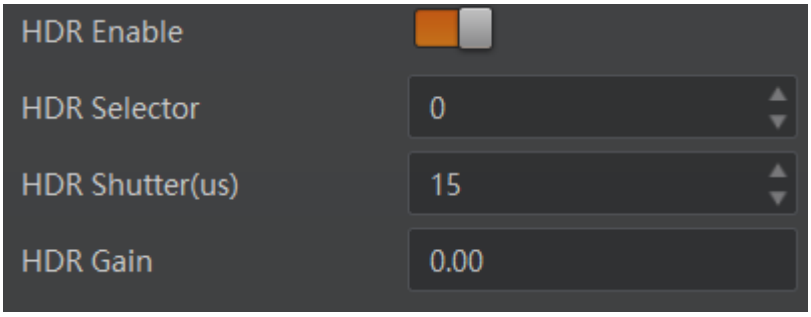

Figure 11-18 Set HDR

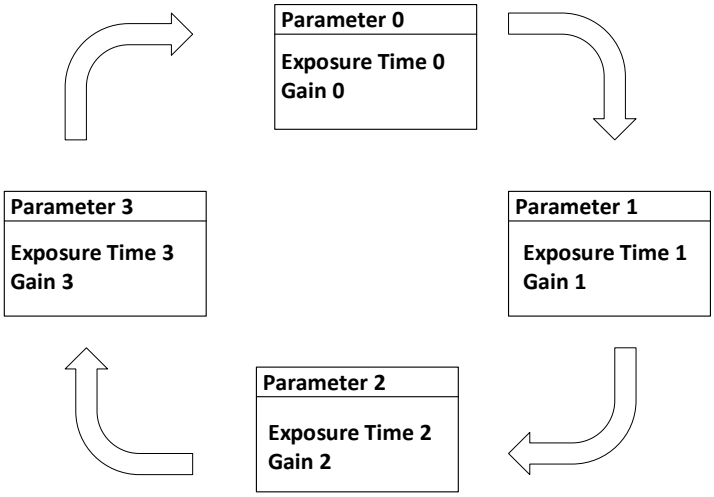

Figure 11-19 HDR Polling

11.12 Set Gain

NOTE

The gain function may differ by camera models.

The camera has 2 types of gain, including the analog gain and digital gain. The analog gain is applied before the signal from the camera sensor is converted into digital values, while digital gain is applied after the conversion.

11.12.1 Set Analog Gain

The camera supports 3 types of analog gain modes: **Off**, **Once** and **Continuous**. Click **Analog Control**, and select **Gain Auto** according to actual demands. The analog gain mode and principle are shown below.

Table 11-3 Analog Gain Mode and Principle

Gain Mode	Principle
Off	The camera adjusts gain according to the value configured by user in **Gain**.
Once	Adjust the gain automatically according to the image brightness. After adjusting, it will switch to **Off** Mode.
Continuous	Adjust the gain continuously according to the image brightness.

When the analog gain is set as **Once** or **Continuous**, the gain should be within the range of **Auto Gain Lower Limit** and **Auto Gain Upper Limit**.

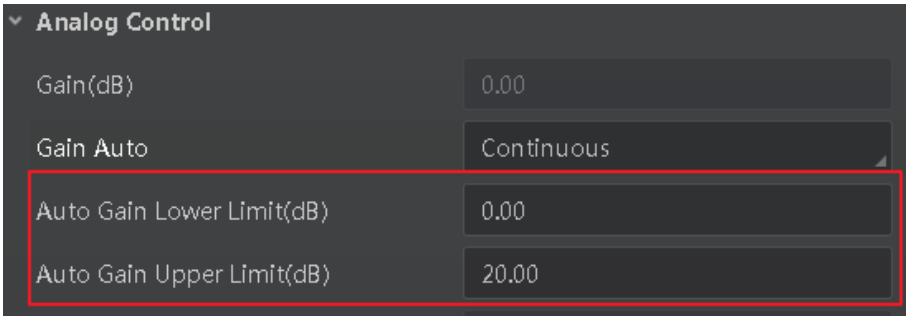

Figure 11-20 Set Gain under Once or Continuous Mode

NOTE

When increasing the analog gain, the image noise will increase too, which will influence image quality. If you want to increase image grayscale value, it is recommended to increase the camera's exposure time. If the exposure time reaches its upper limit, and at this point, you can increase analog gain.

11.12.2 Set Digital Gain

Apart from analog gain, the camera supports digital gain function. When analog gain reaching its upper limit and the image is still too dark, it is recommended to improve image brightness via digital gain.

Click **Analog Control**, enable **Digital Shift Enable**, and enter **Digital Shift** according to actual demands. The range of **Digital Shift** is from -6 to 6.

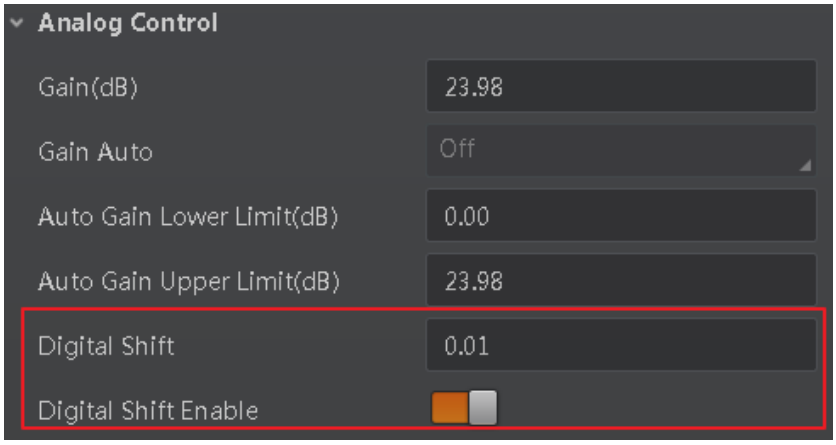

Figure 11-21 Set Digital Gain

11.13 Set Brightness

The camera brightness refers to the brightness when the camera adjusts image under **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain mode. You can set brightness as shown below.

NOTE

You should enable **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain mode first before setting brightness.

Click **Analog Control** > **Brightness**, and set **Brightness** according to actual demand, and its range is from 0 to 255.

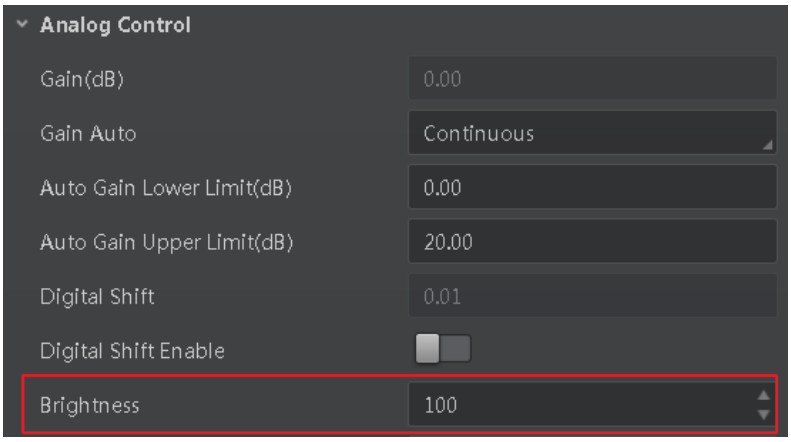

Figure 11-22 Set Brightness

NOTE

After setting brightness, the camera will automatically adjust exposure time to let image brightness reach target one. Under **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain, the higher the brightness value, the brighter the image will be.

11.14 Set Black Level

The camera supports black level function that allows you to change the overall brightness of an image by changing the gray values of the pixels by a specified amount.

Click **Analog Control** > **Black Level Enable**, enable **Black Level Enable**, and enter **Black Level** according to actual demands. The range of black level is from 0 to 4095.

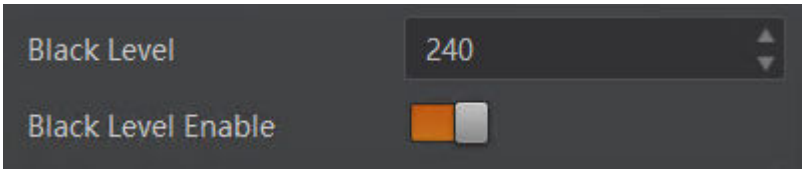

Figure 11-23 Set Black Level

11.15 Set White Balance

NOTE

White balance is only available for color cameras.

The white balance refers to the camera color adjustment depending on different light sources. Adjust the Gain Value of the image's R channel and B channel to keep white regions white under different color temperatures. Ideally, the proportion of R channel, G channel and B channel in the white region is 1:1:1.

Click **Analog Control** > **Balance White Auto**, and select **Balance White Auto** according to actual demands.

Table 11-4 White Balance Status Description

White Balance Mode	Description
Off	You need to set the R, G, B value manually, between 1 and 4095. 1024 means ratio is 1.0
Once	Automatic white balance once. Adjust the white balance for a certain amount of time then stop. It implements an algorithm that finds possible gray areas in the Bayer data.
Continuous	Continuous automatic white balance. It implements an algorithm that finds possible gray areas in the Bayer data.

It is recommended to correct white balance when there is great difference between the camera's color effect and actual effect. You can correct white balance as shown below.

Steps:

1. Put a white paper in the range of the camera's field of view, and make sure the paper covers the entire field of view.
2. Set exposure and gain. It is recommended to set image brightness value between 120 and 160.
3. Select **Once** as **Balance White Auto**, and the camera will automatically adjust white balance for once.

If there is still great difference between correction effect and actual color, it is recommended to correct white balance according to following steps.

Steps:

1. Select **Off** as **Balance White Auto**. At this time, **Balance Ratio** is **1024**.
2. Find corresponding R/G/B channel in **Balance Ratio Selector**. Here we take **Green** as an example.
3. Find camera's R/G/B value.
4. Take **Green** as correction standard, and manually adjust other two channels (R channel and B channel) to let these three channels have same value.

NOTE

- Here we take **Green** as an example. For specific **Balance Ratio Selector** value, please refer to the actual condition.
- In order to avoid repeated correction after rebooting the camera, it is recommended to save white balance parameter to **User Set** after white balance correction. You can refer to the Section **Save and Load User Set** for details.
- If the light source and color temperature in environment change, you need to correct white balance again.

11.16 Set Gamma Correction

The camera supports Gamma correction function. Generally, the output of the camera's sensor is linear with the photons that are illuminated on the photosensitive surface of the sensor. Gamma correction provides a non-linear mapping mechanism as shown below.

- Gamma value between 0.5 and 1: image brightness increases, dark area becomes brighter.
- Gamma value between 1 and 4: image brightness decreases, dark area becomes darker.

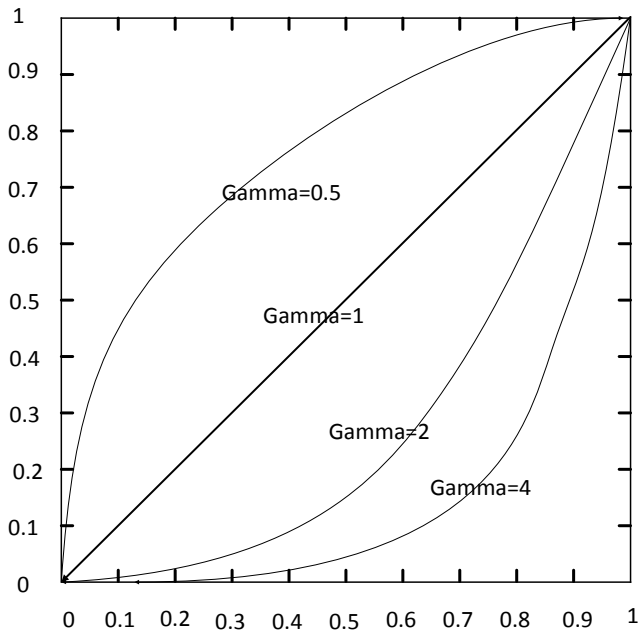

Figure 11-24 Gamma Curve

There are 2 types of Gamma correction, including **User** mode and **sRGB** mode. You can set User mode as shown below.

Steps:

1. Click **Analog Control** > **Gamma Selector**.
2. Select **User** as **Gamma Selector**.
3. Enable **Gamma Enable**.
4. Enter **Gamma** according to actual demands, and its range is from 0 to 4.

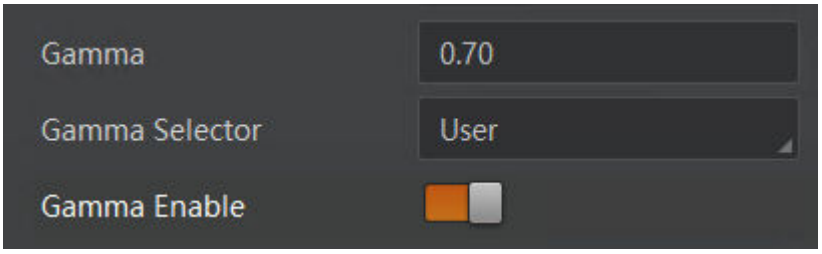

Figure 11-25 Set User Mode

You can set sRGB mode as shown below.

Steps:

1. Click **Analog Control** > **Gamma Selector**.
2. Select **sRGB** as **Gamma Selector**.
3. Enable **Gamma Enable**.

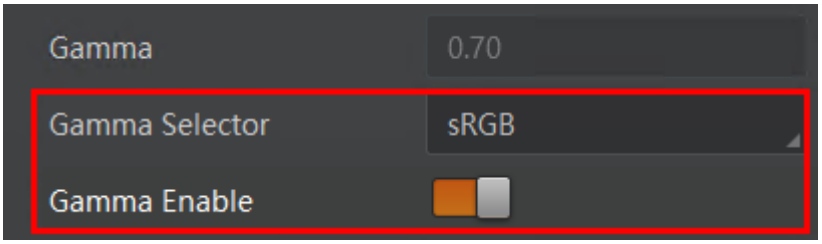

Figure 11-26 Set sRGB Mode

11.17 Set Sharpness

NOTE

The sharpness function is available when the camera is in Mono and YUV pixel format.

The camera supports sharpness function that can adjust the sharpness level of the image edge, and this function is disabled by default.

Click **Analog Control** > **Sharpness Enable**, enable **Sharpness Enable**, and enter **Sharpness** according to actual demands. The range of the brightness is from 0 to 100.

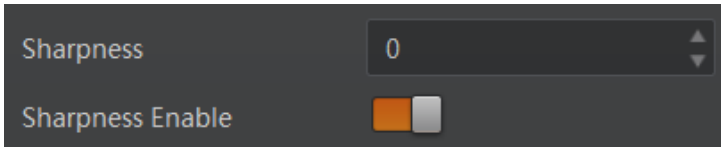

Figure 11-27 Set Sharpness

11.18 Set AOI

NOTE

The AOI function may differ by camera models.

The camera supports AOI function that can adjust the brightness and white balance of the entire image based on the area you selected.

Steps:

1. Click **Analog Control** > **Auto Function AOI Selector**, and select **AOI 1** or **AOI 2 Auto Function AOI Selector**.

2. Enter **Auto Function AOI Width**, **Auto Function AOI Height**, **Auto Function AOI Offset X**, and **Auto Function AOI Offset Y** according to actual demands.

3. Enable **Auto Function AOI Usage Intensity** if **AOI 1** is selected as **Auto Function AOI Selector**. Or enable **Auto Function AOI Usage White Balance** if **AOI 2** is selected as **Auto Function AOI Selector**.

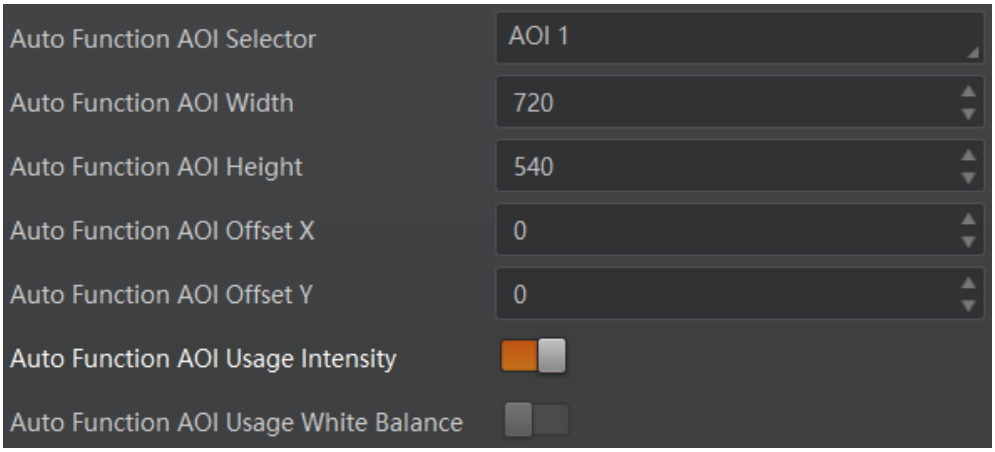

Figure 11-28 Set AOI

11.19 Set Color Transformation Control

NOTE

The function of color transformation control is only available for color cameras.

The color transformation control is used to restore color and eliminate the overlap in the color channels.

Click **Color Transformation Control**, select **Color Transformation Value Selector** according to actual demands, and enable **Color Transformation Enable**.

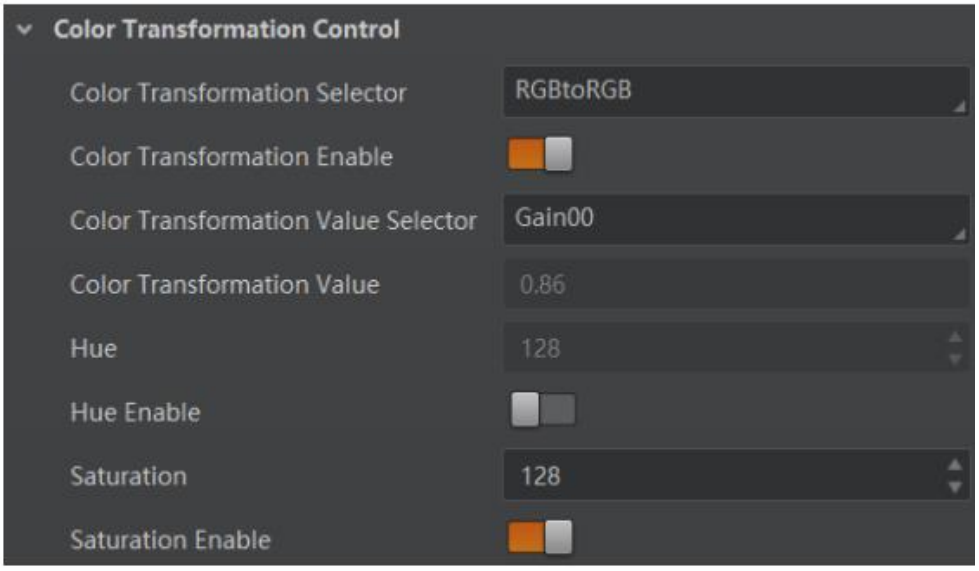

Figure 11-29 Set Color Transformation Control

NOTE

Currently, **RGB to RGB** is available for **Color Transformation Selector** only.

11.20 Set Hue

NOTE

Hue is only available for color cameras.

Adjusting the hue shifts the colors of the image.

Click **Color Transformation Control**, enable **Color Transformation Enable**, enable **Hue Enable**, and enter **Hue** according to actual demands.

Figure 11-30 Set Hue

11.21 Set Saturation

NOTE

Saturation is only available for color cameras.

Adjusting the saturation changes the colorfulness of the colors. A higher saturation, for example, makes colors easier to distinguish.

Click **Color Transformation Control**, enable **Color Transformation Enable**, enable **Saturation Enable**, and enter **Saturation** according to actual demands.

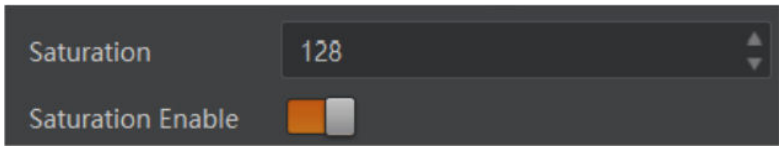

Figure 11-31 Set Saturation

11.22 Set LUT

A Look-Up Table (LUT) is a customizable grayscale-mapping table. You can stretch, amplify the grayscale range that interests you. The mapping can be linear or customized curve.

NOTE

You cannot use Gamma correction function and LUT function at the same time.

Steps:

1. Click **LUT Control**, and enable **LUT Enable**.
2. Enter **LUT Index** according to actual demands, and its range is from 0 to 1023.

3. Enter **LUT Value** according to actual demands, and its range is from 0 to 4095.
4. Click **Execute** in **LUT Save** to save it.

NOTE

The parameter of LUT Save may differ by camera models. If the camera has no LUT Save, the settings you configured will be saved in the camera in real time.

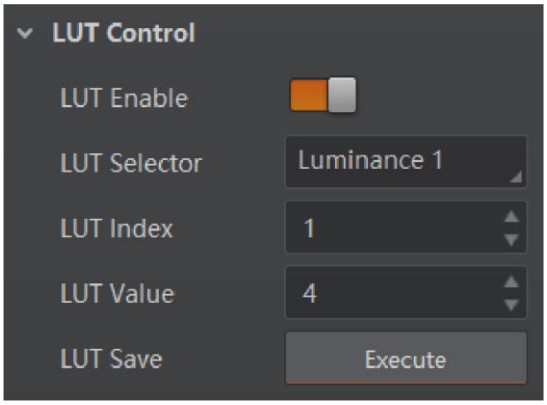

Figure 11-32 Set LUT

11.23 Set Shading Correction

The camera supports shading correction function that improves the image uniformity when you acquire a non-uniformity image due to external conditions. The shading correction type includes LSC correction, FFC correction, FPNC correction, and PRNUC correction.

NOTE

The specific shading correction type that cameras support may differ by camera models.

11.23.1 LSC Correction

LSC correction stands for Lens Shading Correction that eliminates non-uniform illumination brought by lens. The LSC correction supports two correction methods, including auto image correction or correcting image via setting parameters.

NOTE

The specific LSC correction method that cameras support may differ by camera models.

- **Auto Image Correction**

Steps:

1. Click **Shading Correction**, select **LSC Correction** as **Shading Selector**.
2. Click **Execute** in **Activate Shading**.

3. Enable **LSC Enable**.

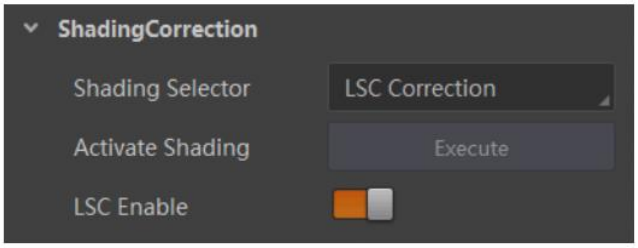

Figure 11-33 Auto Image Correction

- **Correcting Image via Setting Parameters**

Some camera models support correcting image via setting parameters to adjust the image brightness according to different scenarios.

Steps:

1. Click **Shading Correction**, select **LSC Correction** as **Shading Selector**.
2. Select tables from **LSC Table Selector** ranging from **Table 0** to **Table 7** according to actual demands.
3. Enable **LSC Target Enable** and set **LSC Target R/G/B** according to actual demands.

NOTE

- The larger value configured in **LSC Target R/G/B**, and brighter the image is.
- The function of **LSC Target Enable** and **LSC Target** is only valid before executing **Activate Shading**.

4. Click **Execute** in **Activate Shading**, and enable **LSC Enable**.

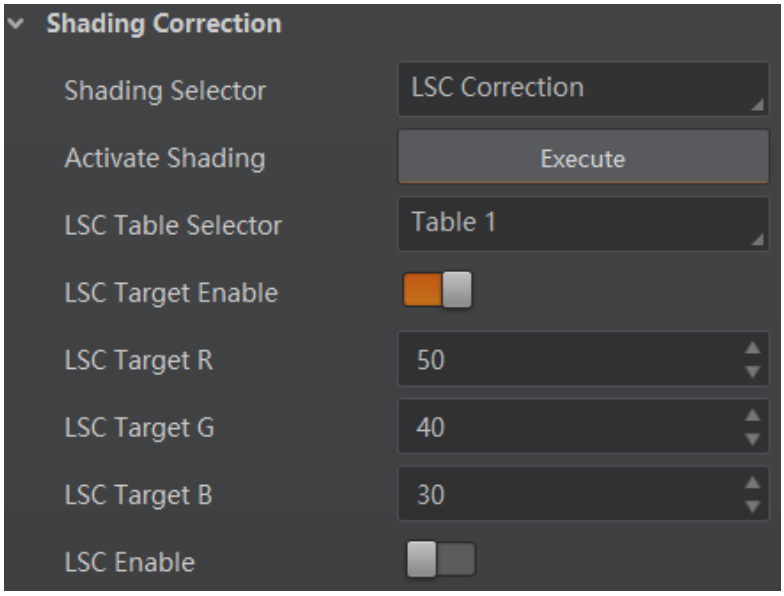

Figure 11-34 Correcting Image via Setting Parameters

NOTE

The LSC correction can be done only when the camera is in full resolution. If you are only interested in certain details in the image, you can use the ROI function.

11.23.2 LSC Sequencer

Without stopping camera's image streams, LSC sequencer function can periodically take pictures of collected images via setting multiple groups of brightness parameter tables according to the default sequencer parameter group or manually setting sequencer parameter group. Therefore, the camera can process images of inconsistent uniformity due to different light sources.

NOTE

The LSC sequencer function may differ by camera models.

Steps:

1. Click **Shading Correction**, select **LSC Correction** as **Shading Selector**.
2. Select tables from **LSC Table Selector** ranging from **Table 0** to **Table 7** according to actual demands.

NOTE

When using eight LSC tables, the default sequencer order is from Table 0 to Table 7 in turn.

3. Enable **LSC Target Enable** and set **LSC Target**.

NOTE

- The larger value configured in **LSC Target**, and brighter the image is.
- The function of **LSC Target Enable** and **LSC Target** is only valid before executing **Activate Shading**.

4. Click **Execute** in **Activate Shading**, and enable **LSC Sequencer Enable**.

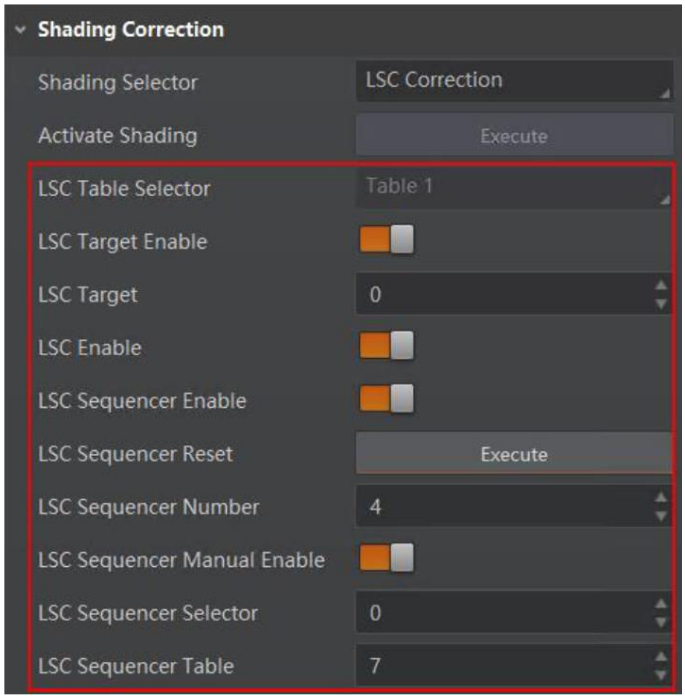

Figure 11-35 LSC Sequencer

5. Set **LSC Sequencer Number** to configure how many tables to participate the sequencer.
6. (Optional) Click **Execute** in **LSC Sequencer Reset** to reset the sequencer.
7. (Optional) Enable **LSC Sequencer Manual Enable** if you need to set the sequencer order manually, and set **LSC Sequencer Selector** and **LSC Sequencer Table** according to actual demands.

11.23.3 FFC Correction

The flat field correction (FFC) is used to improve the image uniformity that may be impacted by the sensor, light sources, external conditions, etc. The FFC correction supports two correction methods, including auto image correction or correcting image via setting parameters.

NOTE

The FFC correction can be done only when the camera is in full resolution.

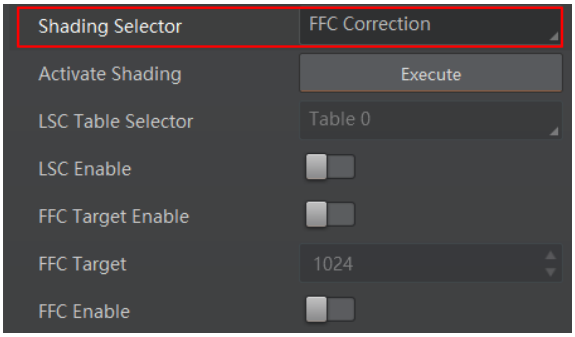

Figure 11-36 FFC Correction

- **Auto Image Correction**

Steps:

1. Click **Shading Correction**, select **FFC Correction** as **Shading Selector**.
2. Click **Execute** in **Activate Shading**, and enable **FFC Enable**.

- **Correcting Image via Setting Parameters**

Steps:

1. Click **Shading Correction**, select **FFC Correction** as **Shading Selector**.
2. Enable **FFC Target Enable** and set **FFC Target** according to actual demands.
3. Click **Execute** in **Activate Shading**, and enable **FFC Enable**.

NOTE

The function of **FFC Target Enable** and **FFC Target** is only valid before executing **Activate Shading**.

11.23.4 Other Corrections

Click **Shading Correction**, and enable **NUC Enable**. The **FPNC Enable** and **PRNUC Enable** will be automatically enabled or disabled according to the camera's condition.

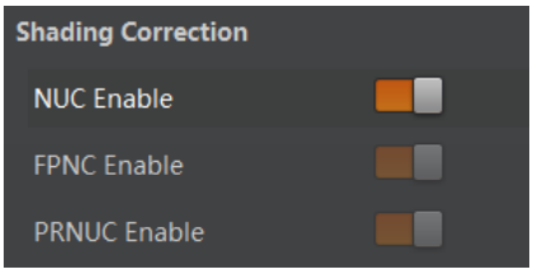

Figure 11-37 Other Corrections

NOTE

The specific setting steps of other corrections may differ by camera models.

Chapter 12 Other Functions

12.1 Device Control

NOTE

The specific device control parameters may differ by camera models.

In the **Device Control** attribute, you can view device information, edit device name, reset device, etc. The specific parameters in **Device Control** attribute are shown below.

Table 12-1 Device Control Parameter Description

Parameter	Read/Write	Description
Device Type	Read only	It is the device type.
Device Scan Type	Read only	It is the scan type of the sensor.
Device Vendor Name	Read only	It is the name of device manufacturer.
Device Model Name	Read only	It is the device model.
Device Manufacture Info	Read only	It is the manufacturer information.
Device Version	Read only	It is the device version.
Device Firmware Version	Read only	It is the device firmware version.
Device Serial Number	Read only	It is the device serial number.
Device ID	Read only	It is the device ID.
Device User ID	Read and write	Device name and it is empty by default. You can set according to your preference. ● If User ID is empty, the client software displays the device model. ● If you set it, the client software displays the User ID you set.

Parameter	Read/Write	Description
Device Uptime (s)	Read only	It is the period of time when device is powered up.
Board Device Type	Read only	It is the device type.
TEC Enable	Read and write	It enables TEC function.
TEC Temperature	Read and write	It sets the max. temperature of sensor. ● If actual sensor's temperature is lower than this parameter, and TEC function is not enabled. ● If actual sensor's temperature is higher than this parameter and TEC enable is enabled, and then TEC function is enabled.
Fan Control Mode	Read and write	It sets the fan mode. ● In auto mode, it includes three-level fan speed: 70, 85 and 100. According to the difference between the configured sensor temperature (TEC Temperature parameter) and the actual temperature, adjustment is made every 30 seconds. If actual temperature - configured temperature > 2 degrees, fan speed will increase. Otherwise, fan speed will decrease. ● In manual mode, the fan speed is decided by value set in **Fan Speed**.
Fan Speed	Read and write	It sets the fan speed, and its range is from 40 to 100.
Device Connection Selector	Read and write	It is the ID of GenICam XML.
Device Connection Speed (Mbps)	Read only	It is the device connection speed.

Parameter	Read/Write	Description
Device Link Selector	Read and write	It selects device link.
Device Link Speed (Mbps)	Read only	It is the link speed.
Device Link Connection Count	Read only	It is the link connection quantity.
Device Link Heartbeat Mode	Read and write	It enables heartbeat mode or not.
Device Stream Channel Count	Read only	It counts data packet quantity.
Device Stream Channel Selector	Read and write	It is the character set used in register.
Device Stream Channel Type	Read only	It is the stream channel type.
Device Stream Channel Link	Read only	It is the stream channel link quantity.
Device Stream Channel Endianness	Read only	It is the image data endianness.
Device Stream Channel Packet Size (B)	Read and write	It is the data packet size.
Device Event Channel Count	Read only	It is the channel quantity that the device supports.
Device Character Set	Read only	It is the character set used in register.
Device Reset	Read and write	Click **Execute** to reset the device.
Device Temperature Selector	Read and write	It selects device component temperature.
Device Temperature	Read only	It displays the real-time temperature of the device component you selected in **Device**

Parameter	Read/Write	Description
		Temperature Selector.
Find Me	Read and write	Click **Execute** to let red indicator flash once, and find device.
Device Max Throughput(Kbps)	Read only	It is the maximum flow of device operation.
Device PJ Number	Read only	It is the device's project number.

12.2 Embedded Information in Image

NOTE

The embedded information function may differ by camera models.

The camera supports adding and embedding the collection information to the image data. You can set in the client software and define which information to be embedded in the image data.

Embedded information includes following categories: **Timestamp**, **Gain**, **Exposure**, **Brightness Info**, **White Balance**, **Frame Counter**, **Ext Triggering Count**, **Line Input Output**, and **ROI Position**.

Each category of embedded information has its unique data format.

Table 12-2 Embedded Information Data Format

No.	Information Type	Byte	Data Format Description
1	Timestamp	4 Bytes	4 bytes are used to transfer the timestamp information.
2	Gain	4 Bytes	4 bytes are used to transfer the gain information. Each low 8 bits of the 4 valid data are combined to transfer the gain information. Note: High bits will be complemented with 0 automatically.
3	Exposure	4 Bytes	4 bytes are combined to show the exposure time, and the unit is μs.
4	Brightness Info	4 Bytes	4 bytes are used to transfer the brightness

No.	Information Type	Byte	Data Format Description
			information. Value Range: 0 to 4095. Note: High bits will be complemented with 0 automatically.
5	White Balance	8 Bytes	R/G/B occupies 2 bytes each. Value Range: 0 to 4095.
6	Frame Counter	4 Bytes	Value Range: 0 to 2^{32}-1.
7	Ext Trigger Count	4 Bytes	Value Range: 0 to 2^{32}-1.
8	Line Input Output	4 Bytes	4 bytes are used to transfer the line input and output information.
9	ROI Position	8 Bytes	The column coordinate occupies 2 bytes, and the row coordinate occupies 2 bytes. The column coordinate information comes first. The length and width occupy 2 bytes respectively, and the length information comes first.

NOTE

- The specific embedded information categories may differ by camera models.
- The camera embeds category that you select into the image data. The ROI area do not influence collection information embedding. If the ROI area is small and there is not enough space in first line image, and then the collection information will be embedded into the second line image.
- The low 8-bit of each valid data storages image embedded information.

Click **Image Format Control > Embedded Image Info Selector**, select specific parameters as **Embedded Image Info Selector**, and enable **Frame Spec Info**.

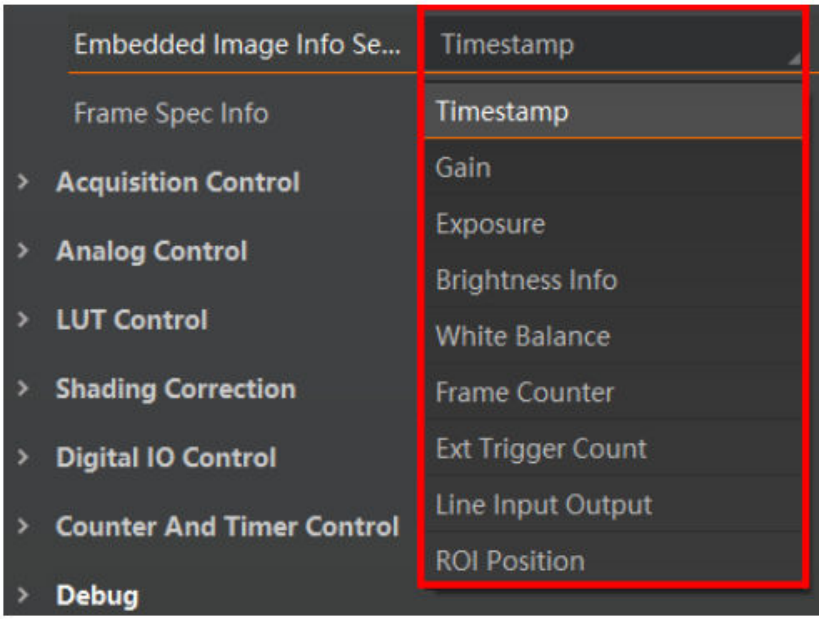

Figure 12-1 Set Embedded Information

12.3 Set Multicast

NOTE

The multicast function may differ by camera models.

The multicast function allows you to access the same camera via multiple PCs, and it has 3 modes as follows.

Controller and Data Receiver: This mode allows you to read and edit the camera's parameters, and get its image data.

Controller: This mode allows you to read and edit the camera's parameters, but you cannot get its image data.

Data Receiver: This mode allows you read the camera's parameters and get its image data, but you cannot edit the camera's parameters.

NOTE

- The same camera can be connected to only one MVS client software via the controller and data receiver or the controller mode at the same time, while in the data receiver mode, the same camera can be connected to multiple client software.
- When the multicast function is enabled, the camera icon on the client software of other PCs will become , and you can connect the camera via the data receiver mode.

- When you connect the camera via the data receiver mode, the camera icon on the client software of your PC will become , and at this time, you can read its parameters only.
- You can set multicast function for both the available camera and connected camera, but the specific settings are different.

For the available camera, you can set multicast function as follows.

Steps:

1. Right click the available camera, and click **Multicast Settings**.

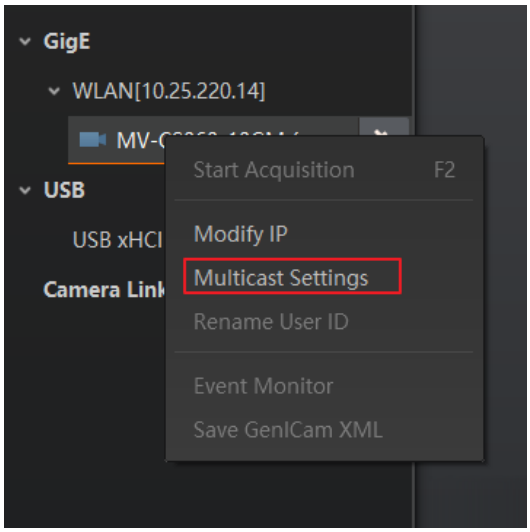

Figure 12-2 Click Multicast Settings

2. Select **Role**, and enter the **IP Address** and **Port**.
3. Click **OK**.

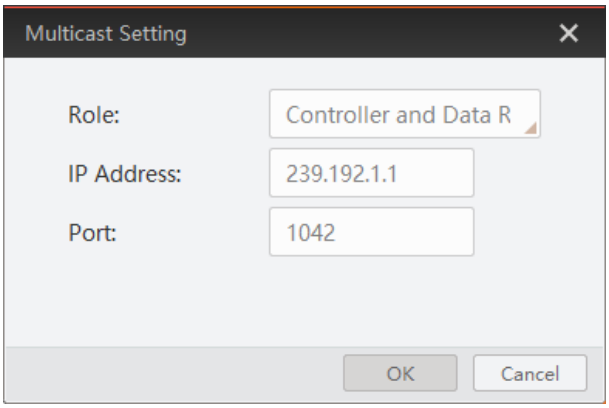

Figure 12-3 Set Multicast for Available Camera

For the connected camera, you can set multicast function as follows.

NOTE

For the connected camera, only the **Controller and Data Receiver** is available.

Steps:

1. Right click the connected camera, and click **Multicast Settings**.

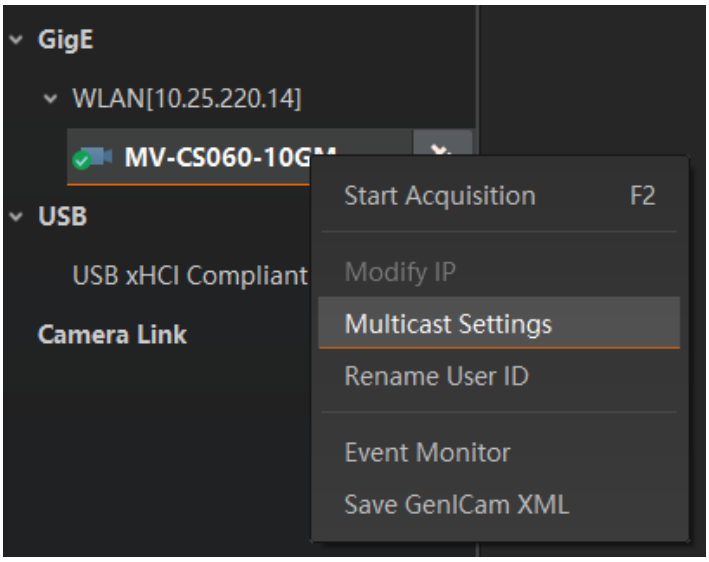

Figure 12-4 Click Multicast Settings

2. Enable the multicast function, and edit the **IP Address** and **Port**.
3. Click **OK**.

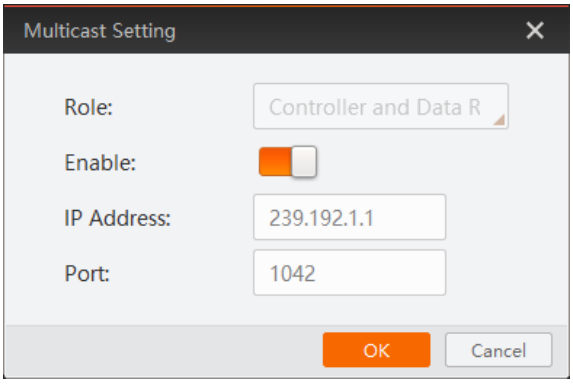

Figure 12-5 Set Multicast for Connected Camera

12.4 File Access Control

NOTE

The file access control function may differ by camera models.

The file access control allows you to export or import the camera's feature configuration (including User Set 1, User Set 2, or User Set 3) or DPC (Defective Pixel Correction) data, LUT Luminance 1/2/3 to or from the local PC as the mfa format.

Steps:

1. Select a camera in the device list.
2. Click  to open the **File Access** interface.

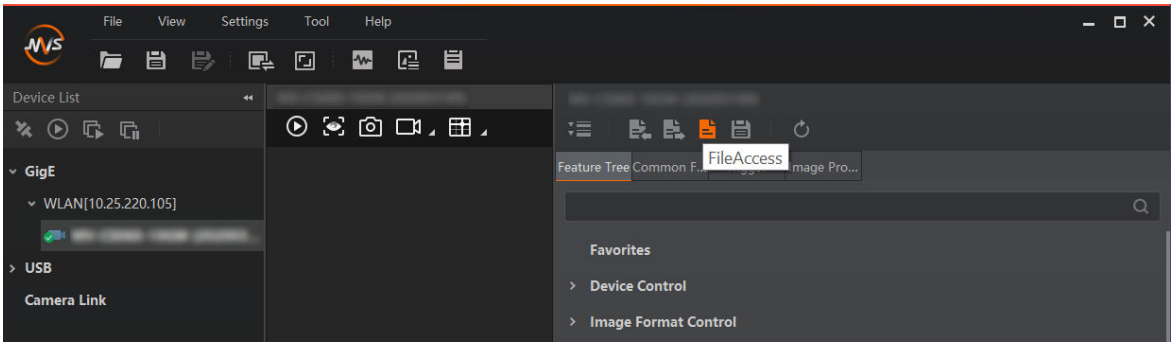

Figure 12-6 File Access

3. Select a device feature from the drop-down list.

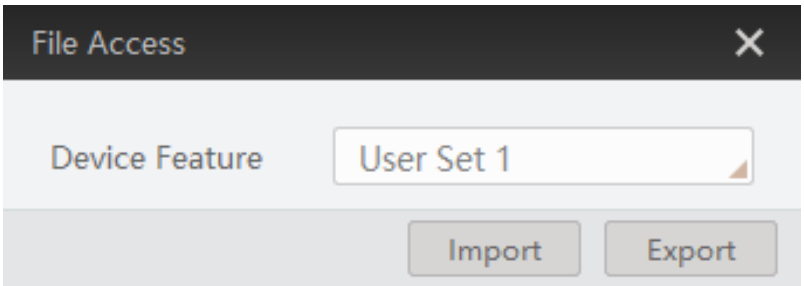

Figure 12-7 File Access Interface

4. Click **Import** or **Export** to import or export according to actual demands.

NOTE

- Importing and exporting the camera's device feature among the same model cameras are supported.
- If User Set 1/2/3 is selected as device feature, you need to load the corresponding user set you selected to take effect.
- If LUT Luminance 1/2/3 is selected as device feature, and they will take effect only when you select the same parameters in LUT Selector.

12.5 Set Event Control

NOTE

The event control function may differ by camera models.

The event control function allows you to enable event messages and camera events like Acquisition Start, Acquisition End, etc.

When the **Event Notification** is set to **Notification On**, the camera can generate an event and transmit a related event message to the computer whenever a specific situation occurs.

Steps:

1. Click **Event Control**, and select specific event in **Event Selector** according to actual demands.
2. Set **Notification On** as **Event Notification**.

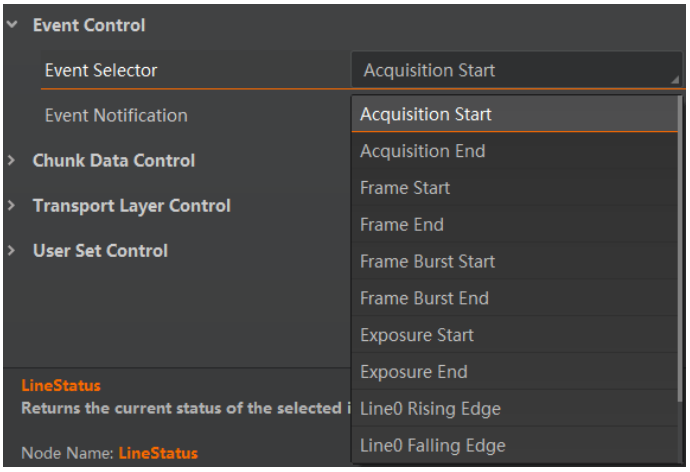

Figure 12-8 Select Event

3. Right click the connected camera, and click **Event Monitor**.

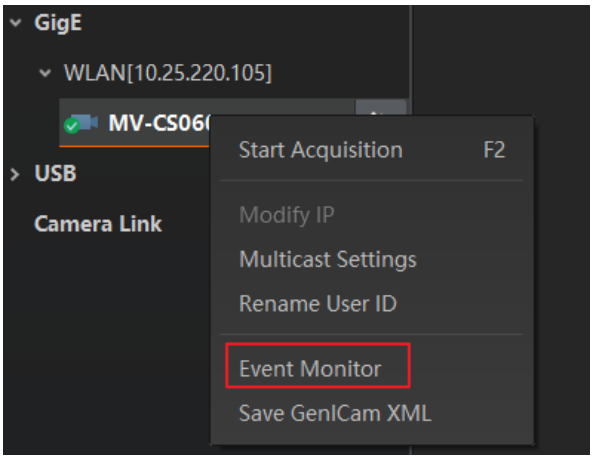

Figure 12-9 Click Event Monitor

4. View the specific event information in the event monitor interface.

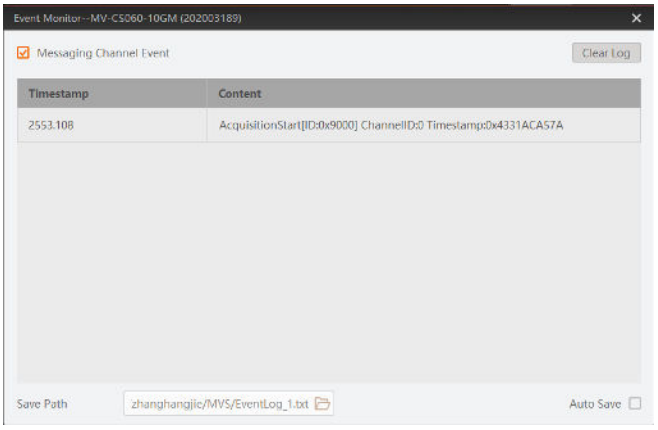

Figure 12-10 Event Monitor Interface

12.6 Transport Layer Control

NOTE

The specific transport layer control parameters may differ by camera models.

You can go to **Transport Layer Control** attribute to view the camera's load size, GEV version, etc.

Table 12-3 Transport Layer Control Description

Parameter	Read/Write	Description
Paylode Size (B)	Read only	It is the camera's load size.
GEV Version Major	Read only	It is the major version in GEV version.
GEV Version Minor	Read only	It is the minor version in GEV version.
GEV Device Mode Is Big Endian	Read only	It is the endianness in device's register.
GEV Device Mode Character Set	Read only	It is the character set in device's register.
GEV Interface Selector	Read only	It sets which physical network interface to be controlled.
GEV MAC Address	Read only	It is the MAC address of the network interface.

Parameter	Read/Write	Description
GEV Supported Option Selector	Read and write	It selects the GEV option to interrogate for existing support.
GEV Supported Option	Read only	It indicates whether the selected GEV option is supported or not.
GEV Current IP Configuration LLA	Read only	It indicates whether the Link Local Address IP configuration scheme is activated on the given network interface.
GEV Current IP Configuration DHCP	Read and write	It indicates whether the DHCP IP configuration scheme is activated on the given network interface.
GEV Current IP Configuration Persistent IP	Read and write	It indicates whether persistent IP configuration scheme is activated on the given network interface.
DEV PAUSE Frame Reception	Read and write	It controls whether incoming pause frames are handled on the given logical link.
GEV Current IP Address	Read only	It is the current IP address for the given network interface.
GEV Current Subnet Mask	Read only	It is the current subnet mask of the given interface.
GEV Current Default Gateway	Read only	It is the default gateway IP address to be used on the given network interface.
GEV First URL	Read only	It is the first choice of URL for the XML device description file.
GEV Second URL	Read only	It is the second choice of URL to the XML device description file.
GEV Number Of Interfaces	Read only	It indicates the number of physical network interfaces supported by this device.

Parameter	Read/Write	Description
GEV Persistent IP Address	Read and write	It indicates the persistent IP address for this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Persistent Subnet Mask	Read and write	It indicates the persistent subnet mask associated with the persistent IP address on this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Persistent Default Gateway	Read and write	It indicates the persistent default gateway for this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Link Speed	Read only	It indicates the speed of transmission negotiated by the given network interface in Mbps.
GEV Message Channel Count	Read only	It indicates the number of message channels supported by this device.
GEV Stream Channel Count	Read only	It indicates the number of stream channels supported by this device.
GEV Heartbeat Timeout (ms)	Read and write	It indicates the current heartbeat timeout in milliseconds.
GEV Heartbeat Disable	Read and write	It disables the GEV Heartbeat.
GEV Timestamp Tick Frequency (Hz)	Read only	It indicates the number of timestamp ticks in 1 second (frequency in Hz).
Timestamp Control Latch	Read and write	It latches the current timestamp value of the device.
Timestamp Control Reset	Read and write	It resets the timestamp value for the device.
Timestamp Control Latch	Read and write	It resets the timestamp control latch.

Parameter	Read/Write	Description
Reset		
Timestamp Value	Read only	It is a read only element. It indicates the latched value of the timestamp.
GEV CCP	Read and write	It controls the device access privilege of an application.
GEV MCP Host Port	Read and write	It controls the port to which the device must send messages. Setting this value to 0 closes the message channel.
GEV MCDA	Read and write	It controls the destination IP address for the message channel.
GEV MCTT (ms)	Read and write	It provides the transmission timeout value in milliseconds.
GEV MCRC	Read and write	It controls the number of retransmissions allowed when a message channel message times out.
GEV MCSP	Read only	It indicates the source port for the message channel.
GEV Stream Channel Selector	Read only	It selects the stream channel to control.
GEV SCP Interface Index	Read only	It is the Index of network interface to be used.
GEV SCP Host Port	Read and write	It is the host port of the channel
GEV SCP Direction	Read only	It transmits or receives the channel.
GEV SCPS Fire Test Packet	Read only	It sends a test packet.
GEV SCPS Do Not Fragment	Read and write	The state of this feature is copied into the “do not fragment” bit of the IP header of each stream packet.
GEV SCPS Big Endian	Read only	It is the Endianness of multi-byte pixel

Parameter	Read/Write	Description
		data for this stream.
GEV SCPS Packet Size (B)	Read and write	It specifies the stream packet size (in bytes) to send on this channel.
GEV SCPD	Read and write	It indicates the delay (in timestamp counter units) to insert between each packet for this stream channel.
GEV SCDA	Read and write	It indicates the destination IP address for this stream channel.
GEV SCSP	Read only	It indicates the source UDP port address for this stream channel.
GEV GVSP Extended ID Mode	Read and write	It can enable the extended ID mode.

12.7 Save and Load User Set

The camera supports 4 sets of parameters, including 1 default set and 3 user sets. The relation among 4 sets of parameters is shown below.

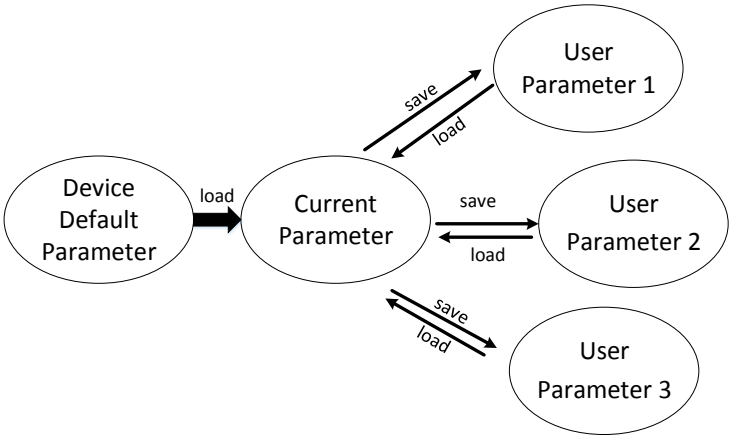

Figure 12-11 Parameter Relation

You can save parameters, load parameters and set user default as shown below.

- **Save Parameters**

Steps:

1. Click **User Set Control**, and select a user set in **User Set Selector**. Here we take selecting **User Set 1** as an example.

2. Click **Execute** in **User Set Save** to save parameters.

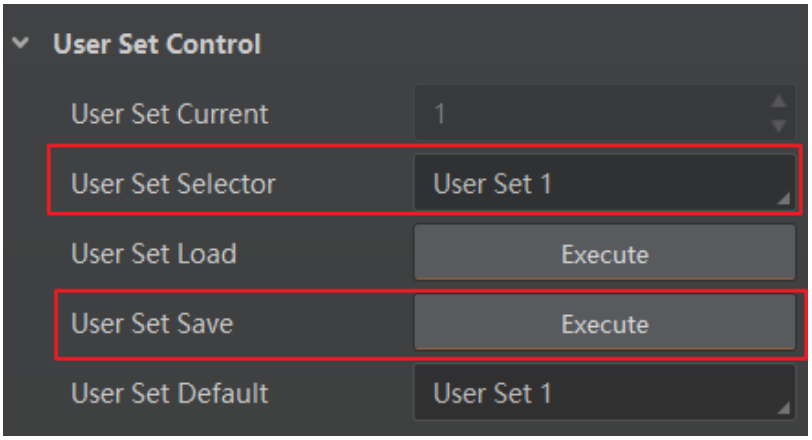

Figure 12-12 Save User Set

- **Load Parameters**

Steps:

1. Click **User Set Control**, and select a user set in **User Set Selector**. Here we take selecting **User Set 1** as an example.
2. Click **Execute** in **User Set Load** to load parameters to the camera, as shown below.

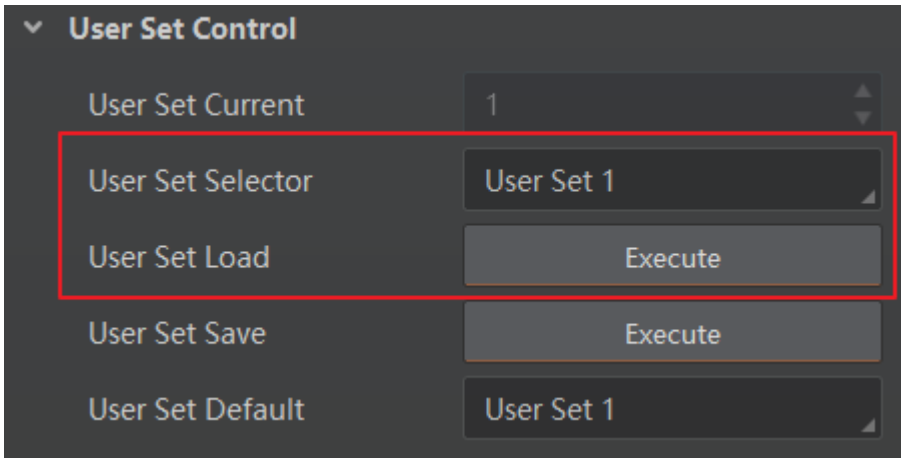

Figure 12-13 Load User Set

NOTE

Loading parameters is available when connecting with camera, but without acquisition.

- **Set User Default**

You can also set default parameter by selecting parameter from drop-down list of **User Set Default**, as shown below.

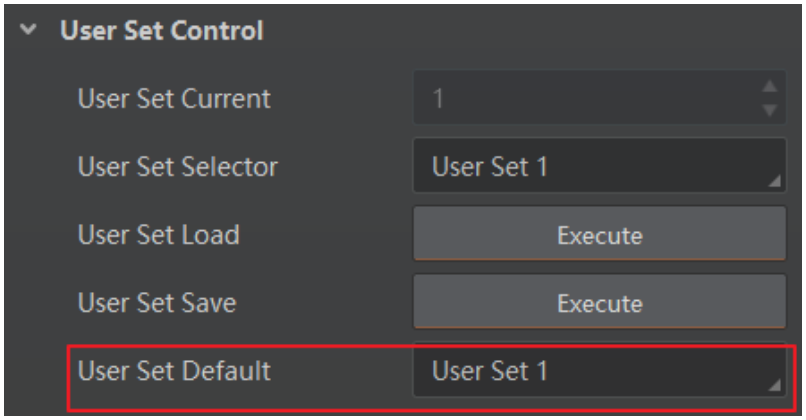

Figure 12-14 Set User Default

12.8 Update Firmware

The camera supports updating firmware via the MVS client software.

NOTE

- Before updating, make sure power cable and others are properly connected.
- Use the firmware package of the corresponding camera model for updating.

Steps:

1. Click **Tool > Firmware Updater** to open the update interface.
2. Select corresponding device type like GigE, USB, or Camera Link.
3. Click to select the camera you want to update.
4. Click to select the update file in the local computer.
5. Click **Update** to start updating.

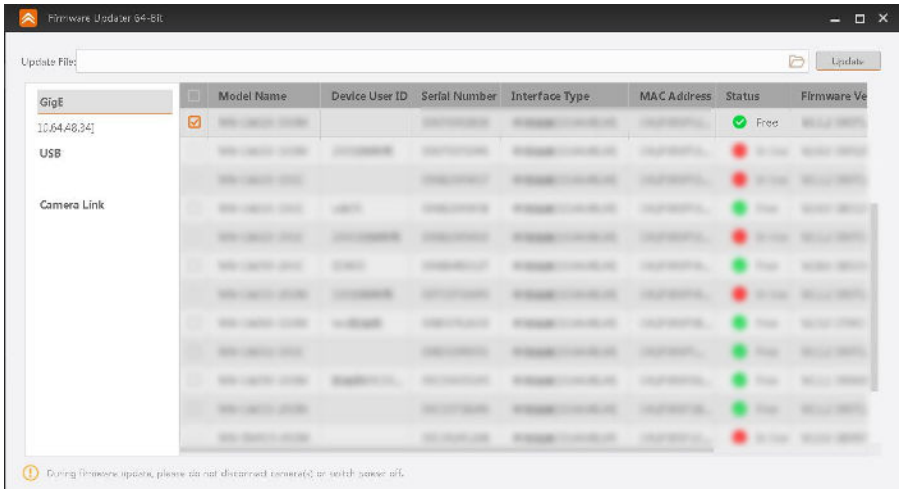

Figure 12-15 Update Firmware

NOTE

- The camera will reboot automatically after updating the firmware.
- The firmware updating process may take a few minutes, please wait patiently.
- During firmware updating, do not disconnect the camera or switch power off.

Chapter 13 Trouble Shooting

Table 13-1 Trouble Shooting

No.	Trouble	Possible Reason	Solution
1	No camera found when running the MVS client software.	Camera is not started up normally, or network cable connection error.	Check camera power wiring (observe the indicator), and check network connection.
2	Camera connection error.	Camera and client software are not in the same network segment.	Use MVS IP Configurator tool to find the camera and edit its IP address.
3	Live view is black.	Aperture is closed, or the camera exception occurs.	Open the aperture or reboot the camera.
4	Live view is normal, but the camera cannot be triggered.	Incorrect wiring or the trigger mode is not enabled.	1. Check whether the camera trigger mode and related trigger signal input are normal in the current environment.
			2. Check whether the wiring is correct under corresponding triggering mode.
5	The gigabit Ethernet becomes the fast Ethernet.	The network cable is damaged.	Check whether the network cable is damaged.

Chapter 14 Revision History

Table 14-1 Revision History

Version No.	Document No.	Date	Revision Details
V3.4.49	UD26068B	Nov. 3, 2021	● Modify Section Appearance. ● Modify Section Second Type of Pin Definitions. ● Modify Section Installation Preparation. ● Modify Section LSC Correction.
V3.4.38	UD24434B	Jun. 16, 2021	● Modify section Appearance. ● Add section Rolling Shutter. ● Add section Sensor Shutter Mode. ● Modify section Set LUT. ● Modify section Set Shading Correction. ● Modify section Device Control. ● Modify section File Access Control.
V3.4.28	UD21670B	Oct. 16, 2020	● Add section Overview. ● Modify section Appearance. ● Modify section Set External Trigger Source. ● Add section Set Anyway Trigger. ● Modify section Set Test Pattern. ● Modify section Device Control. ● Add section Set Multicast. ● Modify section Transport Layer Control.
V1.0.0	UD12962B	Jan. 9, 2019	Original version.

Appendix A Camera Parameter Index

Table Appendix A-1 Camera Parameter Index

Attribute	Parameter	Section
Device Control	Device Type	Section Device Control
	Device Scan Type	
	Device Vendor Name	
	Device Model Name	
	Device Manufacturer Info.	
	Device Version	
	Device Firmware Version	
	Device Serial Number	
	Device ID	
	Device User ID	
	Device Uptime (s)	
	Board Device Type	
	TEC Enable	
	TEC Temperature	
	Fan Control Mode	
	Fan Speed	
	Device Connection Selector	
	Device Connection Speed (Mbps)	
	Device Link Selector	
	Device Link Speed (Mbps)	
	Device Link Connection Count	
	Device Link Heartbeat Mode	
	Device Stream Channel Count	
	Device Stream Channel Selector	
	Device Stream Channel Type	

	Device Stream Channel Link	
	Device Stream Channel Endianness	
	Device Stream Channel Packet Size (B)	
	Device Event Channel Count	
	Device Character Set	
	Device Reset	
	Device Temperature Selector	
	Device Temperature	
	Find Me	
	Device Max Throughput (Kbps)	
	Device PJ Number	
Image Format Control	Width Max	Section View Resolution & Set ROI
	Height Max	
	Region Selector	
	Width	
	Height	
	Offset X	
	Offset Y	
	Reverse X	Section Set Image Reverse
	Reverse Y	
	Pixel Format	Section Set Pixel Format
	Pixel Size	
	Test Pattern Generator Selector	Section Set Test Pattern
	Test Pattern	
	Binning Selector	Section Set Binning
	Binning Horizontal	
	Binning Vertical	
	Decimation Horizontal	Section Set Decimation

	Decimation Vertical	
	Embedded Image Info Selector	Section Embedded Information in Image
	Frame Spec Info	
Acquisition Control	Acquisition Mode	Section Set Frame Rate
	Acquisition Stop	
	Acquisition Burst Frame Count	
	Acquisition Frame Rate (Fps)	
	Acquisition Frame Rate Control Enable	
	Resulting Frame Rate (Fps)	
	Trigger Selector	Section External Trigger Mode
	Trigger Mode	
	Trigger Software	
	Trigger Source	
	Trigger Activation	
	Trigger Delay (μs)	
	Trigger Cache Enable	
	Sensor Shutter Mode	Section Sensor Shutter Mode
	Exposure Mode	Section Set Exposure Time Mode & Set Exposure Auto
	Exposure Time Mode	
	Exposure Time (μs)	
	Exposure Auto	
	Auto Exposure Time Lower Limit (μs)	
	Auto Exposure Time Upper Limit (μs)	
	HDR Enable	Section Set HDR
	HDR Selector	
	HDR Shutter (μs)	
	HDR Gain	

Analog Control	Gain (dB)	Section Set Gain
	Gain Auto	
	Auto Gain Lower Limit (dB)	
	Auto Gain Upper Limit (dB)	
	Digital Shift	
	Digital Shift Enable	
	Brightness	Section Set Brightness
	Black Level	Section Set Black Level
	Black Level Enable	
	Balance White Auto	Section Set White Balance
	AWB Color Temperature Mode	
	Balance Ratio Selector	
	Balance Ratio	
	Gamma	Section Set Gamma Correction
	Gamma Selector	
	Gamma Enable	
	Sharpness Enable	Section Set Sharpness
	Sharpness	
	Auto Function AOI Selector	Section Set AOI
	Auto Function AOI Width	
	Auto Function AOI Height	
	Auto Function AOI Offset X	
	Auto Function AOI Offset Y	
	Auto Function AOI Usage Intensity	
	Auto Function AOI Usage White Balance	
Color Transformation	Color Transformation Selector	Section Set Color Transformation Control
	Color Transformation Enable	

Control	Color Transformation Value Selector	
	Color Transformation Value	
	Hue	Section Set Hue
	Hue Enable	
	Saturation	Section Set Saturation
	Saturation Enable	
LUT Control	LUT Selector	Section Set LUT
	LUT Enable	
	LUT Index	
	LUT Value	
	LUT Save	
Shading Correction	NUC Enable	Section Set Shading Correction
	FPNC Enable	
	PRNUC Enable	
	Shading Selector	
	Activate Shading	
	LSC Table Selector	
	LSC Target Enable	
	LSC Target R	
	LSC Target G	
	LSC Target B	
	LSC Enable	
	LSC Sequencer Enable	
	LSC Sequencer Reset	
	LSC Sequencer Number	
	LSC Sequencer Manual Enable	
	LSC Sequencer Selector	
	LSC Sequencer Table	

	FFC Target Enable	
	FFC Target	
	FFC Enable	
Digital IO Control	Line Selector	Section I/O Output
	Line Mode	
	Line Inverter	
	Line Status	
	Line Status All	
	Line Debouncer Time (μs)	
	Line Source	
	Strobe Enable	
	Strobe Line Duration (μs)	
	Strobe Line Delay (μs)	
	Strobe Line Pre Delay (μs)	
Counter And Timer Control	Counter Selector	Section Set Counter Trigger
	Counter Event Source	
	Counter Reset Source	
	Counter Reset	
	Counter Value	
	Counter Current Value	
File Access Control	File Selector	Section File Access Control
	File Operation Selector	
	File Operation Execute	
	File Open Mode	
	File Operation Status	
	File Operation Result	
	File Size (B)	
Event Control	Event Selector	Section Set Event Control

	Event Notification	
Transport Layer Control	Paylode Size (B)	Section Transport Layer Control
	GEV Version Major	
	GEV Version Minor	
	GEV Device Mode Is Big Endian	
	GEV Device Mode Character Set	
	GEV Interface Selector	
	GEV MAC Address	
	GEV Supported Option Selector	
	GEV Supported Option	
	GEV Current IP Configuration LLA	
	GEV Current IP Configuration DHCP	
	GEV Current IP Configuration Persistent IP	
	DEV PAUSE Frame Reception	
	GEV Current IP Address	
	GEV Current Subnet Mask	
	GEV Current Default Gateway	
	GEV First URL	
	GEV Second URL	
	GEV Number Of Interfaces	
	GEV Persistent IP Address	
	GEV Persistent Subnet Mask	
	GEV Persistent Default Gateway	
	GEV Link Speed	
	GEV Message Channel Count	
	GEV Stream Channel Count	

	GEV Heartbeat Timeout (ms)	
	GEV Heartbeat Disable	
	GEV Timestamp Tick Frequency (Hz)	
	Timestamp Control Latch	
	Timestamp Control Reset	
	Timestamp Control Latch	
	Timestamp Value	
	GEV CCP	
	GEV MCP Host Port	
	GEV MCDA	
	GEV MCTT (ms)	
	GEV MCRC	
	GEV MCSP	
	GEV Stream Channel Selector	
	GEV SCP Interface Index	
	GEV SCP Host Port	
	GEV SCP Direction	
	GEV SCPS Fire Test Packet	
	GEV SCPS Do Not Fragment	
	GEV SCPS Big Endian	
	GEV SCPS Packet Size (B)	
	GEV SCPD	
	GEV SCDA	
	GEV SCSP	
	GEV GVSP Extended ID Mode	
User Set Control	User Set Current	Section Save and Load User Set
	User Set Selector	
	User Set Load	

	User Set Save	
	User Set Default	

See Far, Go Further

UD26068B