

GigE Area Scan Camera

User Manual

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FCC Conditions

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

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

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

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Table of Contents

Chapter 1 Overview	0
1.1 Introduction	0
1.2 Key Feature	0
Chapter 2 Appearance	1
Chapter 3 Interface and Indicator	4
3.1 Interface Description	4
3.2 Indicator Description	6
Chapter 4 Camera Installation	7
4.1 Installation Preparation	7
4.2 Install Camera	7
Chapter 5 Camera Connection	8
5.1 Install MVS Client	
5.2 Turn off Firewall	9
5.3 Set PC Network	
5.4 Set Camera Network	
5.5 Connect Camera to Client Software	
Chapter 6 Client Software Layout	13
Chapter 6 Client Software Layout	16
Chapter 6 Client Software Layout Chapter 7 Camera Features	16 16
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter	16
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter	16
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode	16 16 16 17 18
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure	16 16 16 17 18 18
 Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure 	16 16 16 17 18 18 19
 Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure	16 16 16 17 18 18 19 20
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure 7.4.2 Overlap Exposure Chapter 8 Image Acquisition	16 16 16 17 18 18 19 19 20 20
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure 7.4.2 Overlap Exposure 8.1 Set Frame Rate	16 16 16 17 18 18 19 19 20 20 21
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure 7.4.2 Overlap Exposure 8.1 Set Frame Rate 8.2 Set Acquisition Mode	16 16 16 17 18 18 19 20 20 21 21
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure 7.4.2 Overlap Exposure 8.1 Set Frame Rate 8.2 Set Acquisition Mode 8.3 Set Trigger Mode	16 16 16 17 18 18 19 20 20 21 21 21 22
Chapter 6 Client Software Layout Chapter 7 Camera Features 7.1 Global Shutter 7.2 Rolling Shutter 7.3 Sensor Shutter Mode 7.4 Non-Overlap Exposure and Overlap Exposure 7.4.1 Non-Overlap Exposure 7.4.2 Overlap Exposure Chapter 8 Image Acquisition 8.1 Set Frame Rate 8.2 Set Acquisition Mode 8.3 Set Trigger Mode 8.4 External Trigger Mode	16 16 16 17 18 19 20 21 21 22 22 22 22 22 22 22 22

8.4.4 Set Counter Trigger	25
8.4.5 Set Action Command Trigger	26
8.4.6 Set Anyway Trigger	27
8.5 Trigger Related Parameters	27
8.5.1 Set Burst Frame Count	28
8.5.2 Set Trigger Delay	28
8.5.3 Set Trigger Cache Enable	29
8.5.4 Set Trigger Activation	
8.5.5 Set Trigger Debouncer	
8.6 Set Event Control	32
8.7 Set Action Command	
Chapter 9 I/O Output	36
9.1 Select Output Signal	
9.2 Set Output Signal	
9.2.1 Enable Level Inverter	
9.2.2 Enable Strobe Signal	
Chapter 10 I/O Electrical Feature and Wiring	42
10.1 I/O Electrical Feature	42
10.1 I/O Electrical Feature 10.1.1 Line 0 Opto-isolated Input Circuit	
	42
10.1.1 Line 0 Opto-isolated Input Circuit	42 43
10.1.1 Line 0 Opto-isolated Input Circuit 10.1.2 Line 1 Opto-isolated Output Circuit	42 43 44
10.1.1 Line 0 Opto-isolated Input Circuit 10.1.2 Line 1 Opto-isolated Output Circuit 10.1.3 Line 2 Bi-direction I/O Circuit	42 43 44 47
10.1.1 Line 0 Opto-isolated Input Circuit 10.1.2 Line 1 Opto-isolated Output Circuit 10.1.3 Line 2 Bi-direction I/O Circuit 10.2 I/O Wiring	
10.1.1 Line 0 Opto-isolated Input Circuit 10.1.2 Line 1 Opto-isolated Output Circuit 10.1.3 Line 2 Bi-direction I/O Circuit 10.2 I/O Wiring 10.2.1 Line 0 Wiring	
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 48 49
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 49
 10.1.1 Line 0 Opto-isolated Input Circuit 10.1.2 Line 1 Opto-isolated Output Circuit 10.1.3 Line 2 Bi-direction I/O Circuit 10.2 I/O Wiring 10.2.1 Line 0 Wiring 10.2.2 Line 1 Wiring 10.2.3 Line 2 Wiring Chapter 11 Image Parameter	
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 52 52 52
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 52 52 52 52 53
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 52 52 52 52 52 52 52
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 52 52 52 52 52 52 52 52 52 52 52 53
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 49 52 52 52 52 52 52 52 52 52 52 52 52 52
 10.1.1 Line 0 Opto-isolated Input Circuit	42 43 44 47 47 47 48 49 52 52 52 52 52 52 52 52 52 52 52 52 52 52

11.10 Set Exposure Time Mode	60
11.11 Set Exposure Auto	61
11.12 Set HDR	62
11.13 Set Gain	63
11.13.1 Set Analog Gain	63
11.13.2 Set Digital Gain	64
11.14 Set Brightness	64
11.15 Set Black Level	65
11.16 Set White Balance	65
11.17 Set Gamma Correction	67
11.18 Set Sharpness	68
11.19 Set Digital Noise Reduction	69
11.20 Set Channel Correct Mode	69
11.21 Set Contrast Ratio	69
11.22 Set AOI	70
11.23 Set Color Transformation Control	71
11.24 Set Hue	71
11.25 Set Saturation	
11.26 Set Super Palette Control	73
11.27 Set LUT	73
11.28 Set Shading Correction	74
Chapter 12 Other Functions	76
12.1 Device Control	76
12.2 Embedded Information in Image	78
12.3 Set Multicast	81
12.4 File Access Control	83
12.5 Transport Layer Control	84
12.6 Transfer Control	89
12.7 Set Fan	
12.8 Save and Load User Set	90
12.9 Update Firmware	92
12.10 Encrypt Device via Dongle Tool	93
Chapter 13 Trouble Shooting	94
Chapter 14 Revision History	95
Appendix A Camera Parameter Index	97

Chapter 1 Overview

1.1 Introduction

The GigE area scan camera uses the GigE interface to transmit non-compressed images in real time, and it acquires images and sets parameters via the client software or SDK. The GigE area scan 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.

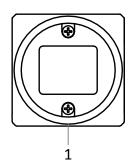
1.2 Key Feature

- 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 GigE interface and max. transmission distance of 100 meters without relay.
- Compatible with the GigE Vision Protocol, the GenlCam Standard, and the third-party software based on the protocol and standard.

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

Chapter 2 Appearance

Appearances here are for reference only. Refer to the camera's specification for detailed dimension information.



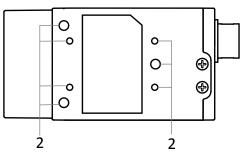
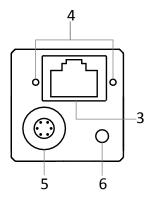
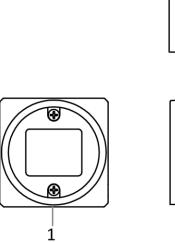
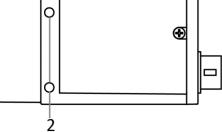
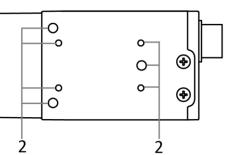


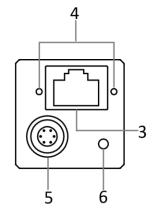
Figure 2-1 Appearance (Type I)

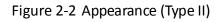


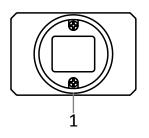












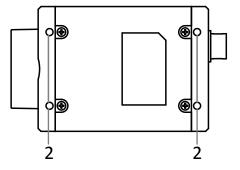
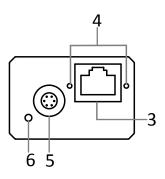
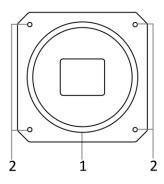


Figure 2-3 Appearance (Type III)





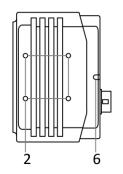
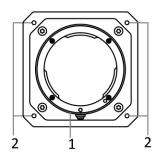
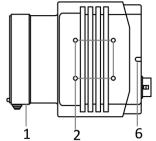


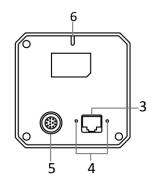
Figure 2-4 Appearance (Type IV)

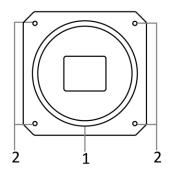
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1 2 6 Figure 2-5 Appearance (Type V)





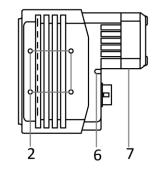
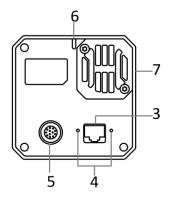
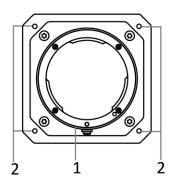
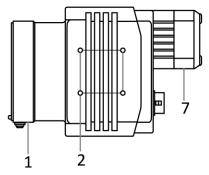


Figure 2-6 Appearance (Type VI)







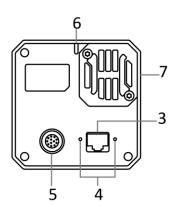


Figure 2-7 Appearance (Type VII)

Table 2-1 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	Gigabit Ethernet Interface	It refers to the gigabit Ethernet interface for transmitting data.
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.
7	Fan	It is used to cool the camera.

Chapter 3 Interface and Indicator

3.1 Interface Description

There are 2 types of power and I/O interfaces, including 6-pin and 12-pin power and I/O interfaces. Read the followings to get pin definitions.

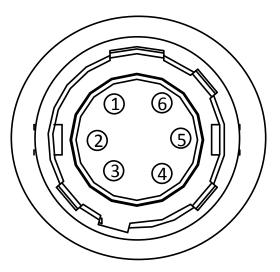


Figure 3-1 6-Pin Interface

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

No.	Signal	I/O Signal Source	e Description	
1	DC_PWR		Camera power supply	
2	OPTO_IN	Line 0+	Opto-isolated input	
3	GPIO	Line 2+	Can be configured as input or output	
4	OPTO_OUT	Line 1+	Opto-isolated output	
5	OPTO_GND	Line 0/1-	Opto-isolated signal ground	
6	GND	Line 2-	Camera power supply ground	

Table 3-1 Pin Definitions (6-Pin)

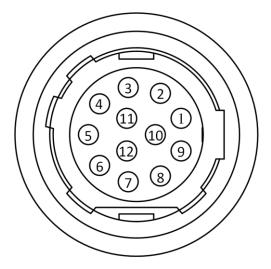


Figure 3-2 12-Pin Interface

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

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		
6	Reserved				
7	Reserved				
8	RS-232_RX		RS-232 received data		
9	RS-232_TX		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		

Table 3-2 Pin Definitions (12-Pin)

3.2 Indicator Description

The camera indicator is used to display different camera status.

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.		

- 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 Camera Installation

4.1 Installation Preparation

You need to prepare following accessories before camera installation.

No.	Name	Quantity	Description
1	Power and I/O Cable	1	It refers to the 6-pin or 12-pin power and I/O cable. You need to purchase separately.
2	Network Cable	1	It refers to CAT-5e network cable or above. You need to purchase separately.
3	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.
4	Lens	1	It refers to the lens that matches with lens mount of the camera. You need to purchase separately.
5	Adapter Ring	1	If the lens you used does not match with lens mount of the camera, you need to use an adapter ring. You need to purchase separately.

Table 4-1 Accessories

4.2 Install Camera

Before you start

Make sure all the related devices are power-off during the installation.

Steps:

- 1. Fix the camera to the installation position.
- 2. Install the lens to the camera.
- 3. Use a network cable to connect the camera with a switch or a network interface card.
- 4. Select a power supply method.

• Direct supply: Use the 6-pin or 12-pin power and I/O cable to connect the camera to a power adapter.

• PoE (Power over Ethernet): For the camera that supports PoE, use a network cable to connect the camera to a switch that supports PoE or a network interface card.

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.

- The MVS client software is compatible with 32/64-bit Windows XP/7/10, 32/64-bit Linux, and 64-bit MacOS operating systems. Here we take Windows as an example.
- 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.

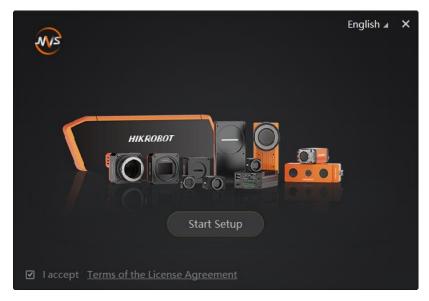


Figure 5-1 Installation Interface

4. Click Start Setup.

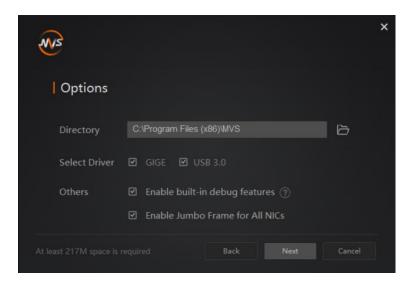


Figure 5-2 Default Settings

- 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.

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).



O Turn on Windows Defender Firewall

Block all incoming connections, including those in the list of allowed apps
 Notify me when Windows Defender Firewall blocks a new app



Turn off Windows Defender Firewall (not recommended)

Figure 5-3 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.

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**.

Device List	44
* 🕑 🛱 🖬	
√ GigE	
[10.6.113.13]	
> USB	NIC Settings
Camera Link	Add Remote Camera

Figure 5-4 NIC Settings

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

NIC Configurator 64-Bit			_ ×
NIC(s):	Intel(F	R) Ethernet	Conn
Jumbo Frame		Enable	
Receive Buffers	2048		▲ ▼
Transmit Buffers	2048		▲ ▼
NIC Properties		Open	
Internet Protocol Properties		Open	
		Apply	Cancel

Figure 5-5 NIC Configurator

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.

Modify IP Address				
Modify IP address to make device reachable. 10.64.58.1 - 10.64.58.254				
 Static IP 				
IP address:	10.64.58.150			
Subnet Mask:				
Default GateWay:				
O DHCP				
🔿 LLA				
	OK Cano	el		

Figure 5-6 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.

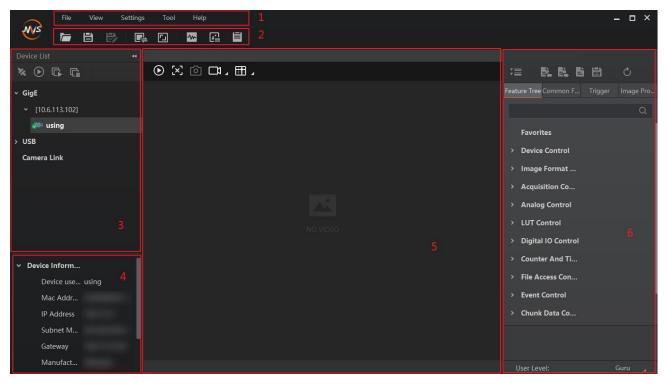


Figure 6-1 Main Window

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

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.	

Table 6-1 Description of the Main Window

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

The camera's attribute tree and parameters may differ by camera models.

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.
Action Control	You can view and set the device's action control related parameters.
Counter And Timer Control	You can view and set the counter related parameters.

Table 6-2 Description

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.
Chunk Data Control	You can view and set the device's chunk data control related parameters to generate supplementary image data and append that data to every image that you acquire.
Transport Layer Control	You can view and set the parameters of the device's transport layer.
Transfer Control	You can view the device's transfer sources, transfer mode, queue information, etc.
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.

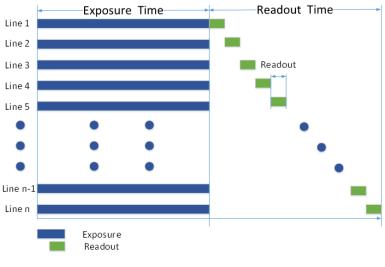


Figure 7-1 Global Shutter

7.2 Rolling Shutter

For cameras that support rolling shutter: as soon as the exposure ends, and the data readout starts simultaneously. After the whole action, the rest of rows start to expose and read out one by one. All pixels expose at the same time, then readout at different time, as shown below.

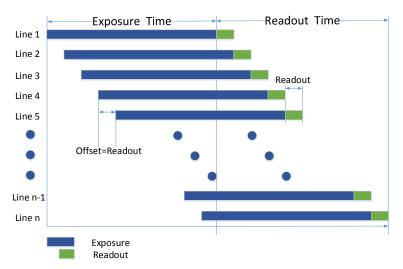


Figure 7-2 Rolling Shutter

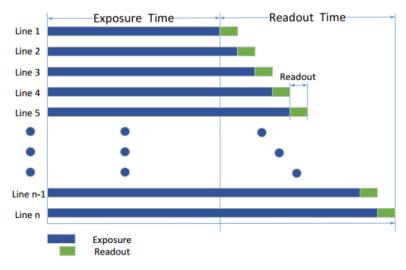
7.3 Sensor Shutter Mode

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.





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.

Trigger Cache Enable	Rolling
Sensor Shutter Mode	Global Reset
Exposure Mode	Trigger Rolling

Figure 7-4 Sensor Shutter Mode

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

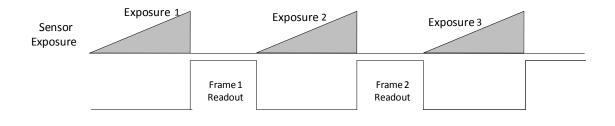


Figure 7-5 Internal Trigger Non-Overlap Exposure

• Non-overlap Exposure under External Trigger Mode

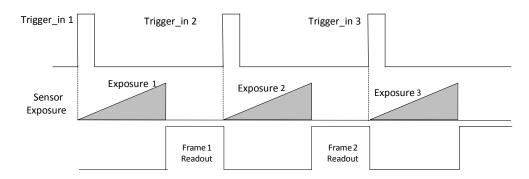


Figure 7-6 External Trigger Non-Overlap Exposure

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

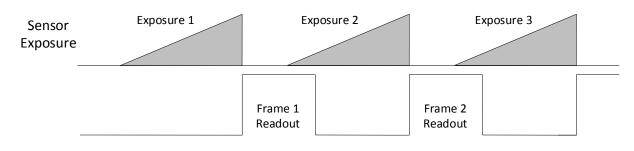


Figure 7-7 Internal Trigger Overlap Exposure

• Overlap Exposure under External Trigger Mode

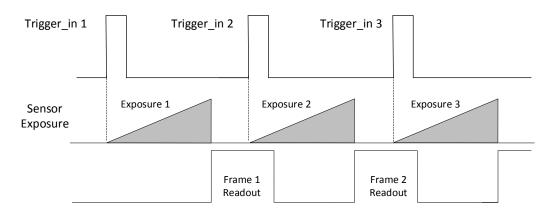


Figure 7-8 External Trigger Overlap Exposure

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 5 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.
- Image compression mode: This function is used to compress data before transmitting to the PC, and increase the frame rate to some extent.

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

 Acquisition Control 	
Acquisition Mode	Continuous
Acquisition Start	Execute
Acquisition Stop	Execute
Acquisition Burst Frame Count	
Acquisition Frame Rate(Fps)	16.00
Acquisition Frame Rate Control Enable	
Resulting Frame Rate(Fps)	16.00
Reference Frame Rate	

Figure 8-1 Set Frame Rate

When you enable the image compression mode (refer to section **Set Image Compression Mode** for details), you can view the **Reference Frame Rate** that is a reference rate calculated according to bandwidth and the compression ratio.

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

- 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.

 Acquisition Control 		
Acquisition Mode	Continuous	
Acquisition Start	SingleFrame	
Acquisition Stop	Execute	

Figure 8-2 Set Acquisition Mode

The acquisition mode is **Continuous** by default.

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.

Trigger Selector	Frame Burst Start
Trigger Mode	Off
Trigger Source	Off
Trigger Activation	On
Trigger Delay(us)	0.00

Figure 8-3 Set Trigger Mode

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

External Trigger Source	Parameter	Parameter Value	Principle
Software trigger	Acquisition Control > Trigger Source	Software	The software sends trigger signal to the camera via 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.
Action command trigger	Acquisition Control > Trigger Source	Action 1	The action command sends trigger signal to the camera

Table 8-1	Principle and	Parameter	of External	Trigger Mode
	Findple and	Farameter		ingger woue

External Trigger Source	Parameter	Parameter Value	Principle
			to acquire images.
Software trigger, hardware trigger, counter, and action command	Acquisition Control > Trigger Source	Anyway	Use software trigger, hardware trigger, counter or action command to send trigger signal to the camera to acquire images.

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

Trigger Selector	Frame Burst Start
Trigger Mode	On
Trigger Source	Counter 0
Trigger Activation	Software
Trigger Delay(us)	Line 0
Exposure Mode Exposure Time(us)	Line 2
	Counter 0
	Action 1
Exposure Auto	Anyway

Figure 8-4 Set Trigger Source

These 5 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.

Trigger Selector	Frame Burst Start
Trigger Mode	On
Trigger Software	Execute
Trigger Source	Software
Trigger Delay(us)	0.00
Trigger Cache Enable	

Figure 8-5 Set Software Trigger

8.4.3 Set Hardware Trigger

The camera has 1 Opto-isolated input (Line 0), and 1 bi-directional I/O (Line 2) that can be configured as input signal, as shown below.

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.

 Digital IO Control 	
Line Selector	Line 2
Line Mode	Input

Figure 8-6 Set Line2 as Input Signal

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

Trigger Selector	Frame Burst Start
Trigger Mode	On 🖌
Trigger Source	Line 0
Trigger Activation	Rising Edge
Trigger Delay(us)	0.00
Trigger Cache Enable	

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.

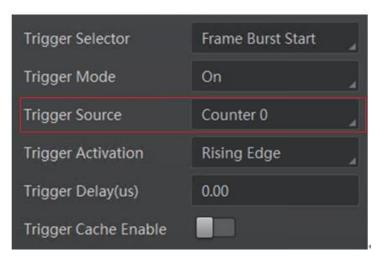


Figure 8-8 Set Counter Trigger

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.

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.

Table 8-2 Description of Counter And Timer Control

Parameter	Read/Write	Description
Counter Current Value	Read only	It displays the number of executed external trigger.
*	Counter And Timer Contr	trol
	Counter Selector	Counter 0
	Counter Event Source	Line 0
	Counter Reset Source	Software
	Counter Reset	Execute
	Counter Value	1
	Counter Current Value	0

Figure 8-9 Counter Trigger Parameters

8.4.5 Set Action Command Trigger

When you need to use the function of action commands, you should set action command trigger first.

Steps:

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

Trigger Selector	Frame Burst Start
Trigger Mode	On
Trigger Source	Action 1
Trigger Delay(us)	0.00
Trigger Cache Enable	
Exposure Mode	Timed

Figure 8-10 Set Action Command Trigger

For specific function of action commands, please refer to the section **Set Action Command** for details.

8.4.6 Set Anyway Trigger

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

Steps:

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

Trigger Selector	Frame Burst Start
Trigger Mode	On
Trigger Software	Execute
Trigger Source	Anyway
Trigger Activation	Rising Edge
Trigger Delay(us)	0.00
Trigger Cache Enable	

Figure 8-11 Set Anyway 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.

Trigger Source Trigger Parameter	Software Trigger	Hardware Trigger	Counter Trigger	Action Command Trigger	Any Trigger
Burst Frame Count	v	V	v	v	v
Trigger Delay	v	V	v	v	v
Trigger Cache Enable	v	V	V	v	v
Trigger Activation	×	V	V	×	v
Trigger Debouncer	×	٧	٧	×	v

Table 8-3 Trigger Source and Trigger Parameter

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.

 Acquisition Control 	
Acquisition Mode	Continuous
Acquisition Stop	Execute
Acquisition Burst Frame Count	1 2
Acquisition Frame Rate(Fps)	25.18

Figure 8-12 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.

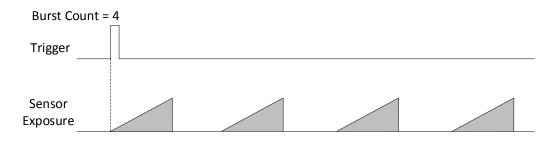


Figure 8-13 Sequence Diagram of Burst Frame Count

8.5.2 Set Trigger Delay

From camera receiving signal and responding, this period is trigger delay. Its sequence diagram is shown below.

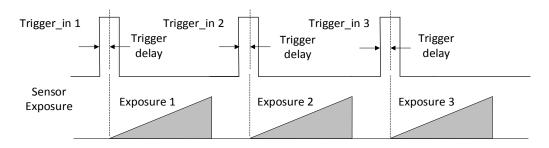


Figure 8-14 Signal Delay Sequence Diagram

Trigger Selector	Frame Burst Start
Trigger Mode	On
Trigger Source	Line 0
Trigger Activation	Rising Edge
Trigger Delay(us)	0.00
Trigger Cache Enable	

You can set proper value in **Trigger Delay**, and its range is from 0 µs to 16000000 µs.

Figure 8-15 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.

Trigger Selector	Frame Burst Start 🛛 🔏
Trigger Mode	On 🔒
Trigger Source	Line 0
Trigger Activation	Rising Edge 🛛
Trigger Delay(us)	0.00
Trigger Cache Enable	

Figure 8-16 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, or level low of the external signal. The principle and parameter of trigger activation are shown below.

Trigger Activation	Parameter	Parameter Value	Principle
Rising Edge	Acquisition Control > Trigger Activation	Rising Edge	Rising Edge refers to the rising edge of the trigger signal is valid, that is camera exposure and acquisition at the beginning of the rising edge of the trigger signal.
Falling Edge	Acquisition Control > Trigger Activation	Falling Edge	Falling Edge refers to the falling edge of the trigger signal is valid, that is camera exposure and acquisition at the beginning of the falling edge of the trigger signal.
Level High	Acquisition Control > Trigger Activation	Level High	Level High refers to the level high of the trigger signal is valid. As long as trigger signal is in level high, the camera keeps exposure and acquisition status.
Level Low	Acquisition Control > Trigger Activation	Level Low	Level Low refers to the level low of the trigger signal is valid. As long as trigger signal is in level low, the camera keeps exposure and acquisition status.

Table 8-4 Trigger Activation Principle and Parameter

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

GigE Area Scan Camera • User Manual

Trigger Selector	Frame Burst Start
Trigger Mode	On 🔒
Trigger Source	Line 0
Trigger Activation	Rising Edge
Trigger Delay(us)	Rising Edge
Trigger Cache Enable	Falling Edge
Evpoquea Moda	Level High
Exposure Mode	Level Low

Figure 8-17 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.

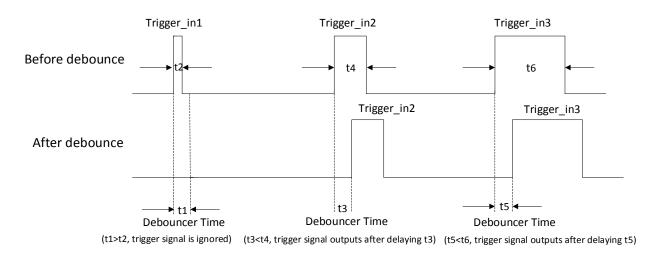


Figure 8-18 Trigger Debouncer Sequence Diagram

Click **Digital IO Control > Line Debouncer Time**, enter **Line Debouncer Time**, and its range is from 1 μs to 1000000 μs.

 Digital IO Control 	
Line Selector	Line 0
Line Mode	Input
Line Status	
Line Status All	0х6
Line Debouncer Time(us)	50

Figure 8-19 Set Trigger Debouncer

8.6 Set Event Control

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.

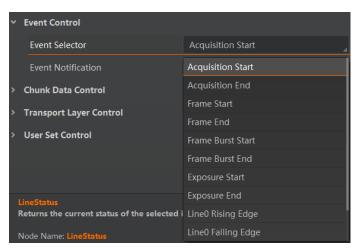


Figure 8-20 Select Event

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

GigE Area Scan Camera • User Manual

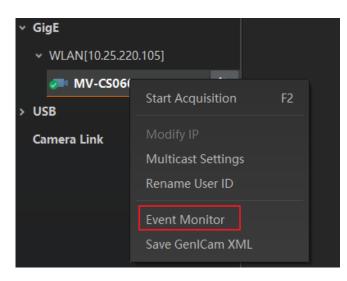


Figure 8-21 Click Event Monitor

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

Timestamp	Content	
2553.108	AcquisitionStart[ID:0x9000] ChannelID:0 Timestamp:0x4331ACA57A	

Figure 8-22 Event Monitor Interface

8.7 Set Action Command

The action command function may differ by camera models.

The action command allows you to execute actions on multiple cameras at roughly the same time by using a single broadcast protocol message.



- The action command function is available only with client software version of V3.1.0 and higher.
- If you want to send action commands that are executed in multiple cameras at exactly the same time, it is recommended to enable Gev IEEE 1588 first by clicking Transport Layer Control > Gev IEEE 1588.

Steps:

- 1. Click Tool > GigE Vision Action Command.
- 2. Select Network Interfaces to set the subnet that the command to be sent to.
- 3. Enter the **Device Key**, **Group Key**, and **Group Mask**.

GigE Vision A	ction Command		×
Network Ir	nterfaces		
	[10.64.48.34]	
Action Con	nmand		
Device Ke	у	000000000000	0000000
Group Key	(0x00000000	
Group Ma	sk	OxFFFFFFF	
Scheduled	k		
Benchmar	k Camera		
Delay Tim	e(ns)	20	
Periodical	ly Send		
		Start Sending	Close

Figure 8-23 Set Action Command

The specific contents entered in **Device Key** and **Group Key** should be the same with those in **Action Device Key** and **Action Group Key** of the **Action Control** feature. The bitwise AND operation of the **Group Mask** against the **Action Group Mask** feature should results in non-zero.

- 4. Enable Scheduled.
- 5. Click ^e in **Benchmark Camera** to select one camera as benchmark camera. Once benchmark camera is selected, other cameras keep time synchronization with it.
- 6. (Optional) Enter **Delay Time** according to actual demands.

- The delay time should NOT be shorter than the maximum time required to transmit the command across the network.
- When the benchmark camera receives the command, all the cameras will trigger certain actions simultaneously after the specified delay time.

7. (Optional) Enable **Periodically Send** to enable the client to send commands periodically, and enter **Sending Interval** according to actual demands.

The default value of sending interval is 1000 ms, and its range is from 1 ms to 3600000 ms.

8. (Optional) Enable **Request Acknowledgement** to display the acknowledgement messages.

Up to 50 messages can be displayed. Once the message quantity exceeds 50, the earliest message will be automatically deleted.

9. Click Start Sending.

Chapter 9 I/O Output

9.1 Select Output Signal

The camera has 1 opto-isolated output (Line 1), and 1 bi-directional I/O (Line 2) that can be configured as output signal. Here we take **Line 2** as an example.

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.

 Digital IO Control 		
Line Selector	Line 2	4
Line Mode	Strobe	
Line Inverter		

Figure 9-2 Enable Line Inverter

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**.



The specific line source may differ by camera models.

 Digital IO Control 	
Line Selector	Line 2
Line Mode	Strobe
Line Inverter	
Line Status	
Line Status All	0x2
Line Source	Exposure Start Active
Strobe Enable	Exposure Start Active
Strobe Enable Strobe Line Duration(us)	Exposure Start Active Acquisition Start Active
Strobe Line Duration(us)	
	Acquisition Start Active
Strobe Line Duration(us)	Acquisition Start Active Acquisition Stop Active
Strobe Line Duration(us) Strobe Line Delay(us)	Acquisition Start Active Acquisition Stop Active Frame Burst Start Active
Strobe Line Duration(us) Strobe Line Delay(us) Strobe Line Pre Delay(us)	Acquisition Start Active Acquisition Stop Active Frame Burst Start Active Frame Burst End Active
Strobe Line Duration(us) Strobe Line Delay(us) Strobe Line Pre Delay(us) • Action Control	Acquisition Start Active Acquisition Stop Active Frame Burst Start Active Frame Burst End Active Soft Trigger Active

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	The camera outputs signals to external devices when it starts exposure.
2	Exposure End Active	The camera outputs signals to external devices when it stops exposure.
3	Acquisition Start Active	The camera outputs signals to external devices when it starts acquiring images.

No.	Name	Description
4	Acquisition Stop Active	The camera outputs signals to external devices when it stops acquiring images.
5	Frame Trigger Wait	The camera outputs signals to external devices when it waits to be triggered.
6	Frame Start Active	The camera outputs signals to external devices when it starts doing the capture of a frame.
7	Frame End Active	The camera outputs signals to external devices when it stops doing the capture of a frame.
8	Frame Burst Start Active	The camera outputs signals to external devices when it starts doing the capture of many frames.
9	Frame Burst End Active	The camera outputs signals to external devices when it stops doing the capture of many frames.
10	Soft Trigger Out	The camera outputs signals to external devices when it has a software trigger.
11	Hard Trigger Active	The camera outputs signals to external devices when it has a hardware trigger.
12	Count Active	The camera outputs signals to external devices when it has a counter trigger.
13	Timer Active	The camera outputs signals to external devices when it has a timer trigger.

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**.

× 1	Digital IO Control		
	Line Selector	Line 2	4
	Line Mode	Strobe	
	Line Inverter		
	Line Status		
	Line Status All		
	Line Source	Exposure Start Active	
	Strobe Enable		
	Strobe Line Duration(us)	0	
	Strobe Line Delay(us)	0	

Figure 9-4 Set Strobe Line Duration

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.

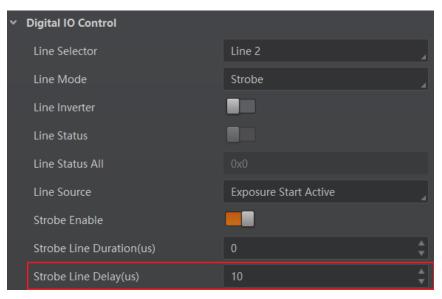
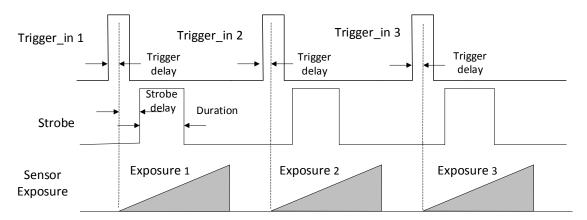


Figure 9-5 Set Strobe Line Delay



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.

 Digital IO Control 		
Line Selector	Line 2	4
Line Mode	Strobe	4
Line Inverter		
Line Status		
Line Status All		
Line Source	Frame Burst Start Active	4
Strobe Enable		
Strobe Line Duration(us)	2499849	
Strobe Line Delay(us)	0	
Strobe Line Pre Delay(us)	10	^

Figure 9-7 Set Strobe Line Pre Delay

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

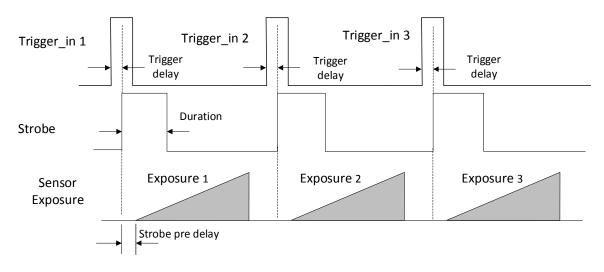


Figure 9-8 Sequence Diagram of Strobe Line Pre Delay

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.

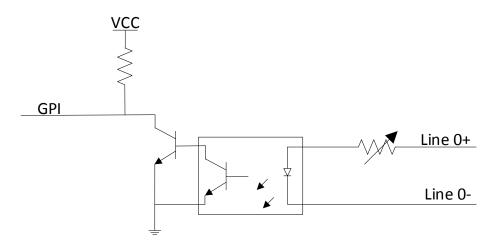


Figure 10-1 Line 0 Internal Circuit

The maximum input current of Line 0 is 25 mA.

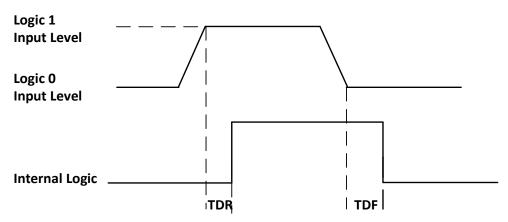


Figure 10-2 Input Logic Level

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

Table 10-1 Input Electrical Feature

- 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.

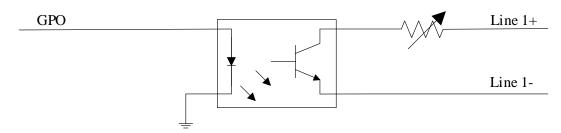


Figure 10-3 Line 1 Internal Circuit

The maximum output current of Line 1 is 25 mA.

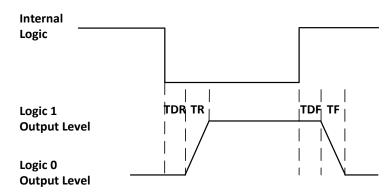


Figure 10-4 Output Logic Level

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

Parameter Name	Parameter Symbol	Value
Output Logic Level Low	VL	575 mV
Output Logic Level High	νн	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

Table 10-2 Output Electric Feature

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

		1 0	
External Voltage	External Resistance	VL	Output Current
3.3 VDC	1 ΚΩ	575 mV	2.7 mA
5 VDC	1 ΚΩ	840 mV	4.1 mA
12 VDC	2.4 ΚΩ	915 mV	4.6 mA
24 VDC	4.7 ΚΩ	975 mV	4.9 mA

Table 10-3 Parameter of Output Logic Level Low

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.

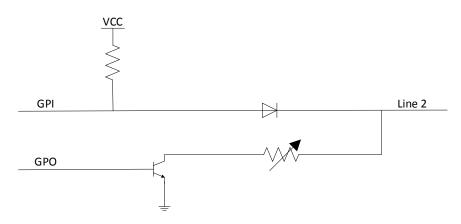


Figure 10-5 Line 2 Internal Circuit

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 output are shown below.

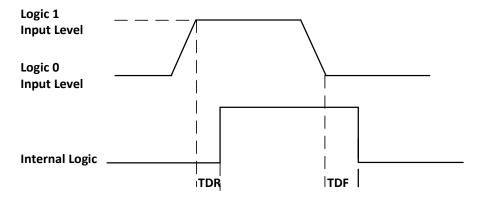


Figure 10-6 Input Logic Level

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	νн	3.3 VDC to 24 VDC
Input Rising Time	TDR	< 1 µs
Input Falling Time	TDF	< 1 µs

- 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.

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

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

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

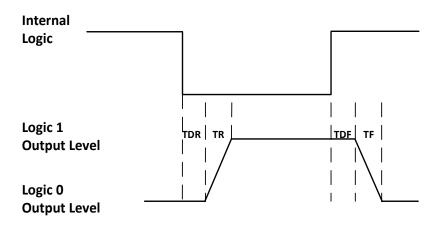


Figure 10-7 Output Logic Level

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

Table 10-6 Electrical Feature of Line 2 Output

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.

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

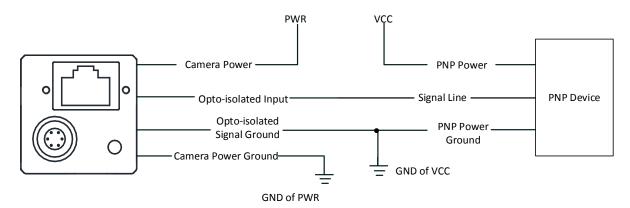


Figure 10-8 Line 0 Connecting to PNP Device

NPN Device

If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 K Ω pull-up resistor. If the VCC of NPN device is 12 VDC, and it is recommended to use 1 K Ω pull-up resistor.

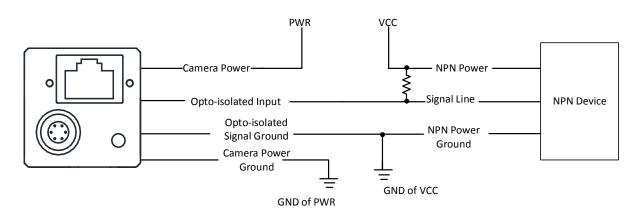


Figure 10-9 Line 0 Connecting to NPN Device

Switch

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

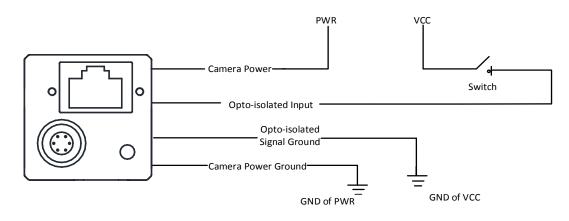


Figure 10-10 Line 0 Connecting to a Switch

10.2.2 Line 1 Wiring

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

• PNP Device

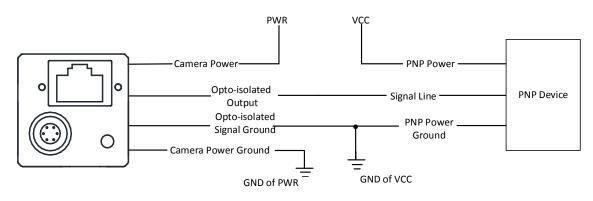


Figure 10-11 Line 1 Connecting to PNP Device

• 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 K Ω pull-up resistor.

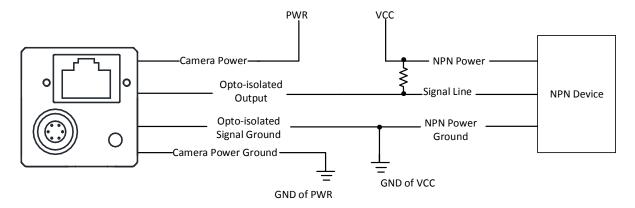


Figure 10-12 Line 1 Connecting to NPN Device

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 330Ω pull-down resistor.

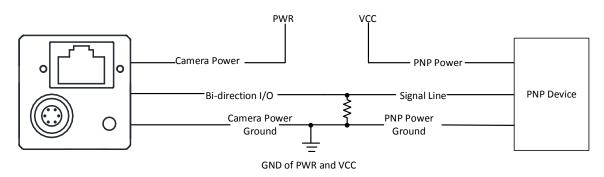
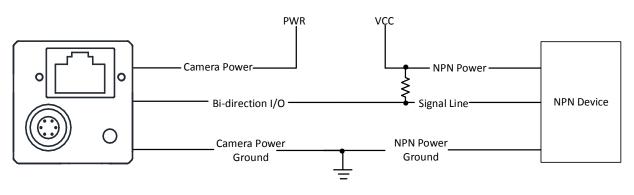


Figure 10-13 Line 2 Connecting to PNP Device as Input

NPN Device

If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 K Ω pull-up resistor. If the VCC of NPN device is 12 VDC, and it is recommended to use 1 K Ω pull-up resistor.

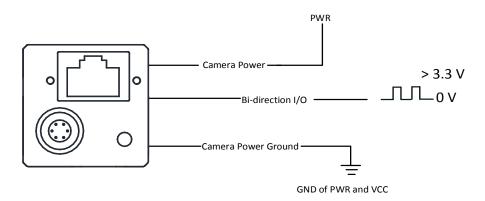


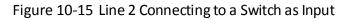
GND of PWR and VCC



• Switch

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





Line 2 Configured as Output

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

• PNP Device

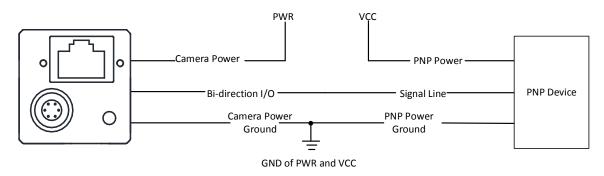


Figure 10-16 Line 2 Connecting to PNP Device as Output

• 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 K Ω pull-up resistor.

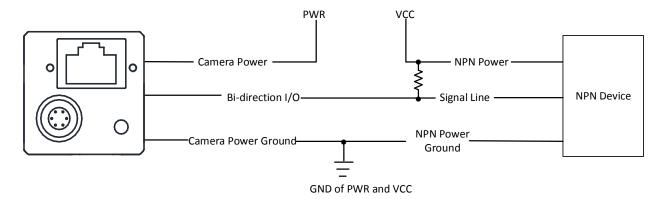


Figure 10-17 Line 2 Connecting to NPN Device as Output

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.

 Image Format Control 		
Width Max	9216	
Height Max	7000	

Figure 11-1 View Resolution

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

11.2 Set ROI

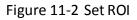
If you are only interested in a certain region of the image, you can set a Region of Interest (ROI) for the camera. Setting Region of Interest can reduce the bandwidth of the image being transmitted. Thus increasing the frame rate to some extent.

- 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.

 Image Format Control 		
Width Max		
Height Max	1200	
Region Selector	Region 0	4
Region Destination	Stream 0	4
Width	1920	
Height	1200	
Offset X	0	
Offset Y	0	



- 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

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.

 Image Format Control 		
Width Max		¢
Height Max		÷
Region Selector	Region 0	
Region Destination	Stream 0	
Width	1920	•
Height	1200	
Offset X	0	
Offset Y	0	
Reverse X		
Reverse Y		

Figure 11-3 Set Image Reverse

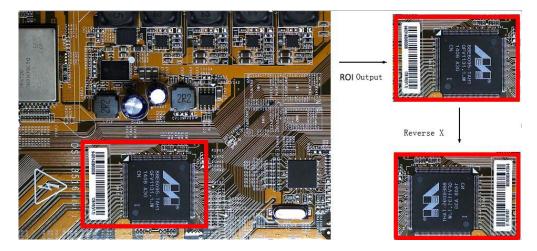


Figure 11-4 Image Reverse Comparison

11.4 Set Image Compression Mode

The function of the image compression is related with camera models, firmware and pixel format, and the actual product you purchased should prevail.

Without affecting image quality, this function allows the camera to compress data before transmitting to the PC, and increase the frame rate to some extent.

Click Image Format Control > Image Compression Mode, and select HB as Image Compression Mode.

You can select **Compression** or **Burst** as **High Bandwidth Mode** according to actual demands. **Compression** only compresses the image data, while **Burst** compresses the image data and increases the frame rate.

Image Compression Mode	НВ
High Bandwidth Mode	Compression

Figure 11-5 Set Image Compression Mode

You can view the mode's related parameters like **HB Abnormal Monitor** and **HB Version** in the device control attribute.

HB Abnormal Monitor	0
HB Version	1.0

Figure 11-6 HB Abnormal Monitor and Version

- HB abnormal monitor is used to monitor image stream condition. If the size of compressed image is larger than that of raw image under HB function, this parameter will increase. When this parameter increases rapidly, it is recommended to disable the image compression mode.
- HB version refers to the version of this function.

11.5 Set Pixel Format

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
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.

Pixel Format	YUV 422 (YUYV) Packec
Pixel Size	Mono 8
Test Pattern Generat	Mono 10
Test Dattern	Mono 12
Test Pattern	RGB 8
Binning Selector	YUV 422 (YUYV) Packed
Binning Horizontal	YUV 422 Packed
Binning Vertical	Bayer RG 8
Decimation Horizontal	Bayer RG 10
	Bayer RG 10 Packed
Decimation Vertical	Bayer RG 12
Embedded Image Inf	Timestamp

Figure 11-7 Set Pixel Format

11.6 Set Test Pattern

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.

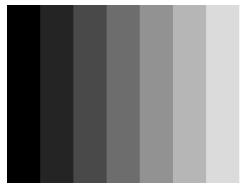
Click Image Format Control > Test Pattern, and set Test Pattern according to actual demands

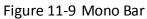
Test Pattern	Off
Binning Selector	Mono Bar
Binning Horizontal Binning Vertical Decimation Horizontal	Checkboard
	Oblique Mono Bar
	Gradual Mono Bar
	Test Image1

Figure 11-8 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.





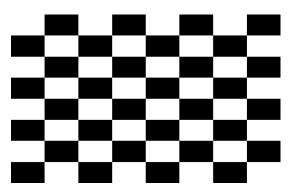


Figure 11-10 Checkboard

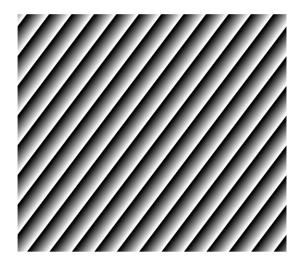


Figure 11-11 Oblique Mono Bar



Figure 11-12 Gradual Mono Bar

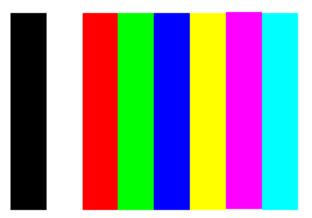


Figure 11-13 Vertical Color Bar



Figure 11-14 Horizontal Color Bar

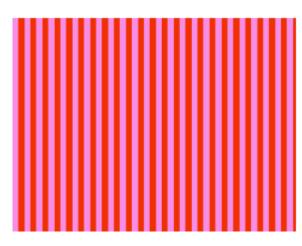


Figure 11-15 Test Image 1

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

11.7 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.

Binning Selector	Region 0	
Binning Horizontal	1	
Binning Vertical	1	

Figure 11-16 Set Binning

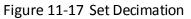
- **Binning Horizontal** refers to the image's width, and **Binning Vertical** refers to the image's height.
- The binning function may differ by camera models.

11.8 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.





- **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.

11.9 Set Exposure Mode

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.

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.

11.10 Set Exposure Time Mode

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.

Trigger Cache Enable	
Exposure Mode	Timed
Exposure Time Mode	UltraShort 🛛 🔏
Exposure Time(us)	Standard
Exposure Auto	UltraShort

Figure 11-18 Set Exposure Time Mode

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.

11.11 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.

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.

Table 11-2 Exposure Method and Principle	Table 11-2 Ex	oosure Method	and Principle
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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**.

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Exposure Mode	Timed
Exposure Time(us)	1546.00
Exposure Auto	Continuous
Auto Exposure Time Lower Limit(us)	34
Auto Exposure Time Upper Limit(us)	39204

Figure 11-19 Set Exposure Time under Once or Continuous Mode

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

11.12 Set HDR

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**.

HDR Enable	
HDR Selector	0 🌲
HDR Shutter(us)	15 🌲
HDR Gain	0.00

Figure 11-20 Set HDR

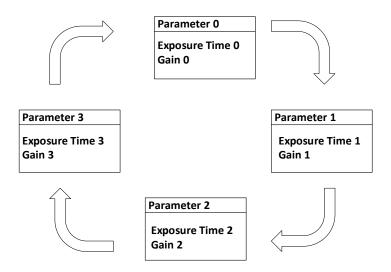


Figure 11-21 HDR Polling

11.13 Set Gain

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.

11.13.1 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.

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.

Table 11-3 Analog Gain Mode and Principle

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**.

~	Analog Control	
	Gain(dB)	0.00
	Gain Auto	Continuous
	Auto Gain Lower Limit(dB)	0.00
	Auto Gain Upper Limit(dB)	20.00



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.

11.13.2 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.

 Analog Control 	
Gain(dB)	23.98
Gain Auto	
Auto Gain Lower Limit(dB)	0.00
Auto Gain Upper Limit(dB)	23.98
Digital Shift	0.01
Digital Shift Enable	

Figure 11-23 Set Digital Gain

11.14 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.

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.

 Analog Control 	
Gain(dB)	
Gain Auto	Continuous
Auto Gain Lower Limit(dB)	0.00
Auto Gain Upper Limit(dB)	20.00
Digital Shift	
Digital Shift Enable	
Brightness	100 🗘

Figure 11-24 Set Brightness

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.

11.15 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 11-25 Set Black Level

11.16 Set White Balance

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.

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.

Table 11-4 White Balance Status Description

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.

- 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.

- 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.

11.17 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.

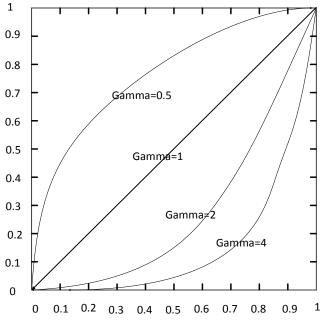


Figure 11-26 Gamma Curve

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

- 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.

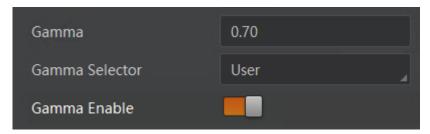


Figure 11-27 Set User Mode

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.

Gamma	0.70	
Gamma Selector	sRGB	2
Gamma Enable		

Figure 11-28 Set sRGB Mode

11.18 Set Sharpness

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 11-29 Set Sharpness

11.19 Set Digital Noise Reduction

This function may differ by camera models.

The function of digital noise reduction can increase the image's SNR and improve its quality.

Click Analog Control > Digital Noise Reduction Mode, select Expert as Digital Noise Reduction Mode, and enter Denoise Strength and Noise Correct according to actual demands.

Denoise Strength refers to the intensity of the digital noise reduction, you can increase it to have a better effect. **Noise Correct** refers to the noise horizontal correction value, and it is used to adjust the noise curve.

Digital Noise Reduction Mode	Expert	
Denoise Strength	128]
Noise Correct	100	

Figure 11-30 Set Digital Noise Reduction

11.20 Set Channel Correct Mode

The channel correction function may differ by camera models.

The channel correction function allows you to adjust the image's uniformity, and you can set channel correct mode as shown below.

Click **Analog Control** > **Channel Correct Mode**, and select **Channel Correct Mode** according to actual demands.

Channel Correct Mode	Passive Mode
Auto Function AOI Selector	Active Mode
Auto Function AOI Width	Passive Mode

Figure 11-31 Set Channel Correct Mode

11.21 Set Contrast Ratio

The contrast ratio function may differ by camera models.

The camera supports the contrast ratio function that adjusts the intensity of light and darkness and color. The larger the contrast ratio, and more clear the image is.

Go to **Analog Control**, enable **Contrast Ratio Enable**, and set **Contrast Ratio** according to actual demands.



Figure 11-32 Set Contrast Ratio

The range of **Contrast Ratio** is from 0 to 100.

11.22 Set AOI

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.

- 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.

Auto Function AOI Selector	AOI 1	
Auto Function AOI Width	720	
Auto Function AOI Height	540	
Auto Function AOI Offset X	0	
Auto Function AOI Offset Y	0	
Auto Function AOI Usage Intensity		
Auto Function AOI Usage White Balance		

Figure 11-33 Set AOI

11.23 Set Color Transformation Control

- The function of color transformation control is only available for color cameras.
- Currently, **RGB to RGB** is available for **Color Transformation Selector** only.

The color transformation control is used to restore color and eliminate the overlap in the color channels. Two methods are available to set color transformation control.

Method 1: Click Color Transformation Control, select Color Transformation Value Selector, and set Color Transformation Value according to actual demand.

Method 2: Click Color Transformation Control, enable Color Transformation Enable, set Hue and Saturation to adjust Color Transformation Value.

 Color Transformation Control 		
Color Transformation Selector	RGBtoRGB	2
Color Transformation Enable		
Color Transformation Value Selector	Gain00	
Color Transformation Value		
Hue		
Hue Enable		
Saturation	128	
Saturation Enable		

Figure 11-34 Set Color Transformation Control

11.24 Set Hue

- Hue is only available for color cameras.
- Hue setting method may differ by camera models. For some models, go to **Analog Control**, enable **Hue Enable**, and enter **Hue** according to actual demands.
- Make sure the camera's pixel format is Bayer, YUV, RGB or BGR.

Adjusting the hue shifts the colors of the image.

- 1. Click Color Transformation Control, and enable Color Transformation Enable.
- 2. Enable Hue Enable, and enter Hue according to actual demands.

Color Transformation Control		
Color Transformation Selector	RGBtoRGB	
Color Transformation Enable	—	
Color Transformation Value Selector	Gain00	
Color Transformation Value		
Hue	128	
Hue Enable		

Figure 11-35 Set Hue

11.25 Set Saturation

- Saturation is only available for color cameras.
- Saturation setting method may differ by camera models. For some models, go to **Analog Control**, enable **Saturation Enable**, and enter **Saturation** according to actual demands.
- Make sure the camera's pixel format is Bayer, YUV, RGB or BGR.

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

- 1. Click Color Transformation Control, and enable Color Transformation Enable.
- 2. Enable Saturation Enable, and enter Saturation according to actual demands.

Y	Color Transformation Control		
	Color Transformation Selector	RGBtoRGB	4
	Color Transformation Enable		
	Color Transformation Value Selector	Gain00	
	Color Transformation Value		
	Hue		
	Hue Enable		
	Saturation	128	
	Saturation Enable		

Figure 11-36 Set Saturation

11.26 Set Super Palette Control

- This function may differ by camera models.
- The mono and bayer pixel formats do not support this function

The super palette control function allows you to select different color areas in the image to set customized hue and saturation values.

Steps:

- 1. Find Super Palette Control in the feature tree, and enable Super Palette Enable.
- 2. Select **Super Palette Selector**, and set corresponding **Super Palette Hue** and **Super Palette Saturation** according to actual demands.

 Super Palette Control 	
Super Palette Enable	
Super Palette Selector	Red
Super Palette Hue	128
Super Palette Saturation	128

Figure 11-37 Set Super Palette Control

11.27 Set LUT

A Look-Up Table (LUT) is a customized grayscale-mapping table. The LUT allows you to replace the pixel values in your images by values defined by you.

- 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.

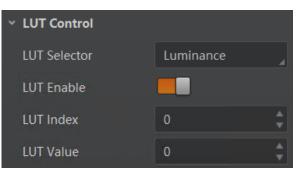


Figure 11-38 Set LUT

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

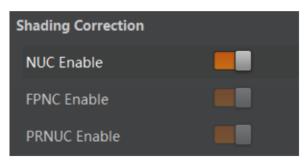
11.28 Set Shading Correction

The shading correction function may differ by camera models.

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 NUC correction, FPNC correction, PRNUC correction, and LSC correction.

• NUC, FPNC and PRNUC Correction

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.





LSC Correction

The steps for LSC correction may differ by camera models.

LSC correction stands for Lens Shading Correction that eliminates non-uniform illumination brought by lens.

- 1. Click Shading Correction, select LSC Correction as Shading Selector.
- 2. Click Execute in Activate Shading.
- 3. Enable LSC Enable.

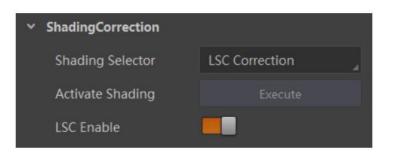


Figure 11-40 LSC Correction

Chapter 12 Other Functions

12.1 Device Control

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.

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.
Device Uptime(s)	Read only	It is the period of time when device is powered up.

Table 12-1 Device Control Parameter Description

Parameter	Read/Write	Description
Board Device Type	Read only	It is the device type.
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.
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.

Parameter	Read/Write	Write Description	
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 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.	
HB Abnormal Monitor	Read only	It monitors image stream condition.	
HB Version	Read only	It is the version of the image compression mode.	

12.2 Embedded Information in Image

The embedded information function and chunk data 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**, **Width**, **Height**, **Offset X**, **Offset Y**, **Pixel Format**, and **ROI Position**. Each category of embedded information has its unique 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.	

Table 12-2 Embedded Information Data Format

No.	Information Type	Byte	Data Format Description	
			Each low 8 bits of the 4 valid data are combined to transfer the gain information.	
			Value Range: 0 to 1023.	
			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 $\ensuremath{\mu}\ensuremath{s}\xspace.$	
4	Brightness Info	4 Bytes	4 bytes are used to transfer the brightness 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	Width	4 Bytes	Value Range: 0 to 2 ³² -1.	
10	Height	4 Bytes	Value Range: 0 to 2 ³² -1.	
11	Offset X	4 Bytes	Value Range: 0 to 2 ³² -1.	
12	Offset Y	4 Bytes	Value Range: 0 to 2 ³² -1.	
13	Pixel Format	4 Bytes	Value Range: 0 to 2 ³² -1.	
14	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.	

- The specific embedded information categories may differ by camera models.
- Color cameras have the white balance only. Embedded information types, inducing width, height, offset X, offset Y and pixel format, are for cameras that support the chunk data function only.
- 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.

Embedded Image Info Se	Timestamp
Frame Spec Info	Timestamp
> Acquisition Control	Gain
> Analog Control	Exposure
	Brightness Info
> LUT Control	White Balance
> Shading Correction	Frame Counter
> Digital IO Control	Ext Trigger Count
> Counter And Timer Control	Line Input Output
	ROI Position
> Debug	

Figure 12-1 Set Embedded Information

You can also use the chunk data function to add the embedded information in images. The chunk data function allows you to generate supplementary image data and append that data to every image that you acquire.

- The chunk data function may differ by camera models.
- The chunk data function is not supported if the camera enables the image compression mode.
- The camera uses the chunk data function to realize embedded information in image in priority if you enable chunk data function and embedded information function both.

Steps:

- 1. Click Chunk Data Control.
- 2. Enable Chunk Mode Active.
- 3. Select specific parameters in **Chunk Selector** according to actual demands.
- 4. Enable Chunk Enable.

 Chunk Data Control 	
Chunk Mode Active	
Chunk Selector	Gain
Chunk Enable	

Figure 12-2 Set Chunk Data Control

12.3 Set Multicast

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.



- 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**.

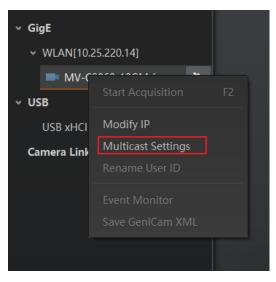


Figure 12-3 Click Multicast Settings

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

Multicast Setting	×
Role:	Controller and Data R
IP Address:	239.192.1.1
Port:	1042
	OK Cancel

Figure 12-4 Set Multicast for Available Camera

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

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

Steps:

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

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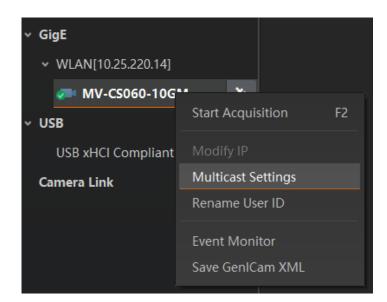


Figure 12-5 Click Multicast Settings

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

Multicast Setting	×
Role:	Controller and Data R
Enable:	
IP Address:	239.192.1.1
Port:	1042
	OK Cancel

Figure 12-6 Set Multicast for Connected Camera

12.4 File Access Control

The file access function allows you to export or import the camera's attributes, DPC data and LUT in the mfa format. Currently, the camera supports User Set 1/2/3, DPC, and LUT Luminance 1/2/3.

- The file access control function and specific device features that can be imported and exported may differ by camera models.
- Make sure that you have stopped acquisition before using this function.
- Make sure that the firmware is same when exporting or importing files between two cameras.

Steps:

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

File View Settings	s Tool Help	_ 🗆 ×
	L 🖸 🚾 🖳 🗎	
Device List 🔫		
× • • •	◉ 🗵 🖻 ⊐⊄⊿ 🖽 ⊿	
√ GigE		Feature Tree Common F., FileAccess Image Pro
 WLAN[10.25.220.105] 		
🔎 MV-CS060-10GM (202003		Favorites
> USB		
Camera Link		Device Control
		> Image Format Control

Figure 12-7 File Access

3. Select **Device Feature** according to actual demands.

File Access		×
Device Feature	User Set 1	
	Import	Export

Figure 12-8 Select Device Feature

4. Click **Import** or **Export** to import or export files.

The camera has different process approaches when you select different device features.

- 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.
- If DPC is selected as device feature, and it will take effect immediately after importing.

12.5 Transport Layer Control

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.

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.
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	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.

Table 12-3 Transport Layer Control Description

Parameter	Read/Write	Description
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.
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.

Parameter	Read/Write	Description	
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 Reset	Read and write	It resets the timestamp control latch.	
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.	

Parameter	Read/Write	Description
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 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 IEEE 1588	Read and write	It enables the IEEE 1588 Precision Time Protocol to control the timestamp register.
Gev GVSP Extended ID Mode	Read and write	It enables the extended ID mode.

12.6 Transfer Control

The transfer control may differ by camera models.

You can go to the **Transfer Control** attribute to view the camera's transfer sources, transfer mode, queue information, etc.

Parameter	Read/Write	Description
Transfer Selector	Read and write	It selects the transfer source.
Transfer Control Selector	Read and write	It selects the transfer mode.
Transfer Queue Max Block Count	Read only	It displays the max. image quantity that the camera memory can save before the compression.
Transfer Queue Current Block Count	Read only	It displays the current saved image quantity. When the quantity is smaller than 1 GB, it displays 0 or 1.
Transfer Queue Over Flow Count	Read and write	It is the image quantity discarded by FPGA.
Transfer Queue Mode	Read and write	It is the operating mode of memory queue.

Table 12-4 Transfer Control Description

12.7 Set Fan

i NOTE

The fan function may differ by camera models.

For cameras with fan, you can go to **Analog Control** > **Fan Open Threshold** to set fan parameters.



Figure 12-9 Set Fan

When the camera's temperature is higher than the value you set in **Fan Open Threshold**, the fan starts to work. Otherwise, the fan stops working.

The temperature unit here is Celsius degree.

12.8 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.

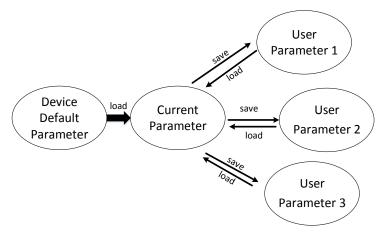


Figure 12-10 Parameter Relation

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.

~	User Set Control	
	User Set Current	
	User Set Selector	User Set 1
	User Set Load	Execute
	User Set Save	Execute
	User Set Default	User Set 1

Figure 12-11 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.

~	User Set Control		
	User Set Current		
	User Set Selector	User Set 1	
	User Set Load	Execute	
	User Set Save	Execute	
	User Set Default	User Set 1	

Figure 12-12 Load User Set

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.

 User Set Control 	
User Set Current	
User Set Selector	User Set 1
User Set Load	Execute
User Set Save	Execute
User Set Default	User Set 1

Figure 12-13 Set User Default

12.9 Update Firmware

The camera supports firmware updating via the MVS client software.

- Before updating, make sure power cable and others are properly connected.
- Please 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.

date File:						K.	Update
GigE	Model Name	Device User ID	Serial Number	Interface Type	MAC Address	Status	Firmware V
10.64.48.34]	Management and the			-		🕑 Free	10.12
USB	$\{a_1,a_2,\ldots,a_{n-1}\}$		-	\$1000000000000000000000000000000000000			
	-			-			
Camera Link	-	1000	-	-		•	

	-			-		•	
		100000		-			
			-	-	-	•	
				-			
		Report.		-			-

Figure 12-14 Update Firmware

- 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.

12.10 Encrypt Device via Dongle Tool

- This function may differ by camera models.
- You can contact the technical support to get the dongle tool.

The dongle tool is used to encrypt and decrypt cameras for protecting data.

- 1. Run the dongle tool, and click **Enumerate**.
- 2. Click Create Random Secret Key or enter it manually.
- 3. Click Write Secret Key.
- 4. Enter plaintext that should be no more than 15 characters, and click Verify.

Step 1 : Enumerate	The second second concerns the second s
Step 2 : Enter Secret Key	
	Create Random Secret Key The encryption key is composed of 64 hexadecimal digits, or an English string of 32 characters. The user can manually enter or click Create Encryption Key.
Step 3	Write Secret Key
Step 4 : Verify and Decrypt	Plaintext1234 Verify
	The plaintext is set to the camera, and the camera returns the encrypted one. The encryption tool decrypts the encryption key, and verifies whether the decrypted result is consistent with the plaintext.

Figure 12-15 Encrypt Device via Dongle Tool

Chapter 13 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.

Table	13-1	Trouble	Shoo	ting

Chapter 14 Revision History

Version No.	Document No.	Date	Revision Details
3.4.50	UD26223B	Nov. 11, 2021	Modify section I/O Wiring.
3.4.43	UD24711B	Jul. 12, 2021	 Add section Super Palette Control. Add section Encrypt Device via Dongle Tool.
3.4.24	UD22445B	Dec. 24, 2020	Add Section Set Color Adjustment.
3.4.20	UD21233B	Sep. 27, 2020	 Modify Section Client Software Layout. Modify Section Set Frame Rate. Add Section Set Image Compression Mode. Add Section Set Digital Noise Reduction. Modify Section Hue. Modify Section Saturation. Modify Section Device Control. Add Section Transfer Control.
3.4.9	UD19137B	April 8, 2020	 Add Section Overview. Modify Section Appearance. Modify Section Client Software Layout. Add Section Sensor Shutter Mode. Modify Section Set Pixel Format. Modify Section Set Test Pattern. Add Section Set Shading Correction. Modify Section Transport Layer Control.
1.0.1	UD15735B	Jul. 24, 2019	 Add Section Set Anyway Trigger. Modify Section Set Action Command. Add Section Set Color Transformation Control.

Table 14-1 Revision History

1.0.0 UD12911B Jan. 9, 2019	Original version.
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Appendix A 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	
	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	

Table Appendix A-1 Camera Parameter Index

Device Character Set	
	-
	_
	_
	_
	_
	_
	_
HB Abnormal Monitor	_
HB Version	
Width Max	Section View Resolution & Set
Height Max	
Region Selector	
Width	
Height	
Offset X	_
Offset Y	-
Reverse X	Section Set Image Reverse
Reverse Y	_
Image Compression Mode	Section Image Compression Mode
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	-
	Width MaxHeight MaxRegion SelectorWidthHeightOffset XOffset YReverse XReverse YImage Compression ModePixel FormatPixel SizeTest Pattern Generator SelectorTest PatternBinning SelectorBinning HorizontalDecimation Horizontal

	Embedded Image Info Selector	Section Embedded Information
	Frame Spec Info	in Image
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)	
	Reference Frame Rate	
	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
	Exposure Time Mode	Mode & Set Exposure Auto
	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	
Digital Noise Reduction Mode	Section Set Digital Noise
Denoise Strength	Reduction
Noise Correct	
Channel Correct Mode	Section Set Channel Correct Mode
Fan Open Threshold	Section Set Fan
Contrast Ratio	Section Set Contrast Ratio
Contrast Ratio Enable	
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	Color Transformation Selector	Section Set Color
Transformation Control	Color Transformation Enable	Transformation Control
control	Color Transformation Value Selector	
	Color Transformation Value	
	Hue	Section Set Hue
	Hue Enable	
	Saturation	Section Set Saturation
	Saturation Enable	
Set Super Palette	Super Palette Enable	Section Set Super Palette Control
Control	Super Palette Selector	
	Super Palette Hue	
	Super Palette Saturation	
LUT Control	LUT Selector	Section Set LUT
	LUT Enable	
	LUT Index	
	LUT Value	
Shading	NUC Enable	Section Set Shading Correction
Correction	FPNC Enable	
	PRNUC Enable	-
	Shading Selector	
	Activate Shading	
	LSC Enable	
Digital IO Control	Line Selector	Section I/O Output
	Line Mode	

	I	
	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)	
Action Control	Action Unconditional Mode	Section Set Action Command
	Action Device Key	
	Action Queue Size	
	Action Selector	
	Action Group Mask	
	Action Group Key	
Counter And Timer	Counter Selector	Section Set Counter Trigger
Control	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	
Chunk Data Control	Chunk Mode Active	Section Embedded Information
	Chunk Selector	in Image
	Chunk Enable	
Transport Layer	Paylode Size (B)	Section Transport Layer Control
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	
	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	

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 IEEE 1588	
	Gev GVSP Extended ID Mode	
Transfer Control	Transfer Selector	Section Transfer Control
	Transfer Control Selector	
	Transfer Queue Max Block Count	
	Transfer Queue Current Block Count	
	Transfer Queue Over Flow Count	
	Transfer Queue 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	



UD26223B