Hikrobot Co., Ltd.

Industrial Short Wave Infrared Camera

User Manual

HIKROBOT

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

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

Available Model

This manual is applicable to the Industrial Short Wave Infrared Camera.

Contact Information

Hangzhou Hikrobot Co., Ltd.
E-mail: global.support@hikrobotics.com
Website: ***https://en.hikrobotics.com/***

Contents

Chapter 1 Safety Instruction

The safety instructions are intended to ensure that the user can use the device correctly to avoid danger or property loss. Read and follow these safety instructions before installing, operating and maintaining the device.

1.1 Safety Claim

● To ensure personal and device safety, when installing, operating, and maintaining the device, follow the signs on the device and all safety instructions described in the manual.
● The note, caution and danger items in the manual do not represent all the safety instructions that should be observed, but only serve as a supplement to all the safety instructions.
● The device should be used in an environment that meets the design specifications, otherwise it may cause malfunctions, and malfunctions or component damage caused by non-compliance with relevant regulations are not within the scope of the device's quality assurance.
● Our company will not bear any legal responsibility for personal safety accidents and property losses caused by abnormal operation of the device.

1.2 Safety Instruction

⚠**Caution**:
● Do not install the device if it is found that the device and accessories are damaged, rusted, water ingress, model mismatch, missing parts, etc., when unpacking.
● Avoid storage and transportation in places such as water splashing and rain, direct sunlight, strong electric fields, strong magnetic fields, and strong vibrations.
● Avoid dropping, smashing or vigorously vibrating the device and its components.
● It is forbidden to install the indoor device in an environment where it may be exposed to water or other liquids. If the device is damp, it may cause fire and electric shock hazard.
● Place the device in a place out of direct sunlight and ventilation, away from heat sources such as heaters and radiators.
● In the use of the device, you must be in strict compliance with the electrical safety regulations of the nation and region.
● Use the power adapter provided by the official manufacturer. The power adapter must meet the Limited Power Source (LPS) requirements. For specific requirements, please refer to the device's technical specifications.
● Do not cover the device's plug or outlet for disconnecting power supply.
● It is strictly forbidden to wire, maintain, and disassemble the device is powered on.

Otherwise, there is a danger of electric shock.
- Make sure that the device is installed in good condition, the wiring is firm, and the power supply meets the requirements before powering on the device.
- For a device with a power switch, please use the switch to power on and off. It is strictly forbidden to plug and unplug the power cord.
- If the device emits smoke, odor or noise, please turn off the power and unplug the power cord immediately, and contact the dealer or service center in time.
- It is strictly forbidden to touch any terminal of the device when operating it. Otherwise there is a danger of electric shock.
- It is strictly forbidden for non-professional technicians to detect signals during device operation, otherwise it may cause personal injury or device damage.
- It is strictly forbidden to maintain the device is powered on, otherwise there is a danger of electric shock.
- Avoid aiming the lens at strong light (such as lighting, sunlight, or laser beams, etc.), otherwise the image sensor will be damaged.
- It is forbidden to touch the image sensor directly. If it is necessary to clean, please moisten the soft clean cloth with 75% or less alcohol and gently wipe off the dust. When the product is not in use, dust protection is required. Damage caused by improper maintenance will not be liable for warranty.
- Keep clean of the device's image acquisition window. It is recommended to use cleaning water to wipe off the dust.
- If the device does not work properly, please contact your dealer or the nearest service center. Never attempt to disassemble the device yourself (we shall not assume any responsibility for problems caused by unauthorized repair or maintenance).
- Please dispose of the device in strict accordance with the relevant national or regional regulations and standards to avoid environmental pollution and property damage.

Note:
- Check whether the device's package is in good condition, whether there is damage, intrusion, moisture, deformation, etc. before unpacking.
- Check the surface of the device and accessories for damage, rust, bumps, etc. when unpacking.
- Check whether the quantity and information of the device and accessories are complete after unpacking.
- Store and transport the device according to the storage and transport conditions of the device, and the storage temperature and humidity should meet the requirements.
- It is strictly prohibited to transport the device in combination with items that may affect or damage the device.
- 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.
- Please read the manual and safety instructions carefully before installing the device.
- Please install the device strictly according to the installation method in this manual.
- The case of the device may be overheated, and it needs to be powered off for half an hour before it can be touched.
- The device should not be placed with exposed flame sources, such as lighted candles.

1.3 Electromagnetic Interference Prevention

- Make sure that the shielding layer of cables is intact and 360° connected to the metal connector when using shielded cables.
- Do not route the device together with other equipment (especially servo motors, high-power devices, etc.), and control the distance between cables to more than 10 cm. Make sure to shield the cables if unavoidable.
- The control cable of the device and the power cable of the industrial light source must be wired separately to avoid bundled wiring.
- The power cable, data cable, signal cable, etc. of the device must be wired separately. Make sure to ground them if the wiring groove is used to separate the wiring and the wiring groove is metal.
- During the wiring process, evaluate the wiring space reasonably, and do not pull the cables hard, so as not to damage the electrical performance of the cables.
- If the device is powered on and off frequently, it is necessary to strengthen the voltage isolation, and consider adding a DC/DC isolation power supply module between the device and the adapter.
- Use the power adapter to supply power to the device separately. If centralized power supply is necessary, make sure to use a DC filter to filter the power supply of the device separately before use.
- The unused cables of the device must be insulated.
- When installing the device, if you cannot ensure that the device itself and all equipment connected to the device are well grounded, you should isolate the device with an insulating bracket.
- To avoid the accumulation of static electricity, ensure that other equipment (such as machines, internal components, etc.) and metal brackets on site are properly grounded.
- During the installation and use of the device, high voltage leakage must be avoided.
- Use a figure-eight bundle method if the device cable is too long.
- When connecting the device and metal accessories, they must be connected firmly to maintain good conductivity.
- Use a shielded network cable to connect to the device. If you use a self-made network cable, make sure that the shielding shell at the aviation head is well connected to the aluminum foil or metal braid of the shielding cable.

Chapter 2 Overview

2.1 Introduction

The industrial short wave infrared camera adopts a high-sensitivity InGaAs sensor, covering multiple wavebands from visible light to SWIR, and features a high quantum efficiency response. Some device models are equipped with TEC, providing better image consistency. The industrial short wave infrared camera also supports multiple trigger modes, multiple event outputs, and data acquisition and parameter settings via the client software or SDK.

2.2 Key Feature

- Adopts compact structure and design to meet spatial requirements.
- Supports multiple ISP functions like digital noise reduction, contrast ratio, etc.
- Adopts GigE interface and max. transmission distance of 100 meters without relay.
- Compatible with GigE Vision V2.0 Protocol, GenlCam Standard, and third-party software based on the protocol and standard.

Note
- The specific functions may differ by device models.
- Refer to the device's datasheet for specific parameters.

Chapter 3 Device Hardware

3.1 Appearance

Note
- For specific appearance and dimension, please refer to the device's datasheet for details.
- The appearance is subject to change, and the actual device you purchased shall prevail.

Refer to the figures below for the information and appearance of different device models.
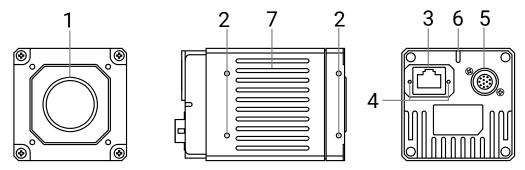
Figure 3-1 Appearance of Device with TEC (Type I)
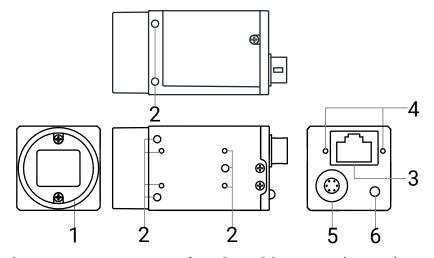
Figure 3-2 Appearance of Device Without TEC (Type II)
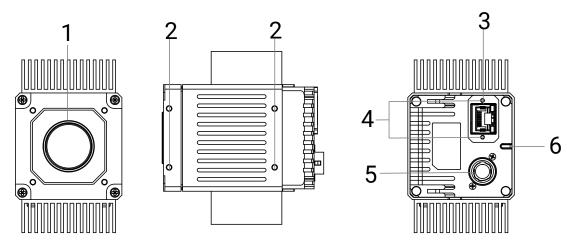
Figure 3-3   Appearance of Device Without TEC (Type III)

Table 3-1   Component Description

No.	Component	Description
1	Lens Mount	It is used to install the lens. Refer to the device's datasheet for the information of specific lens mount.
2	Screw Hole	It refers to the M3 screw, and is used to fix the device to the installation position.
3	GigE Interface	It refers to the GigE interface for transmitting data.
4	Screw Hole of GigE Interface	It refers to the M2 screw hole for fixing the network cable.
5	Power and I/O Connector	It provides power supply and I/O function. It includes 6-pin P7 connector and 12-pin P10 connector. Refer to the device's specification and section *Power and I/O Connector* for details.
6	LED Indicator	It indicates the device's status. See section *Indicator* for details.
7	Cooling Fan or TEC	It is used to cool the device to ensure its normal operation.

3.2 Power and I/O Connector

The device has a 6-pin P7 connector or a 12-pin P10 connector serving as the power and I/O connector that provides power supply and I/O.

3.2.1 6-Pin P7 Connector

The 6-pin P7 connector is applicable to the type II device.
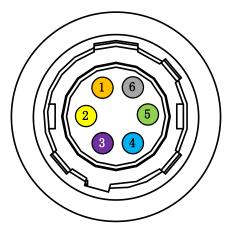
Figure 3-4   6-Pin P7 Connector

Note
- Refer to the table below and the label attached to the power and I/O cable to wire the device.
- The wire cores shown in figure and table are only the wire sequence and the corresponding wire core color of the cables sold by our company. If the cables are not purchased from our company, please refer to the actual wire sequence and the corresponding wire core color.

Table 3-2   Pin Definitions of 6-Pin P7 Connector

No.	Color	Signal	I/O Signal Source	Description
1	Orange	DC_PWR	--	Device power supply
2	Yellow	OPTO_IN	Line 0+	Opto-isolated input
3	Purple	GPIO	Line 2+	Can be configured as input or output
4	Blue	OPTO_OUT	Line 1+	Opto-isolated output
5	Green	OPTO_GND	Line 0-/1-	Opto-isolated signal ground
6	Gray	GND	Line 2-	Device power supply ground

3.2.2 12-Pin P10 Connector

The 12-pin P10 connector is applicable to the type I and type III devices.
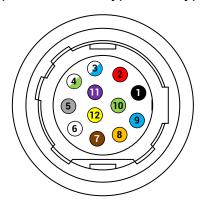
Figure 3-5   12-Pin P10 Connector

ⓘ**Note**
- Refer to the table below and the label attached to the power and I/O cable to wire the device.
- The wire cores shown in figure and table are only the wire sequence and the corresponding wire core color of the cables sold by our company. If the cables are not purchased from our company, please refer to the actual wire sequence and the corresponding wire core color.

Table 3-3   Pin Definitions of 12-Pin P10 Connector

No.	Color	Signal	I/O Signal Source	Description
1	Black	GND	Line 2-	Device power supply ground
2	Red	DC_PWR	--	Device power supply
3	White/Blue	DC_PWR	--	Device power supply
4	White/Green	OPT_IN-	Line 0-	Opto-isolated input signal ground
5	Gray	OPT_OUT-	Line 1-	Opto-isolated output signal ground
6	White	GND	--	Device power supply ground
7	Brown	GND	--	Device power supply ground
8	Orange	RS232_RXD	--	RS-232 receives
9	Blue	RS232_TXD	--	RS-232 transmits
10	Green	GPIO2	Line 2+	Can be configured as input or output
11	Purple	OPT_OUT+	Line 1+	Opto-isolated output
12	Yellow	OPT_IN+	Line 0+	Opto-isolated input

3.3 Indicator

The device's indicator is used to indicate the operation status of the device.

⌐i Note

● The indicator status may differ by device models, and actual devices you purchased shall prevail.
● When the indicator is lit up, flashing rapidly, flashing slowly, and flashing very slowly, its unlit interval is 5 sec, 0.2 sec, 1 sec, and 2 sec respectively.
● The indicator sometimes may show a purple color when red and blue colors flashing at the same time.

Table 3-4   Indicator Description

No.	Indicator Color	Status	Device Status Description
1	Red	Flashing very slowly	The device's wiring exception occurs.
2	Red	Solid	The device exception occurs.
3	Blue	Flashing slowly	The device is acquiring images in trigger mode.
4	Blue	Flashing rapidly	The device is acquiring images normally.
5	Blue	Solid	The device is in an idle status.
6	Red and Blue	Slow flashing in alternative	The function of finding me is executed, or the firmware is updating.

Chapter 4 Quick Start Guide

4.1 Device Installation

4.1.1 Installation Preparation

You need to prepare following accessories before device installation.

Table 4-1   Accessories

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	DC Power Supply	1	You should select a suitable power adapter or switch power supply according to the device power supply and consumption. You need to purchase separately.
3	Network Cable	1	It refers to Cat5e or Cat6a network cable. You need to purchase separately.
4	Lens	1	You need to purchase separately in accordance with device's lens mount.
5	Lens Adapter	1	If other lenses are used, you need to purchase the lens adapter separately.

📖**Note**

- The device mentioned in this manual is an electronic product that requires operation and storage under dry conditions. In case of hot and humid, acidic and alkaline environment, please take isolation and protection measures to avoid corrosion damage of the device's internal components.
- When using the lens, it is necessary to prevent humid environment and avoid steam from entering inside, causing fogging.
- It is recommended to purchase a lens with high transmittance in the short-wave band.
- You can purchase a light source with a required wavelength band according to your demands.

4.1.2 Install Device

Before You Start

● Make sure that the device in package is in good condition and all assembly parts are included.
● Make sure that all related devices are powered off during the installation.

Steps

1. Fix the device to the installation position, select an appropriate lens and install on the device.
2. Use the Cat5e or Cat6a network cable to connect device to a GigE switch or a network interface card.
3. Use one of the following methods for power supply.
● Direct plug-in power supply: Use the 12-pin power and I/O cable to connect device to a proper power adapter. Refer to section ***Power and I/O Connector*** for details.
● PoE power supply: It is valid for the devices that support the PoE function only. You can use a network cable to connect the device to a switch or network card with the PoE function. Refer to the device's specification for PoE information.

4.2 Install Client Software

MVS client software is used to connect and set device's parameters, and acquire images.

Note

● The MVS client software is compatible with 32/64-bit Windows 7/10/11 and 32/64-bit Linux operating systems. Here we take Windows as an example.
● The graphic user interface may differ by different versions of client software you use.
● The client software has integrated driver required by hardware, and no need to download and install other drivers.
● You can download the client software from ***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 4-1 Installation Window

4. Click **Start Setup**.
5. Select installation directory, driver and others.
● **Select Driver**: You can check **GIGE**, **USB 3.0** and **PCIE** according to actual demands.
● **Others**: Check **Enable built-in debug features** to make it easier to use breakpoints while the device is connected and streaming images. Check **Enable Jumbo Frame for All NICs** to enhance network transmission performance. Check **PCIe-CML**, **PCIe-CXP**, **PCIE-GEV**, **PCIE-XoF** to enumerate the corresponding frame grabbers.
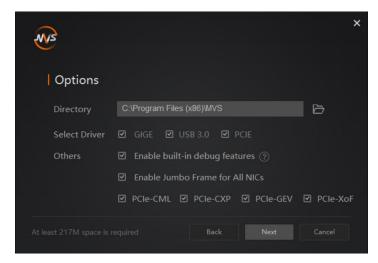
Figure 4-2 Installation Options

ⓘ**Note**

● Regarding options, it is recommended to keep default settings.
● **PCIe-CML**, **PCIe-CXP**, **PCIE-GEV**, **PCIE-XoF** can be checked only when **PCIE** is checked.
● **PCIe-CML**, **PCIe-CXP**, **PCIE-GEV**, **PCIE-XoF** supports frame grabbers developed by our company only.

6. Click **Next** to install.
7. Finish the installation process according to the prompts.

4.3 Set PC Environment

To ensure stable client running and data transmission, you are recommended to set PC environment.

4.3.1 Turn off Firewall

Steps

⌷**i****Note**

For different Windows versions, the path name or interface may differ. Please refer to the actual condition.

1. Go to Windows Firewall.
● Windows 7 system: Click **Start** → **Control Panel** → **Windows Firewall**.
● Windows 10 system: Click **Start** → **Control Panel** → **System and Security** → **Windows Defender Firewall**.
● Windows 11 system: Click **Start** → **Settings** → **Privacy & security** → **Windows Security** → **Firewall & network protection**.
2. For Windows 7 and 10 system, click **Turn Windows Defender Firewall on or off** on the left. For Windows 11, select the network and turn off in **Microsoft Defender Firewall**.
3. Select **Turn off Windows Defender Firewall (not recommended)**.
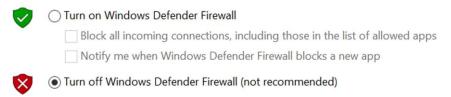
Figure 4-3 Windows Defender Firewall

4. Click **OK**.

4.3.2 Set PC Network

Steps

⌷**i****Note**

For different Windows versions, the specific setting path and interface may differ. Please refer to the actual condition.

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.
● Or select **Use the following IP address** to set an IP address for the PC manually.

Figure 4-4   Set PC Network

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 **GigE**, and click **NIC Settings**.
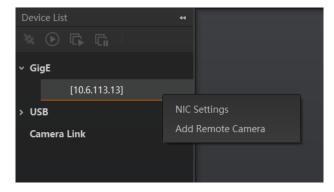
Figure 4-5   Click NIC Settings

2) Enable **Jumbo Frame**, and set **Receive Buffers** and **Transmit Buffers** to 2048.
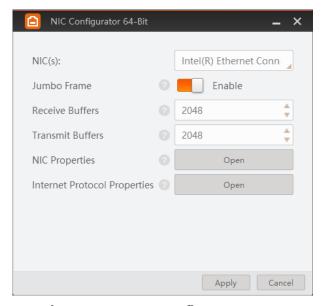
Figure 4-6   NIC Configurator

4.4 Set Device Network

You can set and operate the device in the client software only when the device 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 [icon] in device list to search the device.
3. Select a device to be connected.
4. Right click the device and click **Modify IP**.
5. Set the IP address of the device in the same network segment with the PC.
6. Click **OK**.

Figure 4-7   Set Device Network

4.5 Basic Operation

Steps

1. Double click the device name in the device list, or click [icon] to connect the device to the client software.
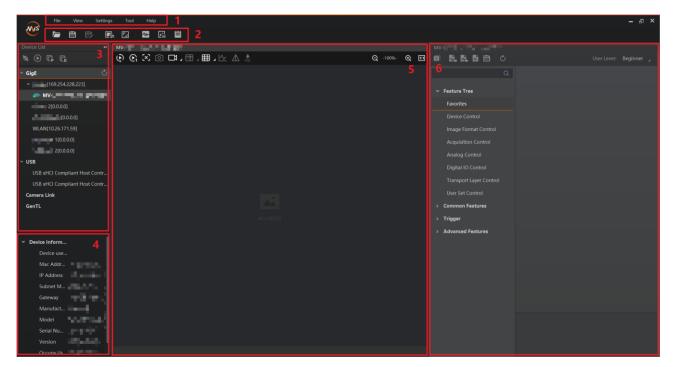
Figure 4-8   Main Window

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[i]**Note**

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

Table 4-2   Main Window Description

No.	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.
5	Display Window	This area displays the acquisition images in real-time. You can click different icons to capture and save image,

No.	Name	Description
		record, etc.
6	Feature Panel	You can view and set features of the selected device, and perform operations such as importing, exporting, and saving features.

2. Set the device's pixel format, exposure time, etc., in the feature panel.

3. Click ▶ in the display window to acquire images continuously.

4. Adjust the device's aperture and focus to have clear images.

5. (Optional) Set the device's other parameters in the feature panel.

☐**Note**

The device's feature tree and parameters may differ by device models.

Chapter 5 I/O Electrical Features and Wiring

5.1 I/O Electrical Features

5.1.1 Input Signal

The internal circuit of opto-isolated input (Line 0) is as follows.

Note

- The maximum input current of Line 0 is 25 mA.
- Make sure that the input voltage is not from 1 VDC to 3.3 VDC, because the electric status between these two values are not stable.
- The breakdown voltage is 30 VDC. Keep voltage stable.
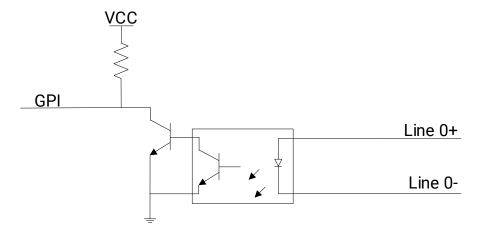
Figure 5-1   Internal Circuit of Input Signal
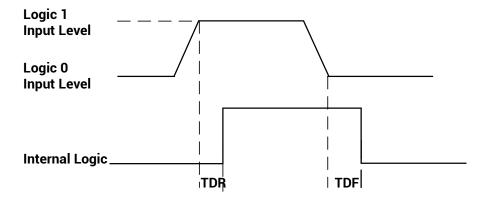
Figure 5-2   Input Logic Level

Table 5-1   Input Electrical Feature

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

5.1.2 Output Signal

The internal circuit of opto-isolated output (Line 1) is as follows.

☐ⁱNote

The maximum output current of Line 1 is 25 mA.
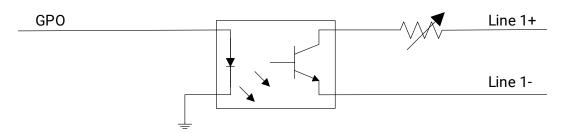
Figure 5-3   Internal Circuit of Output Signal
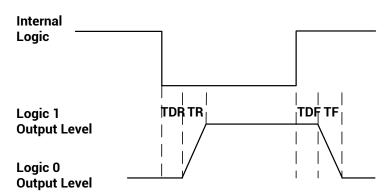
Figure 5-4   Output Logic Level

When the external voltage is 3.3 VDC and the external resistor is 1 KΩ, the electrical features of opto-isolated output is shown below.

Table 5-2   Output Electrical Feature

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

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

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

Table 5-3 Parameters of Output Logic Level Low

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

5.1.3 Bi-Directional Signal

The device has one bi-directional non-isolated I/O signal (Line 2), and you can set it as input signal or output signal according to demands. Its internal circuit is as follows.
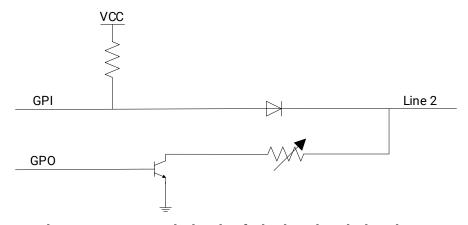
Figure 5-5 Internal Circuit of Bi-Directional Signal

Configured as Input Signal

> **Note**
> ● Make sure that the input voltage is not from 0.3 VDC to 3.3 VDC, because the electric

status between these two values are not stable.
- The breakdown voltage is 30 VDC. Keep voltage stable.
- To prevent damage to the GPIO pin, please connect GND first, and then input voltage in Line 2.

With the condition of 100 Ω resistance and 5 VDC voltage, the logic level and electrical feature of configuring Line 2 as input signal are shown below.
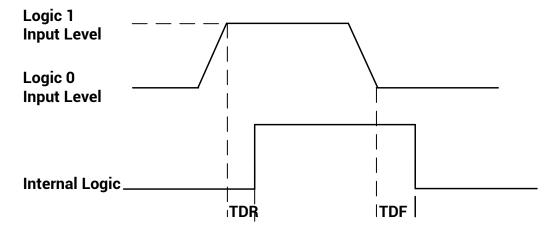
Figure 5-6 Input Logic Level

Table 5-4 Input Electrical Feature

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

Configured as Output Signal

ⓘ **Note**

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

The relation among external voltage, resistance and the output level low is shown below.

Table 5-5 Parameters of Output Logic Level Low

External Voltage	External Resistance	VL (GPIO2)
3.3 VDC	1 KΩ	160 mV
5 VDC	1 KΩ	220 mV

External Voltage	External Resistance	VL (GPIO2)
12 VDC	1 KΩ	460 mV
24 VDC	1 KΩ	860 mV
30 VDC	1 KΩ	970 mV

When the voltage of external resistance (1 KΩ) is pulled up to 5 VDC, the logic level and electrical feature of configuring Line 2 as output are shown below.
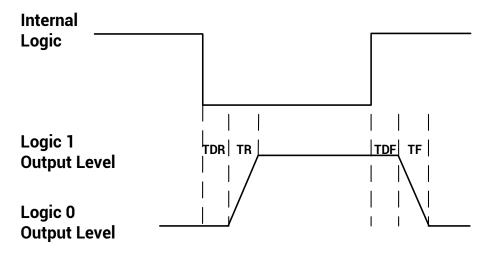
Figure 5-7   Output Logic Level

Table 5-6   Output Electrical Feature

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

5.1.4 Factors Affecting Transmission Delay of I/O Lines

The factors that affect the transmission delay of I/O lines are shown below, where ★ represents the main influencing factor and ☆ represents the secondary factor.

Table 5-7   Factors Affecting Transmission Delay of I/O Lines

Lines / Factors	Opto-Isolated Input Lines	GPIO Input Lines	Opto-Isolated Output Lines	GPIO Output Lines
Working Temperature	★	☆	★	☆
Production Differences of Electronic Components	★	☆	★	☆
Aging	★	-	★	-
External I/O Power Supply Voltage	★	-	★	☆
Load Resistance	-	-	★	☆
Load Current	-	-	★	☆

Regarding the factors that affect the transmission delay of I/O lines in the table above, we provide the following explanations and suggestions:
● Use the I/O circuit at the recommended working temperature of the device. See the device's datasheet for the working temperature.
● Applying current to the input and output circuits of the opto-coupler will accelerate the aging rate of the opto-coupler. Keep the current to a minimum level, and ensure a stable transmission delay.
● In order to reduce the low-speed transmission delay, it is recommended to use an external I/O supply voltage of about 5 V.
● For a better quick trigger, use the recommended pull-up resistor.
● Generally, the trigger input-output frequency of an opto-coupler circuit rarely exceeds 10 kHz, and the trigger input-output frequency of a GPIO circuit rarely exceeds 1 MHz. Keep the trigger input-output frequency of the circuit within this range.
● If you need to reduce the transmission delay, it is recommended to use the GPIO line, which has a shorter transmission delay than the opto-coupler delay, but the GPIO line has the risk of burning out, please use it with caution.
● The bounce of the trigger signal may cause the internal bounce of the device to increase. To avoid bounce, keep the edge of the trigger signal steep to reduce the internal bounce of the device (preferably less than 1 μs).

5.2 I/O Wiring

This section introduces how to wire the device via its I/O connector.

Note

Here we take one kind of device as an example to introduce I/O wiring. The appearance here is for reference only, and the actual device you purchased shall prevail.

5.2.1 Input Signal Wiring

The input signal wiring is shown below when the device uses Line 0 as trigger source in external trigger mode.

Note

Input signal wiring may differ by the external device type.

PNP Device

Figure 5-8 Input Signal Connects to PNP Device

NPN Device

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

Figure 5-9 Input Signal Connects to NPN Device

Switch

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

Figure 5-10 Input Signal Connects to Switch

5.2.2 Output Signal Wiring

The output signal wiring is shown below when the device uses Line 1 as output signal.

☐**i**Note

Output signal wiring may differ by the external device type.

PNP Device

Figure 5-11 Output Signal Connects to PNP Device

NPN Device

● If the VCC of NPN device is 24 VDC, it is recommended to use a 4.7 KΩ pull-up resistor.
● If the VCC of NPN device is 12 VDC, it is recommended to use a 1 KΩ pull-up resistor.
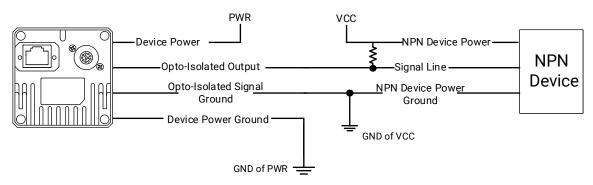
Figure 5-12 Output Signal Connects to NPN Device

5.2.3 Bi-Directional Signal Wiring

The device's Line 2 can be used as input signal and output signal.

Configured as Input Signal

The input signal wiring is shown below when the device's Line 2 is configured as input signal.

☐**Note**

Input signal wiring may differ by the external device type.

PNP Device
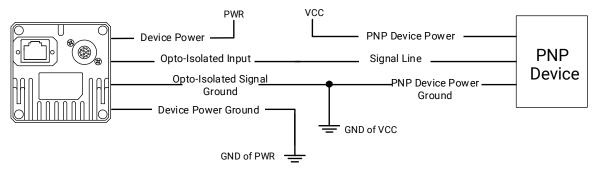
It is recommended to use a 330 Ω pull-down resistor.
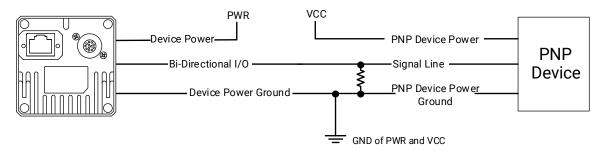
Figure 5-13 Input Signal Connects to PNP Device

NPN Device

● If the VCC of NPN device is 24 VDC, it is recommended to use a 4.7 KΩ pull-up resistor.
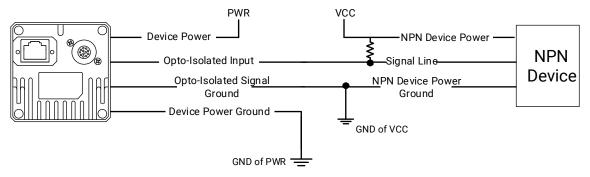● If the VCC of NPN device is 12 VDC, it is recommended to use a 1 KΩ pull-up resistor.
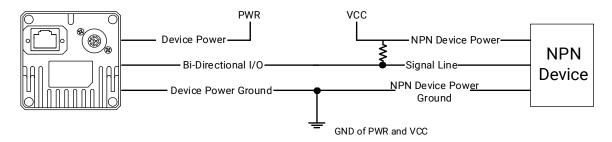
Figure 5-14 Input Signal Connects to NPN Device

Switch

The switch value can provide low electrical level to trigger Line 2.
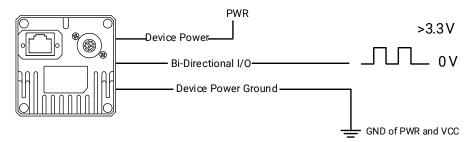
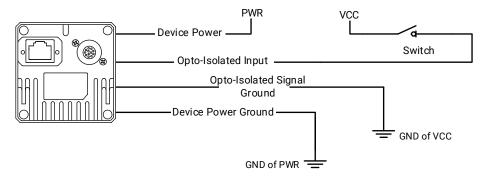**Figure 5-15 Input Signal Connects to Switch**

Configured as Output Signal

The output signal wiring is shown below when the device's Line 2 is configured as output signal.

☐ⓘNote

Output signal wiring may differ by the external device type.

PNP Device
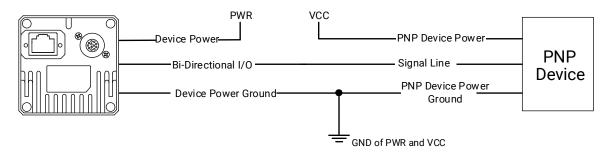
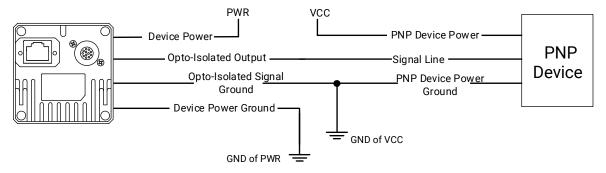**Figure 5-16 Output Signal Connects to PNP Device**

NPN Device

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

● If the VCC of NPN device is 12 VDC, it is recommended to use a 1 KΩ pull-up resistor.
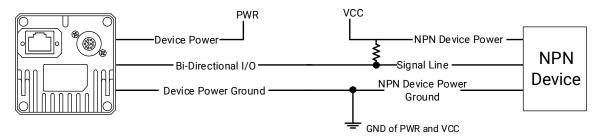
**Figure 5-17 Output Signal Connects to NPN Device**

Chapter 6 Trigger Input and Output

6.1 Trigger Input

6.1.1 Set Trigger Mode

The device supports 2 types of trigger modes, including internal trigger mode and external trigger mode.

- **Internal Trigger Mode**: In this mode, the device acquires images via its internal signals.
- **External Trigger Mode**: In this mode, the device acquires images via external signals like software signal and hardware signal. The trigger source of external trigger mode includes software trigger, hardware trigger, counter trigger, action command trigger, and anyway mode.

Enable Internal Trigger Mode

Go to **Acquisition Control** → **Trigger Mode**, and select **Off** as **Trigger Mode**.

Note

Off refers to the internal trigger mode.
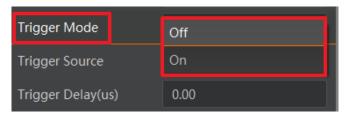
Figure 6-1 Enable Internal Trigger Mode

Enable External Trigger Mode

Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.

Note

On refers to the external trigger mode.
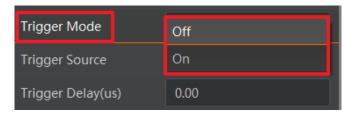
Figure 6-2 Enable External Trigger Mode

6.1.2 Set Trigger Source

External Trigger Source

The device's external trigger source includes software trigger, hardware trigger, counter trigger, action command trigger, and anyway mode. Go to **Acquisition Control → Trigger Source**, and select **Trigger Source** according to actual demands.

Table 6-1 Trigger Source Description

External Trigger Source	Parameter	Description
Software Trigger	Software	The software sends trigger signal to the device via GigE interface to acquire images.
Hardware Trigger	Line 0, Line 2	External device connects device via device I/O interface. External device sends trigger signal to device to acquire images.
Counter Trigger	Counter 0	The counter sends trigger signal to the device to acquire images.
Action Command Trigger	Action 1	The action command sends trigger signal to the device to acquire images. Refer to section **Set Action Command** for details.
Anyway	Anyway	The device can receive software trigger, hardware trigger, or action command trigger to acquire images.
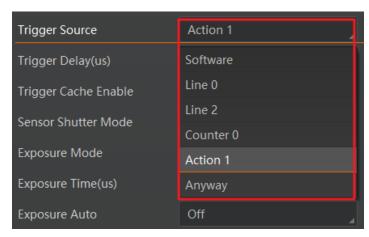
Figure 6-3   External Trigger Source

⌐ℹNote

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

Set and Execute Software Trigger

In software trigger, the software sends trigger signal to the device via GigE interface to acquire images.

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Software** as **Trigger Source**.
3. Click **Execute** in **Trigger Software**.
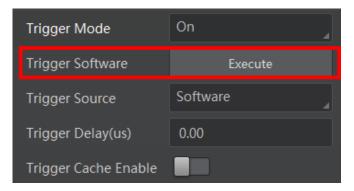
Figure 6-4   Set and Execute Software Trigger

⌐ℹNote

Refer to section ***Set Trigger Related Parameters*** for parameters that can be configured in the trigger source, including acquisition burst frame count, trigger delay, and trigger cache.

Set and Execute Hardware Trigger

In hardware trigger, external device sends trigger signal to the device to acquire images via I/O connector.

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Line 0** or **Line 2** as **Trigger Source** according to actual demands.
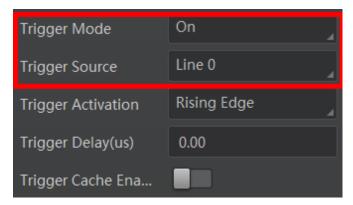
Figure 6-5 Set Line 0 or Line 2 as Input Signal

The device has one opto-isolated input (Line 0), and one bi-directional I/O (Line 2) that can be configured as input signal. Make sure that Line 2 is input signal if you want to use it as trigger source.

Steps

1. Go to **Digital IO Control** and select **Line 2** as **Line Selector**.
2. Select **Input** as **Line Mode**.
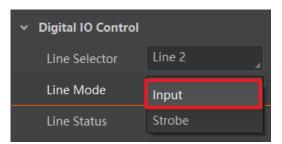
Figure 6-6 Set Line 2 as Input Signal

⌙ℹ**Note**

Refer to section ***Set Trigger Related Parameters*** for parameters that can be configured in the trigger source, including acquisition burst frame count, trigger delay, trigger cache, trigger activation, and trigger debouncer.

Set and Execute Counter Trigger

In counter trigger, the counter sends trigger signal to the device to acquire images.

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Counter 0** as **Trigger Source**.
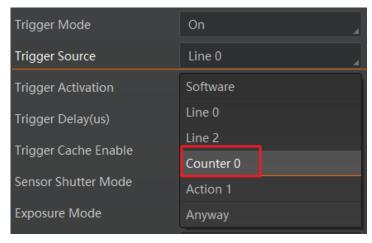
Figure 6-7 Set and Execute Counter Trigger

When using counter trigger, you need to set parameters of **Counter And Timer Control** as shown below.

Table 6-2   Parameters of Counter And Timer Control

Parameter	Read/Write	Description
Counter Selector	Read & Write	It selects counter source. **Counter 0** is available only at present.
Counter Event Source	Read & Write	It selects the signal source of counter trigger. **Line 0** or **Line 2** is available. This parameter is disabled by default.
Counter Reset Source	Read & Write	It selects the signal source of resetting counter. **Software** is available only. This parameter is disabled by default.
Counter Reset	Write is available under certain condition	It resets counter and it can be executed only when **Software** is selected as **Counter Reset Source**.
Counter Value	Read & Write	It is the counter value with the range of 1 to 1023. If the parameter is set to n, the n external trigger signals can perform one counter trigger and acquire one frame of image.

Parameter	Read/Write	Description
Counter Current Value	Read Only	It displays the number of executed external trigger.
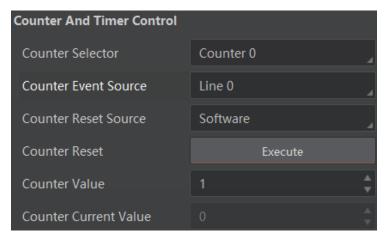
Figure 6-8 Counter and Timer Control

ⓘNote

Refer to section *Set Trigger Related Parameters* for parameters that can be configured in the trigger source, including acquisition burst frame count, trigger delay, trigger cache, and trigger activation.

Set and Execute Anyway Mode

In the anyway mode, the device can receive software trigger, hardware trigger, and action demand trigger to acquire images.

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Anyway** as **Trigger Source**.
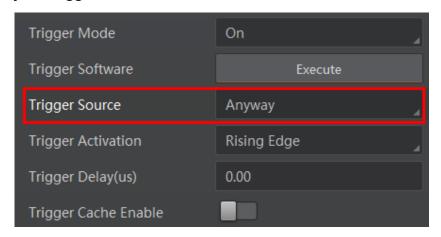
Figure 6-9 Set and Execute Free Trigger

⬚ℹ️Note

- Refer to section *Set Trigger Related Parameters* for parameters that can be configured in the trigger source, including acquisition burst frame count, trigger delay, trigger cache, trigger activation, and trigger debouncer.
- The anyway mode is related to firmware program.

6.1.3 Set Trigger Related Parameters

In external trigger mode, you can set five related parameters, including acquisition burst frame count, trigger delay, trigger cache, trigger activation, and trigger debouncer.

⬚ℹ️Note

- Different trigger sources can set various parameters in external trigger mode.
- √ is supported, and × is not supported.

Table 6-3 Trigger Source and Trigger Related Parameters

Trigger Source Trigger Parameters	Software Trigger	Hardware Trigger	Counter Trigger	Action Command Trigger	Anyway Mode
Acquisition Burst Frame Count	√	√	√	√	√
Trigger Delay	√	√	√	√	√
Trigger Cache	√	√	√	√	√
Trigger Activation	×	√	√	×	√
Trigger Debouncer	×	√	√	×	Partially Supported

Set Acquisition Burst Frame Count

In external trigger mode, you can set acquisition burst frame count. Go to **Acquisition Control** → **Acquisition Burst Frame Count**, and enter **Acquisition Burst Frame Count** according to actual demands.
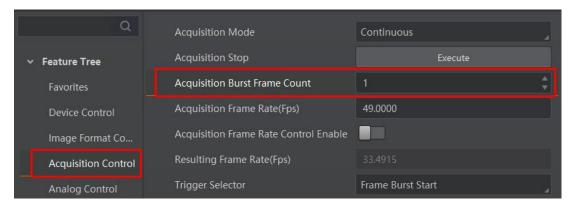
Figure 6-10 Set Acquisition Burst Frame Count

Note

● The range of **Acquisition Burst Frame Count** is from 1 to 1023.
● If **Acquisition Burst Frame Count** is 1, the device is in single frame trigger mode. If **Acquisition Burst Frame Count** is larger than 1, the device is in multi-frame trigger mode.
● If **Acquisition Burst Frame Count** is n, when input 1 trigger signal to the device, the device stops acquiring images after exposing n times and outputting n frame images.
● The sequence diagram below uses rising edge as trigger activation.
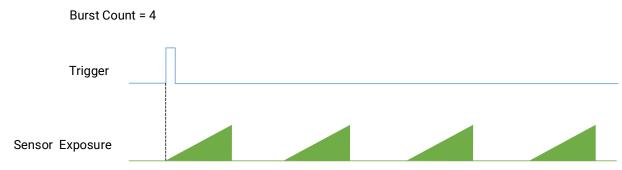
Figure 6-11 Sequence Diagram of Acquisition Burst Frame Count

Set Trigger Delay

The trigger delay function allows the device to add a delay between the receipt of trigger signal and the moment the trigger becomes active. Go to **Acquisition Control → Trigger Delay**, and enter **Trigger Delay**, and the unit is µs.
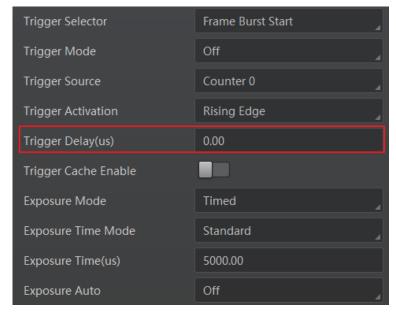
Figure 6-12 Set Trigger Delay
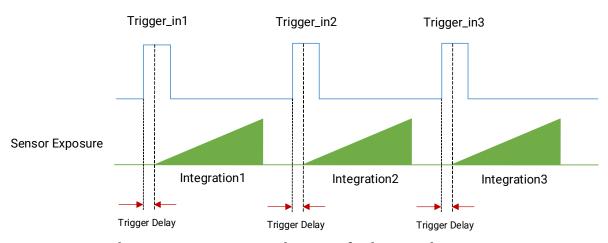
Figure 6-13 Sequence Diagram of Trigger Delay

ⓘNote

The sequence diagram above uses rising edge as trigger activation.

Set Trigger Cache

The trigger cache function allows the device to save and process new signal during trigger stage, and the device can save and process three trigger signals at most. Go to

Acquisition Control → **Trigger Cache Enable**, and enable **Trigger Cache Enable**.

Trigger Selector	Frame Burst Start
Trigger Mode	Off
Trigger Source	Counter 0
Trigger Activation	Rising Edge
Trigger Delay(us)	0.00
Trigger Cache Enable	
Exposure Mode	Timed
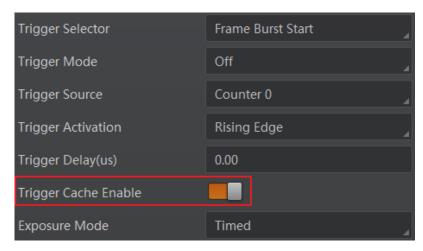
Figure 6-14 Set Trigger Cache

For example, if the device receives the 2nd trigger signal when it is processing the 1st trigger signal, and the result will be different depending on whether **Trigger Cache Enable** is enabled or not.

● The 2nd trigger signal will be filtered without processing if **Trigger Cache Enable** is disabled.
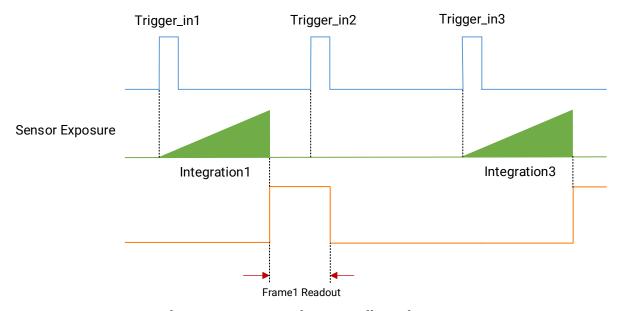
Figure 6-15 Second Frame Filtered

● The 2nd trigger signal will be saved if **Trigger Cache Enable** is enabled.

If the 1st frame image's exposure time of the 2nd trigger signal is not earlier than the device's last frame creation time of the 1st trigger signal, and then the 2nd trigger signal's 1st frame image is created normally.
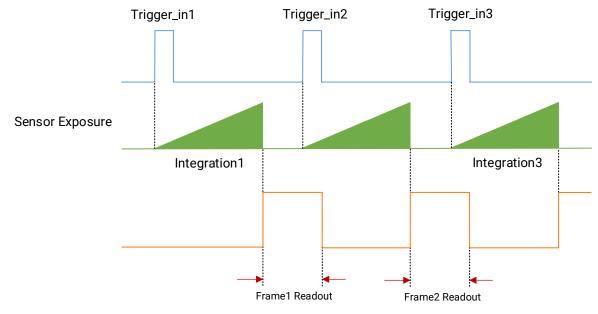
Figure 6-16 Second Frame Created Normally

If the 1st frame image's exposure time of the 2nd trigger signal is earlier than the device's last frame creation time of the 1st trigger signal, and then the device will delay this exposure time. Thus making sure this exposure time is not earlier than the device's last frame creation time of the 1st trigger signal.
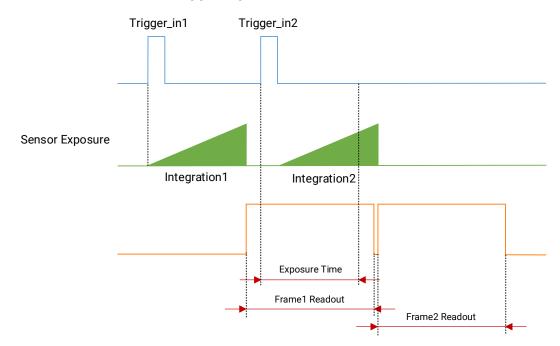
Figure 6-17 Sequence Diagram

⊡**Note**

The three sequence diagrams above use rising edge as trigger activation.

Set Trigger Activation

The device supports triggering image acquisition in the rising edge, falling edge, level high, level low or any edge of the external signal. Go to **Acquisition Control → Trigger Activation**, and select **Rising Edge**, **Falling Edge**, **Any Edge**, **Level High**, or **Level Low** as **Trigger Activation**.

● **Rising Edge**: It means that when the level signal sent by external device is in rising edge, the device receives trigger signal and starts to acquire images.
● **Falling Edge**: It means that when the level signal sent by external device is in falling edge, the device receives trigger signal and starts to acquire images.
● **Any Edge:** It means that when the level signal sent by external device is in rising or falling edge, the device receives trigger signal and starts to acquire images.
● **Level High**: The level high of the trigger signal is valid. As long as the trigger signal is in level high, the device is in image acquisition status.
● **Level Low**: The level low of the trigger signal is valid. As long as the trigger signal is in level low, the device is in image acquisition status.
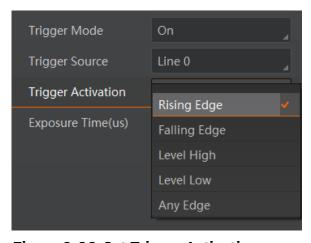
Figure 6-18 Set Trigger Activation

⊡**Note**

The trigger activation may differ by trigger mode.

Set Trigger Debouncer

The trigger debouncer function allows the device to filter out unwanted short external trigger signal that is input to the device. Go to **Digital IO Control** → **Line Debouncer Time**, and enter **Line Debouncer Time** according to actual demands. The range of **Line Debouncer Time** is from 0 μs to 1000000 μs.

ⓘNote

If the **Line Debouncer Time** you set is greater than the time of trigger signal, this trigger signal will be ignored.
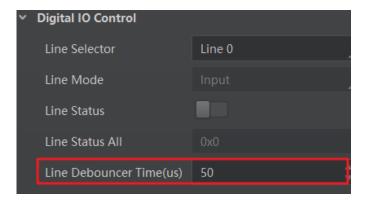
Figure 6-19 Set Trigger Debouncer
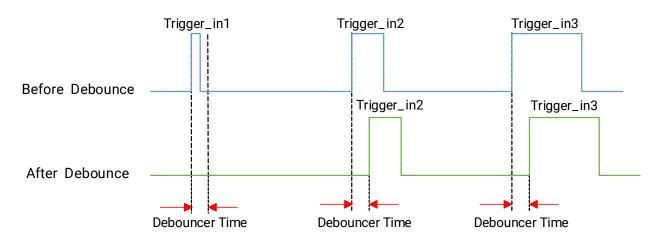
Figure 6-20 Sequence Diagram of Trigger Debouncer

ⓘNote

● The sequence diagram above uses rising edge as trigger activation.
● When you use the trigger debouncer function, there may be a delay in the signal.

6.2 Trigger Output

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

Steps

1. Go to **Digital IO Control** and select **Line 2** as **Line Selector**.
2. Select **Strobe** as **Line Mode**.
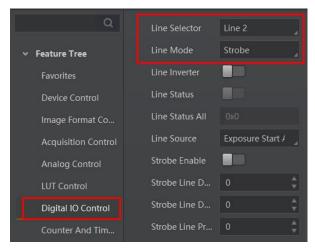
Figure 6-21 Set Line 2 as Output Signal

The output signal of the device is switch signal that can be used to control external devices such as light source, PLC, etc. There are two ways to set output signal, including line inverter and strobe signal.

6.2.1 Enable Line Inverter

The line inverter function allows the device to invert the electrical signal level of an I/O line. Go to **Digital IO Control** → **Line Inverter**, and enable it.
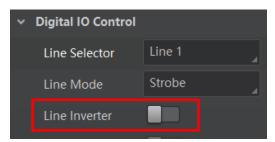
Figure 6-22 Enable Line Inverter

⌊ⁱ⌋**Note**

The line inverter function is disabled by default.

6.2.2 Enable Strobe Signal

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

Steps

1. Go to **Digital IO Control** → **Line Source**, and select **Line Source** according to actual demands.
2. Enable **Strobe Enable**.
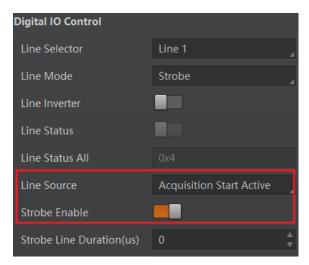
Figure 6-23 Enable Strobe Signal

The supported line sources are as follows:

Table 6-4   Line Source Description

Line Source	Description
Exposure Start Active	The device outputs signals to external devices when it starts exposure.
Exposure End Active	The device outputs signals to external devices when it stops exposure.
Acquisition Start Active	The device outputs signals to external devices when it starts acquiring images.
Acquisition Stop Active	The device outputs signals to external devices when it stops acquiring images.
Frame Burst Start Active	The device outputs signals to external devices when the device's frame burst starts.
Frame Burst End Active	The device outputs signals to external devices when the device's frame burst stops.
Frame Trigger Wait	The device is currently waiting for a frame start trigger.

Line Source	Description
Frame Start Active	The device outputs signals to external devices when it starts doing the capture of a frame.
Frame End Active	The device outputs signals to external devices when it stops doing the capture of a frame.
Soft Trigger Active	The device outputs signals to external devices when it has a software trigger.
Hard Trigger Active	The device outputs signals to external devices when it has a hardware trigger.
Counter Active	The device outputs signals to external devices when it has a counter trigger.
Timer Active	The device outputs signals to external devices when it has a timer trigger.

i **Note**

The specific line sources may differ by device models.

If **Timer Active** is selected as **Line Source**, you can click **Execute** in **Line Trigger Software**, and enter **Strobe Line Delay** according to actual demands. The device will output signals whose duration is configured in **Strobe Line Duration**.
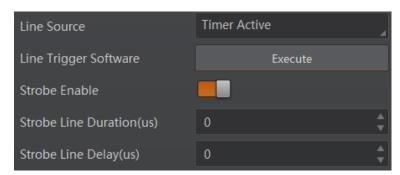
Figure 6-24 Timer Active Parameters
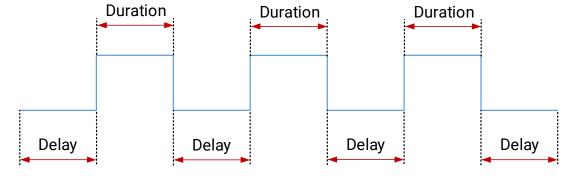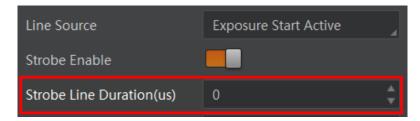
Figure 6-25 Sequence Diagram of Timer Active

Set Strobe Line Duration

After enabling strobe signal, you can set its duration. Go to **Digital IO Control** → **Strobe Line Duration**, and enter it according to actual demands.

Figure 6-26 Set Strobe Line Duration
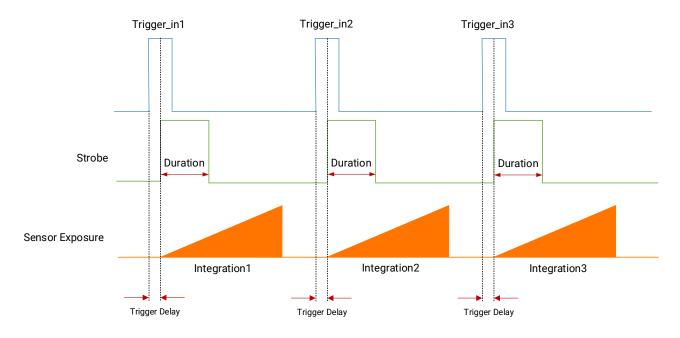
Figure 6-27 Sequence Diagram of Strobe Line Duration

ⓘ**Note**

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

Set Strobe Line Delay

The device supports setting strobe line delay to meet actual demands. When exposure starts, the strobe output does not take effect immediately. Instead, the strobe output will delay according to the strobe line delay setting.

Go to **Digital IO Control** → **Strobe Line Delay**, and enter it according to actual demands. The range of **Strobe Line Delay** is from 0 μs to 10000 μs.
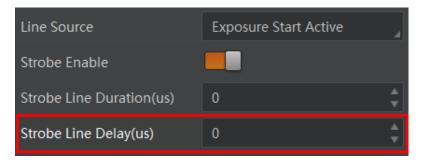
Figure 6-28 Set Strobe Line Delay
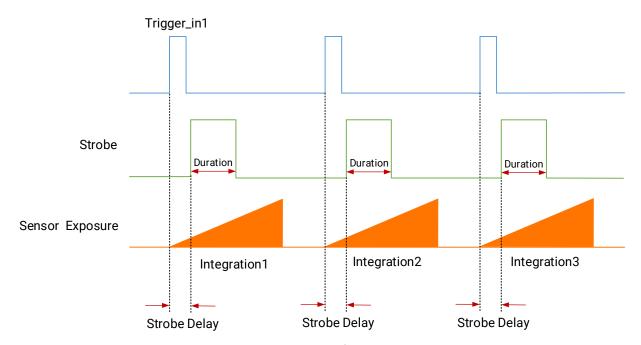
Figure 6-29 Sequence Diagram of Strobe Line Delay

Set Strobe Line Pre Delay

The device 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. The range of **Strobe Line Pre Delay** is from 0 μs to 5000 μs.
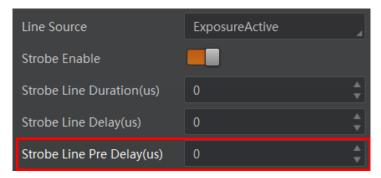
Figure 6-30 Set Strobe Pre Line Delay

The sequence diagram of strobe line pre delay is shown below.
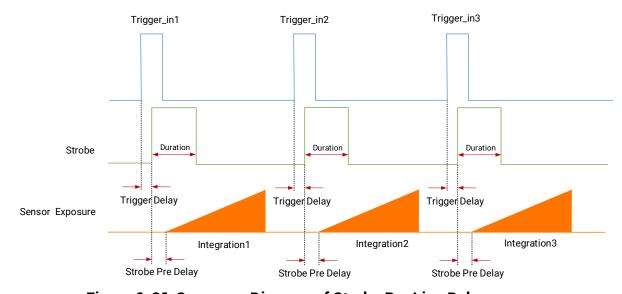
Figure 6-31 Sequence Diagram of Strobe Pre Line Delay

Chapter 7 Image Acquisition

7.1 Set Acquisition Mode

The device supports two types of acquisition modes, including **SingleFrame** mode and **Continuous** mode. Go to **Acquisition Control → Acquisition Mode**, and select **Continuous** or **SingleFrame** as **Acquisition Mode** according to actual demands.
● **SingleFrame**: When device starts image acquisition, it acquires one image only, and then stops.
● **Continuous**: When device starts image acquisition, it acquires images continuously. Real-time frame rate decides the acquisition frame number per second. You can stop image acquisition manually.
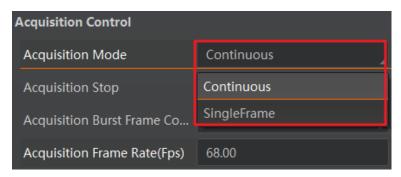
Figure 7-1 Set Acquisition Mode

7.2 Non-Overlap Exposure and Overlap Exposure

The process that the device captures one frame of image includes two stages, exposure and readout. According to the overlap relation between the exposure time and the readout time, devices with different sensors can be divided into overlap exposure and non-overlap exposure.
The device's overlap function is controlled by the overlap mode. Go to **Acquisition Control → Overlap Mode**, select **On** as **Overlap Mode** to have overlap exposure, and select **Off** as **Overlap Mode** to have non-overlap exposure.

Figure 7-2 Set Overlap Mode

Note

- The overlap mode function may differ by device models.
- After the **Overlap Mode** is enabled, exposure lines may appear during image acquisition.

7.2.1 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.
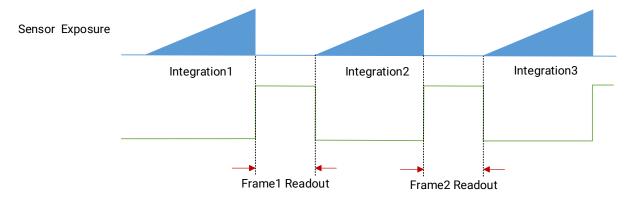
Figure 7-3 Internal Trigger Non-Overlap Exposure
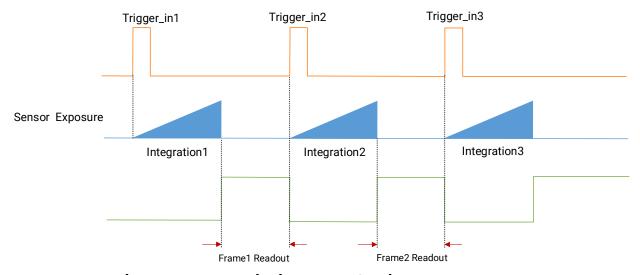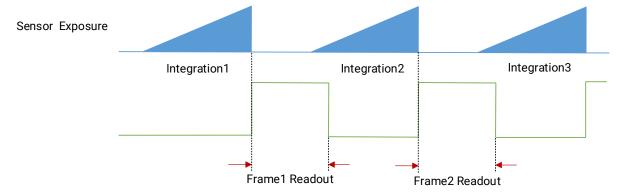
Figure 7-4 External Trigger Non-Overlap Exposure

Note

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

7.2.2 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.

Figure 7-5   Internal Trigger Overlap Exposure
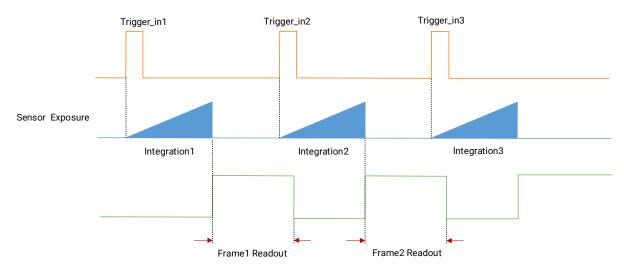
Figure 7-6   External Trigger Overlap Exposure

⌐i⌐**Note**

The overlap exposure is supported in the continuous mode and trigger mode.

Chapter 8 Basic Functions

8.1 Set Frame Rate

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

- Frame readout time: The frame readout time is related with device'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 device 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.

Steps

1. Go to **Acquisition Control** → **Acquisition Frame Rate**, and enter **Acquisition Frame Rate**.
2. Enable **Acquisition Frame Rate Control Enable**.
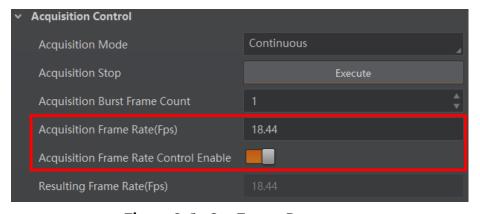
Figure 8-1 Set Frame Rate

ⓘ**Note**

- If the real-time frame rate is smaller than the value you set, the device acquires images by the real-time frame rate.
- If the real-time frame rate is larger than the value you set, the device acquires images by the value you set.

3. View the device's final frame rate in **Resulting Frame Rate**.
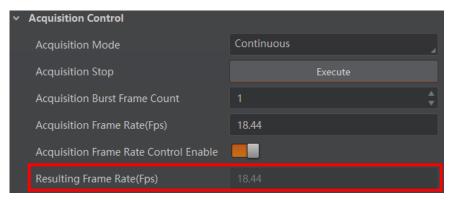
Figure 8-2 View Resulting Frame Rate

8.2 Set Resolution and ROI

☐**Note**

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

Go to **Image Format Control**, and you can view resolution by reading **Width Max** and **Height Max**. **Width Max** stands for the max. pixels per inch in width direction, and **Height Max** stands for the max. pixels per inch in height direction.
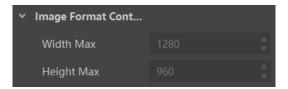
Figure 8-3 View Resolution

If you are only interested in a certain region of the image, you can set a Region of Interest (ROI) for the device.

When the user is only interested in some details in the image, image cropping is needed. That is, an ROI setting is performed on the device to output an image of the region of interest. Setting the region of interest can reduce the transmission data bandwidth and improve the device's frame rate to a certain extent.
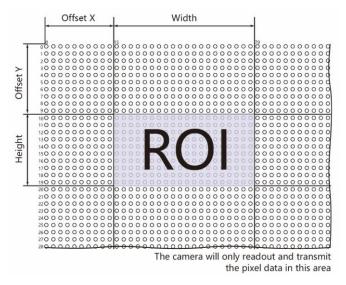
Figure 8-4 ROI

Note
- Region of interest can be set only when you stop real-time acquisition.
- The device currently supports one ROI only, and you can select **Region 0** as **Region Selector**.
- The **Width** plus **Offset X** should not be larger than **Width Max**, and **Height** plus **Offset Y** should not be larger than **Height Max**.

Go to **Image Format Control** → **Region Selector**, and enter **Width**, **Height**, **Offset X**, and **Offset Y**.
- **Width**: It stands for horizontal resolution in ROI area.
- **Height**: It stands for vertical resolution in ROI area.
- **Offset X**: It refers to the horizontal coordinate of the upper-left corner of the ROI.
- **Offset Y**: It refers to the vertical coordinate of the upper-left corner of the ROI.

Figure 8-5 Set ROI

8.3 Set Image Reverse

Note
For different models of device, the image reverse function may be different. Please refer to

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the actual one you got.

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

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

Figure 8-6 Set Image Reverse
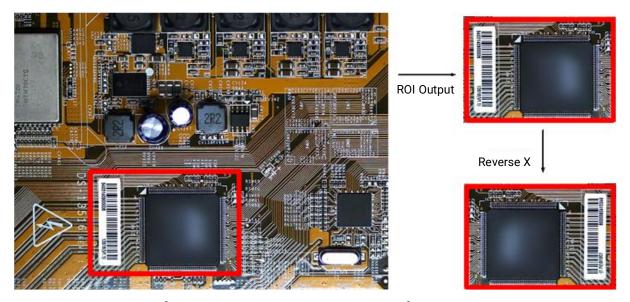
Figure 8-7 Image Reverse Comparison

8.4 Set Pixel Format

This function allows you to set the pixel format of the image data transmitted by the device. Go to **Image Format Control** → **Pixel Format**, and set **Pixel Format** according to actual demands.

⎣i⎤**Note**

The specific pixel formats may differ by device models.

Table 8-1   Pixel Format and Pixel Size

Pixel Format	Pixel Size (Bits/Pixel)
Mono 8	8
Mono 10 Packed Mono 12 Packed	12
Mono 10 Mono 12	16

Figure 8-8   Set Pixel Format

8.5 Set Test Pattern

Note

The test pattern may differ by device models.

The device supports test pattern function. When there is exception in real-time image, you can check whether image in test mode have similar problem to determine the reason. This function is disabled by default, and at this point, the output image by the device is real-time image. If this function is enabled, the output image by the device is test image.
Go to **Image Format Control** → **Test Pattern Generator Selector** → **Test Pattern**, and set **Test Pattern** according to actual demands.
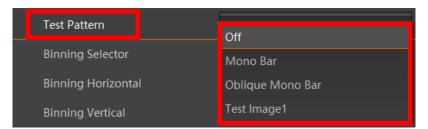
Figure 8-9   Set Test Pattern

The device offers 3 test patterns, including **Mono Bar**, **Oblique Mono Bar**, and **Test Image 1**.

Table 8-2 Test Pattern

Test Pattern	Image
Mono Bar	
Oblique Mono Bar	
Test Image	

Note

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

8.6 Set Binning

> **Note**
> ● **Binning Horizontal** is the image's width, and **Binning Vertical** is the image's height.
> ● The binning-related functions may differ by device models.
> ● The **Binning Mode** is valid when the **Binning Horizontal** or **Binning Vertical** is 2, 3, or 4.
> ● The **Binning Mode** is invalid when the **Decimation Horizontal** or **Decimation Vertical** is 1.

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 **Binning Selector**, and set **Binning Horizontal** and **Binning Vertical** according to actual demands.

Figure 8-10 Set Binning

The device also supports binning mode function. Click **Binning Mode**, and select **Sum** or **Average** according to actual demands.
● Sum: The values of the affected pixels are summed. This improves the signal-to-noise ratio, but also increases the device's response to light.
● Average: The values of the affected pixels are averaged. This greatly improves the signal-to-noise ratio without affecting the device's response to light.
Both binning modes (Sum and Average) reduce the amount of image data to be transferred.
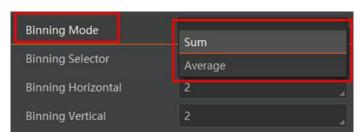
Figure 8-11 Set Binning Mode

8.7 Set Decimation

> **Note**
> ● **Decimation Horizontal** is the image's width, and **Decimation Vertical** is the image's height.
> ● The decimation related functions may differ by device models.

The decimation feature allows you to reduce the number of sensor pixel columns or rows that are transmitted by the device. This procedure is also known as subsampling. It reduces the amount of data to be transferred and may increase the device's frame rate.
Click **Image Format Control**, and set **Decimation Horizontal** and **Decimation Vertical** according to actual demands.

Figure 8-12 Set Decimation

8.8 Set Exposure Mode

ⓘ**Note**
The exposure mode may differ by device models.

The device supports 2 types of exposure modes, including **Timed** and **Trigger Width**.
● If the **Exposure Mode** is **Timed**, the device's exposure time is controlled by **Exposure Auto** and **Exposure Time**.
● If the **Exposure Mode** is **Trigger Width**, exposure time and level signal duration should be the same, and **Exposure Auto** and **Exposure Time** are invalid.

ⓘ**Note**
When the device's **Trigger Mode** is **On**, **Trigger Source** is **Line 0** or **Line 2**, and Trigger Activation is **Level High** or **Level Low**, **Trigger Width** can be selected as **Exposure Mode** and the device's exposure time is controlled by the signal duration.

The device supports 2 types of exposure time modes, including **Ultrashort** mode and **Standard** mode.

8.8.1 Set Ultrashort Mode

In ultrashort mode, the device takes very little exposure time, and the exposure time can only be adjusted manually. Because the exposure time is small, it needs to be used with the light source.

Go to **Acquisition Control** → **Exposure Time Mode**, and set **Exposure Time Mode** according to actual demands.
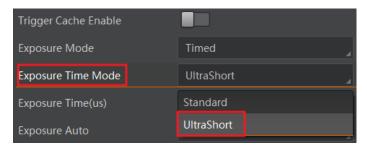
Figure 8-13 Set Ultrashort Mode

⎙**Note**
- The exposure time mode may differ by device models.
- If the device you got does not support **Ultrashort** exposure time mode, and then there is no **Exposure Time Mode** parameter, and your device supports **Standard** exposure time mode only by default.

8.8.2 Set Standard Mode

In standard mode, the device supports 3 types of exposure mode, including **Off**, **Once** and **Continuous**. Click **Acquisition Control** → **Exposure Auto**, and select **Exposure Auto** according to actual demands.
- **Off**: The device exposures according to the value set in **Exposure Time (μs)**.
- **Once**: The device adjusts the exposure time automatically according to the image brightness. After adjusting, it will switch to **Off** mode.
- **Continuous**: The device adjusts the exposure time continuously according to the image brightness.

When the exposure mode is set as **Once** or **Continuous**, the exposure time should be within the range of **Auto Exposure Time Lower Limit (µs)** and **Auto Exposure Time Upper Limit (µs)**.

Exposure Mode	Timed
Exposure Time Mode	Standard
Exposure Time(us)	1415.00
Exposure Auto	Continuous
Auto Exposure Time Lower Limit(us)	15
Auto Exposure Time Upper Limit(us)	104932
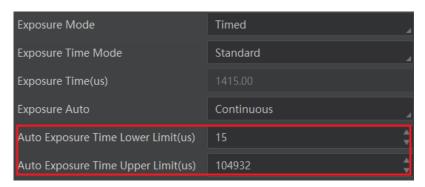
Figure 8-14 Set Exposure Time under Once or Continuous Mode

📖**Note**

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

8.9 Set Sequencer Control

The device supports sequencer function, which allow you to configure multiple groups of parameters to acquire images.
If the device supports sequencer, you can configure multiple groups of parameters including exposure time and gain. The principle of the sequencer is shown below.
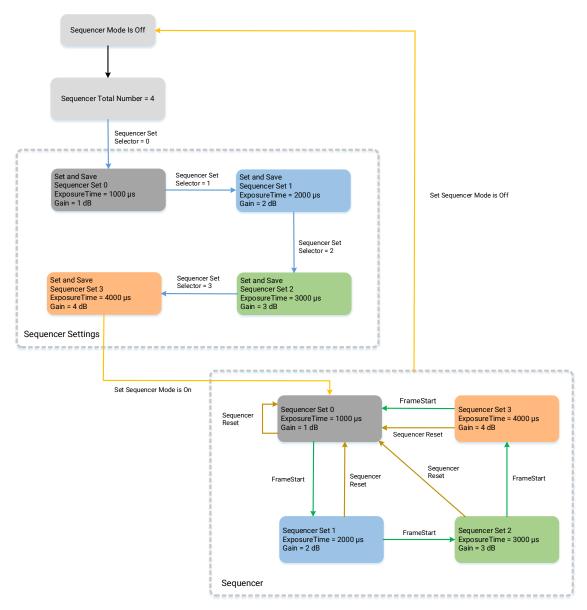
Figure 8-15 Principle of Sequencer

Steps

1. Go to **Sequencer Control**, select **Off** as **Sequencer Mode**, and **On** as **Sequencer Configuration Mode**.
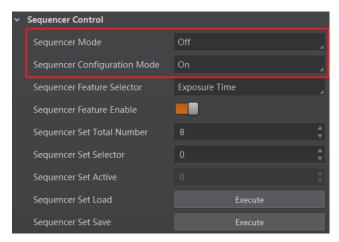
Figure 8-16 Set Sequencer Control

2. Set **Sequencer Set Total Number** to configure how many groups to join sequencer according to actual demands.

Note

Up to 8 groups of parameters can be configured.

3. Set **Sequencer Set Selector** to select one group of parameters, and set **Sequencer Feature Selector** to configure specific parameters.
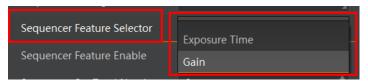
Figure 8-17 Sequencer Feature Selector

Note

● You should go to the corresponding parameters to set their detailed parameters.
● **Sequencer Feature Enable** is enabled by default for configured parameters.

4. (Optional) Click **Execute** in **Sequencer Set Load** to load selected parameters in **Sequencer Set Selector**.
5. (Optional) Click **Execute** in **Sequencer Set Save** to save the selected group of parameters.
6. Repeat step 3 to step 5 to configure other group of parameters.
7. Select **On** as **Sequencer Mode** to start sequencer after configuration.

Note

You cannot configure detailed parameters of group of parameters once sequencer is started.

8. (Optional) Click **Execute** in **Sequencer Restart** to let the sequencer start from the beginning group.
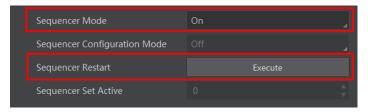
Figure 8-18 Sequencer Restart

⌈i⌋Note

The **Sequencer Restart** is valid when the **Sequencer Mode** is **On**.

8.10 Set Gain

⌈i⌋Note

The gain function may differ by device models.

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

8.10.1 Set Analog Gain

⌈i⌋Note

The analog gain parameter name may differ by device of different models or firmware.

The device supports 3 types of gain mode, including **Off**, **Once** and **Continuous**. Click **Analog Control** → **Gain Auto**, and select **Gain Auto** according to actual demands.
- **Off**: The device adjusts gain according to the value configured by user in **Gain**.
- **Once**: The device adjusts the gain automatically according to the image brightness. After adjusting, it will switch to **Off** mode.
- **Continuous**: The device adjusts the gain continuously according to the image brightness.

When the gain mode is set as **Once** or **Continuous**, the gain should be within the range of **Auto Gain Lower Limit (dB)** and **Auto Gain Upper Limit (dB)**.
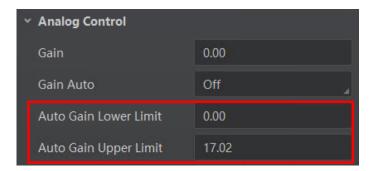
Figure 8-19 Set Gain under Once or Continuous Mode

⌯**Note**

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

8.10.2 Set Digital Gain

Apart from analog gain, the device 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.
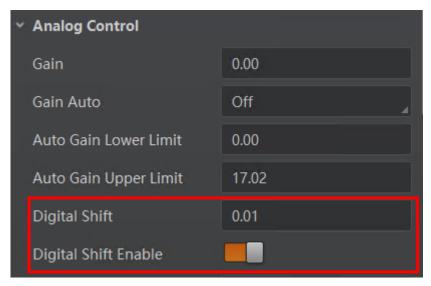
Figure 8-20 Set Digital Gain

⌷**ⁱNote**
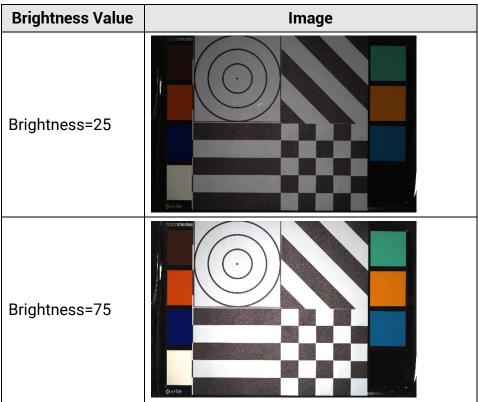
When increasing the digital gain, the image noise will greatly increase too, which will severely influence image quality. It is recommended to use analog gain first, and then to adjust digital gain if the analog gain cannot meet demands.

8.11 Set Brightness
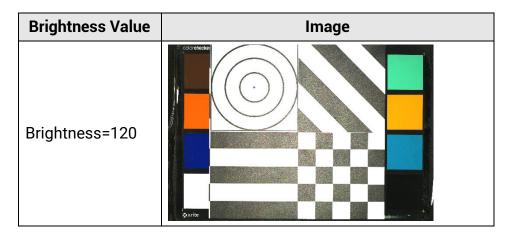
The device brightness refers to the brightness when the device adjusts image under **Once** or **Continuous** exposure mode.

⌷**ⁱNote**

● You should enable **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain mode first before setting brightness.
● After setting brightness, the device 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.
● The range of brightness is between 0 and 255.

Table 8-3   Brightness Example

Brightness Value	Image
Brightness=25	
Brightness=75	

Brightness Value	Image
Brightness=120	

Go to **Analog Control** → **Brightness**, and enter **Brightness** according to actual demand.
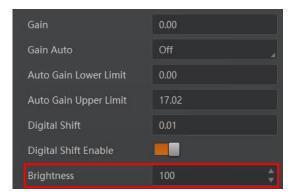
Figure 8-21 Set Brightness

8.12 Set Sharpness

Note
- The sharpness function may differ by device models, and is disabled by default.
- The range of sharpness is between 0 and 100.

The device supports sharpness function that can adjust the sharpness level of the image edge. You can set sharpness as shown below.
Go to **Analog Control** → **Sharpness Enable**, enable **Sharpness Enable**, and enter **Sharpness** according to actual demands.

Figure 8-22 Set Sharpness

8.13 Set Contrast Ratio

⎙**Note**

● The contrast ratio function may differ by device models.
● Make sure that the live view is enabled, and Gamma correction and LUT function is disabled before using the contrast ratio function.
● The range of **Contrast Ratio** is from 0 to 100.

The device 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.
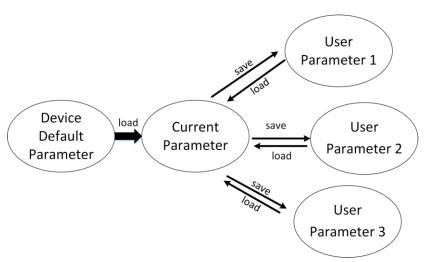
Figure 8-23 Set Contrast Ratio

8.14 User Set Customization

This function allows you to save or load device settings. The device supports four sets of parameters, including one default set and three user sets, and the relation among four sets of parameters is shown below.

Figure 8-24 Parameter Relation

⎙**Note**

After setting user parameters, it is recommended to save user parameters and select them as the default parameters.

8.14.1 Save User Set

Steps

1. Go to **User Set Control**, and select a user set in **User Set Selector**.

⧉**i Note**

Here we take selecting **User Set 1** as an example.

2. Click **Execute** in **User Set Save** to save parameter.
3. View **User Set Save Status**:
● Saving: User parameters are being saved.
● Ready: User parameters have been saved.
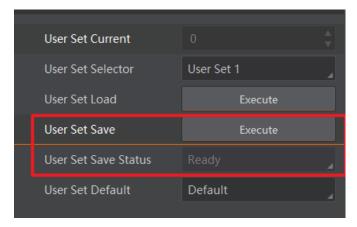
Figure 8-25 Save User Set

8.14.2 Load User Set

⧉**i Note**

Loading user set is available only when the device is connected but without live view.

Steps

1. Go to **User Set Control**, and select a user set in **User Set Selector**.

⧉**i Note**

Here we take selecting **User Set 1** as an example.

2. Click **Execute** in **User Set Load** to load parameter.
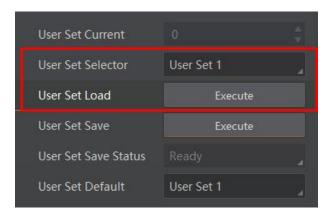
Figure 8-26 Load User Set

8.14.3 Set User Default

You can also set default parameter by going to **User Set Control** and selecting a user set in **User Set Default**.

⊡Note

- The User Set Default is the user set that will be loaded upon power cycling the camera
- Here we take selecting **User Set 1** as an example.
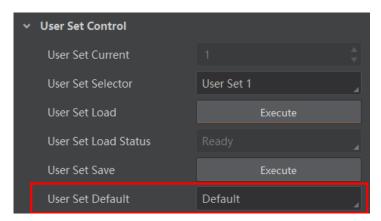
Figure 8-27 Set User Default

Chapter 9 Advanced Functions

9.1 Set Black Level

⎘ⁱNote

The black level may differ by device models.

The device 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.
Go to **Analog Control** → **Black Level Enable**, enable **Black Level Enable**, and enter **Black Level** according to actual demands.

Figure 9-1 Set Black Level

9.2 Set Gamma Correction

⎘ⁱNote

The Gamma correction function may differ by device models.

The device supports Gamma correction function. Generally, the output of the device'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 between 0.5 and 1: image brightness increases, and dark area becomes brighter.
● Gamma between 1 and 4: image brightness decreases, and dark area becomes darker.
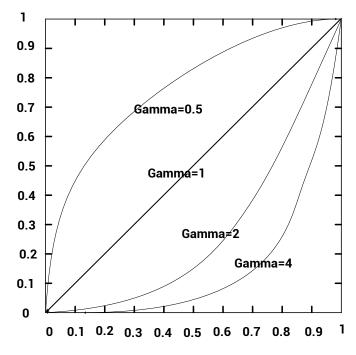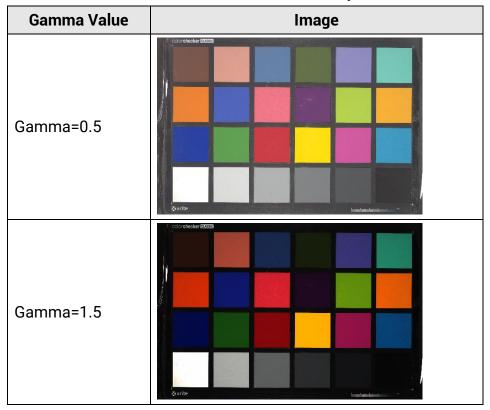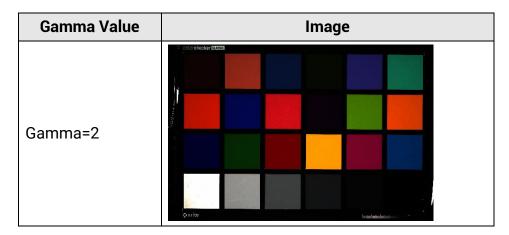
Figure 9-2 Set Gamma Correction

Table 9-1   Gamma Correction Example

Gamma Value	Image
Gamma=0.5	
Gamma=1.5	

Gamma Value	Image
Gamma=2	

There are 2 types of Gamma correction, including **User** mode and **sRGB** mode. Settings method is different as shown below.

User Mode

Steps

1. Go to **Analog Control** → **Gamma Selector**.
2. Select **User** as **Gamma Selector**.
3. Enable **Gamma Enable** to enable it.
4. Enter **Gamma** according to actual demands, and its range is from 0 to 4.
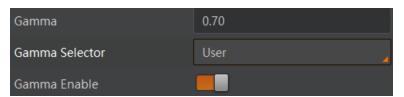
Figure 9-3 Set User Mode

sRGB Mode

Steps

1. Go to **Analog Control** → **Gamma Selector**.
2. Select **sRGB** as **Gamma Selector**.
3. Enable **Gamma Enable** to enable it.

Figure 9-4 Set sRGB Mode

9.3 Set Digital Noise Reduction

☐ⁱNote

- The digital noise reduction function may differ by device models.
- Excessive noise reduction will affect the image details.

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

Steps

1. Go to **Analog Control** → **Digital Noise Reduction Mode**.
2. Select **Expert** as **Digital Noise Reduction Mode**.
3. 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.
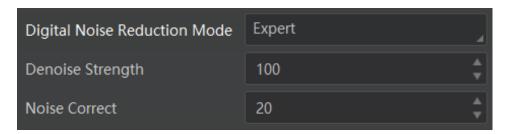
Figure 9-5 Set Digital Noise Reduction

9.4 Set AOI

☐ⁱNote

The AOI function is valid when the auto exposure is on.

The device supports AOI function that can adjust the brightness of the entire image based on the area you selected.

Steps

1. Click **Analog Control** → **Auto Function AOI Selector**, and select **AOI 1**.
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**.

Auto Function AOI Selector	AOI 1
Auto Function AOI Width	1280
Auto Function AOI Height	1024
Auto Function AOI Offset X	0
Auto Function AOI Offset Y	0
Auto Function AOI Usage Intensity	

Figure 9-6 Set AOI

9.5 Set LUT

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

$\boxed{i}$**Note**

- You cannot use Gamma correction function and LUT function at the same time.
- The range of the LUT index is from 0 to 1023.
- The value of LUT value is four times the value of LUT index by default. With different ADC bit depth, the range of the LUT value may differ.
- The parameter of **LUT Save** may differ by device models. If the device has no **LUT Save**, the settings you configured will be saved in the device in real time.
- For different LUTs, after you set **LUT Index** and **LUT Value**, you should click **Execute** in **LUT Save** respectively.

Steps

1. Click **LUT Control**, and enable **LUT Enable**.
2. Enter **LUT Index** and **LUT Value** according to actual demands.
3. Click **Execute** in **LUT Save** to save it.
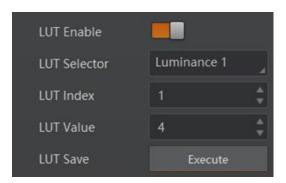
Figure 9-7   Set LUT

9.6 Set Shading Correction

The device supports shading correction function that improves the image uniformity when you acquire a non-uniformity image due to external conditions. The supported shading correction type includes LSC correction.

LSC correction stands for Lens Shading Correction that eliminates non-uniform illumination brought by lens. The images before LSC correction and after correction are shown below.

Figure 9-8   Before LSC Correction

Figure 9-9 After LSC Correction

Steps

1. Go to **Shading Correction**, and select **LSC Correction** as **Shading Selector**.
2. Click **Execute** in **Activate Shading** to let the client software automatically calculate.
3. Enable **LSC Enable**.
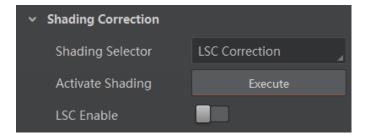
Figure 9-10 LSC Correction

⌊i⌋**Note**

● The LSC correction can be done only when the device is in full resolution. If you are only interested in certain details in the image, you can use the ROI function.
● If the light source and color temperature change, you need to execute LSC correction again.

Chapter 10 Other Functions

10.1 Device Control

ⓘ**Note**
The specific device control parameters may differ by device models.

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

Table 10-1 Parameter Description

Parameter	Read/Write	Description
Device Type	Read Only	It is the device type.
Device Scan Type	Read Only	It is the scan type of the device's sensor.
Device Vendor Name	Read Only	It is the name of the manufacturer of the device.
Device Model Name	Read Only	It is the model of the device.
Device Manufacturer Info	Read Only	It is the manufacturer information about the device.
Device Firmware Version	Read Only	It is the firmware version of the device.
Device Serial Number	Read Only	It is device's serial number.
Device User ID	Read & 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.
Board Device Type	Read Only	It is the device type.
Device Connection Selector	Read & Write	It selects which connection of the device to control.
Device Connection Speed (Mbps)	Read Only	It indicates the speed of transmission of the specified connection.
Device Link Selector	Read & Write	It selects which link of the device to control

Parameter	Read/Write	Description
Device Link Speed (Mbps)	Read Only	It indicates the speed of transmission negotiated on the specified link.
Device Link Connection Count	Read Only	It returns the number of physical connection of the device used by a particular link.
Device Link Heartbeat Mode	Read & Write	It activates or deactivates the link's heartbeat.
Device Stream Channel Count	Read only	It indicates the number of streaming channels supported by the device.
Device Stream Channel Selector	Read & Write	It selects the stream channel to control.
Device Stream Channel Type	Read Only	It reports the type of the stream channel.
Device Stream Channel Link	Read Only	It is the index of device's link to use for streaming the specified stream channel.
Device Stream Channel Endianness	Read Only	It is the endianness of multi-byte pixel data for this stream.
Device Stream Channel Packet Size (B)	Read & Write	It specifies the stream packet size, in bytes, to send on the selected channel for a transmitter or specifies the maximum packet size supported by a receiver.
Device Event Channel Count	Read Only	It indicates the number of event channels supported by the device.
Device Character Set	Read Only	It is character set used by the strings of the device's bootstrap registers.
Device Reset	Write Only	Click **Execute** to reset the device.
Device Temperature Selector	Read & Write	It selects device component to view its temperature. Currently, only sensor can be selected only.
Device Temperature	Read Only	It displays the temperature of selected components in **Device Temperature Selector**.
Relative Humidity	Read Only	It displays the device's internal relative humidity.
Device Fan Enable	Read & Write	It enables fan function.
TEC Enable	Read & Write	It enables TEC function.
TEC Temperature	Read & Write	It sets the target of TEC temperature in degrees Celsius (°C).

Parameter	Read/Write	Description
TEC Voltage	Read Only	It is the TEC voltage.
Find Me	Write Only	The function of finding me is executed. Click **Execute** to find the currently operating device.
Device Max Throughput (Kbps)	Read Only	It is max. bandwidth of the data that can be streamed out of the device.
Device PJ Number	Read Only	It is the device's project number.

10.2 Embed Information into Image

The device supports embedding information into image data. The information will be embedded into the image according to the enabling condition of each type of information in the order of the image embedding information listed in the table below.

☐ⓘ**Note**

Width, **Height**, **Offset X**, **Offset Y** and **Pixel Format** are image embedding information that the device supporting Chunk function has.

Table 10-2 Image Embedding Information

Image Embedding Info.	Byte	Data Format
Timestamp	4	Refer to figure 11-1
Gain	4	4 bytes are used to transfer the gain information. Each low 8 bits of the 4 valid data are combined to transfer the gain information. Value Range: 0 to 1023. Note: High bits will be complemented with 0 automatically.
Exposure	4	4 bytes are combined to show the exposure time, and the unit is μs.
Brightness Info	4	Ranges from 0 to 4095
Frame Counter	4	Ranges from 0 to 2^{32}-1
Ext Trigger Count	4	Ranges from 0 to 2^{32}-1
Line Input Output	4	The 1st byte is input, and each bit corresponds to 1 input. The 2nd byte is output, 3rd and 4th bytes are reserved.
Width	4	Ranges from 0 to 2^{32}-1
Height	4	Ranges from 0 to 2^{32}-1
Offset X	4	Ranges from 0 to 2^{32}-1
Offset Y	4	Ranges from 0 to 2^{32}-1

Image Embedding Info.	Byte	Data Format
Pixel Format	4	Ranges from 0 to 2^{32}-1
ROI Position	8	The starting coordinates occupy two bytes each with the column coordinates at the front and the row coordinates at the back. The length and width coordinates each occupy two bytes.
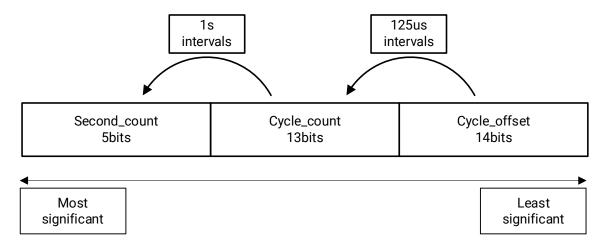
Figure 10-1 Data Format of Timestamp

You can embed information into the image via Chunk function.

Steps

1. Go to **Chunk Data Control** → **Chunk Mode Active**, and **Chunk Mode Active**.
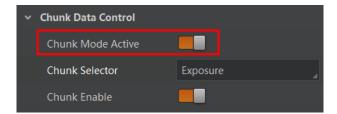
Figure 10-2 Enable Chunk Mode Active

2. Select **Chunk Selector** according to actual demands.
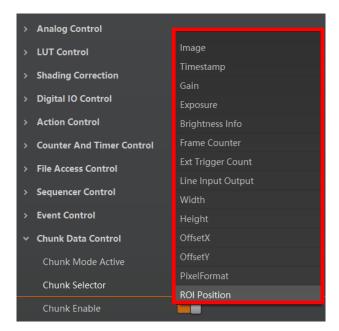
Figure 10-3 Select Chunk Selector

3. Enable **Chunk Enable** to embed information into the image.
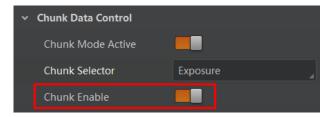
Figure 10-4 Chunk Enable

4. (Optional) Repeat steps above to add multiple Chunk information types.
5. Click ![icon] on the control toolbar of the client software to view specific information.

10.3 Set Action Command

ⓘ**Note**

- The action command function may differ by device models.
- Only V3.1.0 and above version of MVS client software support GigE Vision action command.

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

Steps

1. Go to **Transport Layer Control → GEV IEEE 1588**, and enable **GEV IEEE 1588**.
2. Go to **Acquisition Control → Trigger Selector**, and select **Frame Burst Start**.
3. Select **On** as **Trigger Mode**.

4. Select **Action 1** as **Trigger Source**.
5. Go to **Tool** → **GigE Vision Action Command** in the menu bar.
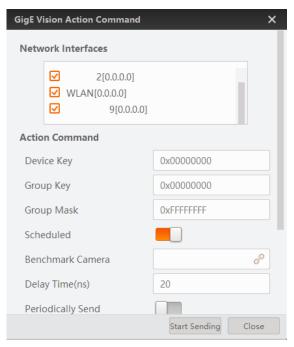
Figure 10-5 GigE Vision Action Command

6. Select **Network Interfaces** to set the subnet that the command to be sent to.
7. Enter **Device Key**, **Group Key**, and **Group Mask**.

Table 10-3 Parameter Description

MVS Parameter Name	Device Parameter Name	Description
Device Key	Action Control → Action Device Key	The parameter value should be the same.
Group Key	Action Control → Action Group Key	The parameter value should be the same.
Group Mask	Action Control → Action Group Mask	The bitwise AND operation of the **Group Mask** against the **Action Group Mask** feature should results in non-zero.

8. Enable **Scheduled**.
9. Click 🔗 in **Benchmark Camera** to select one device as benchmark device. Once benchmark device is selected, other devices keep time synchronization with it.
10. (Optional) Enter **Delay Time** according to actual demands.

⎙**Note**

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

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

⎙**Note**

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

12. (Optional) Enable **Request Acknowledgement** to display the acknowledgement messages.
13. Click **Start Sending**.

10.4 File Access Control

⎙**Note**

The file access control function may differ by device model.

The file access function can import or export the device's feature files and save them in mfa format. The supported feature files include **User Set 1/2/3**, **DPC**, **LUT Luminance 1/2/3**, and **License Notice**.

Steps

1. Select a device in the device list, and click ⎙ to open the file access dialogue box.

Figure 10-6 File Access

2. Select **Device Feature** and click **Import** or **Export**.

Figure 10-7 Import or Export

3. Select a file in MFA format from local PC to import, or select a saving path and enter file name to save and export.

📖**Note**

- 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.
- **License Notice** supports exporting only.
- Importing and exporting the device feature among the same model of devices are supported.

10.5 Event Control

📖**Note**

The event control function may differ by device model.

The event control can record events happen to the device and allow you to view them.

Steps

1. Go to **Event Control** → **Event Selector**, and select **Event Selector** according to actual demands.

📖**Note**

The specific events may differ by device models.
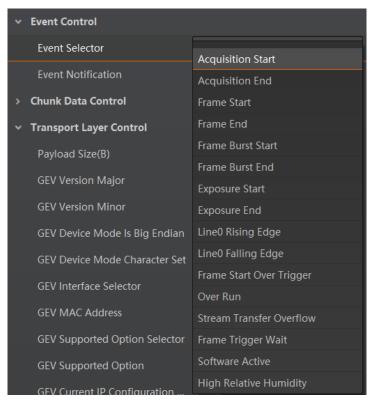
Figure 10-8 Event Selector

2. Select **Notification On** as **Event Notification** to output event.
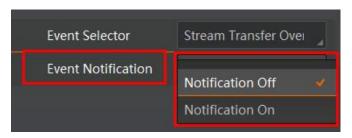
Figure 10-9 Set Event Control

3. Right click the connected device and click **Event Monitor**.
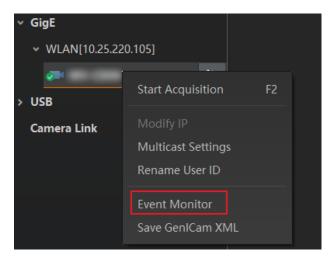
Figure 10-10 Event Monitor

4. Check **Messaging Channel Event**, and view specific event after device starts live view.
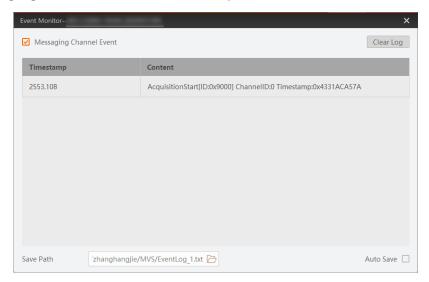
Figure 10-11 Event Monitor Window

10.6 Transport Layer Control

You can go to **Transport Layer Control** to view the device's payload size, GEV version, etc.

⬛**Note**

The specific parameters of transport layer control may differ by device models.

Table 10-4 Parameters of Transport Layer Control

Parameter	Read/Write	Description
Payload Size(B)	Read Only	It is the device's load size.

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

Parameter	Read/Write	Description
		network interfaces supported by this device.
GEV Persistent IP Address	Read & 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 & 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 & Write	It indicates the persistent default gateway for this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Link Speed	Read Only	It indicates the speed of transmission negotiated by the given network interface in Mbps.
GEV Message Channel Count	Read Only	It indicates the number of message channels supported by this device.
GEV Stream Channel Count	Read Only	It indicates the number of stream channels supported by this device.
GEV Heartbeat Timeout (ms)	Read & Write	It indicates the current heartbeat timeout in milliseconds.
GEV Heartbeat Disable	Read & 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 & Write	It latches the current timestamp value of the device.
Timestamp Control Reset	Read & Write	It resets the timestamp value for the device.
Timestamp Control Latch Reset	Read & 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 & Write	It controls the device access privilege of an application.

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 & 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 & 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 & Write	It specifies the stream packet size (in bytes) to send on this channel.
Bandwidth Reserve	Read & Write	It indicates the bandwidth reserved during the data transmission process.
Auto SCPD	Read & Write	After it is enabled, the SCPD value will be adjusted automatically.
GEV SCPD	Read & Write	It indicates the delay (in timestamp counter units) to insert between each packet for this stream channel.
GEV SCDA	Read & 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 MCP Host Port	Read & Write	It controls the port to which the device must send messages. Setting this value to 0 closes the message channel.
GEV MCDA	Read & Write	It controls the destination IP address for the message channel.
GEV MCTT (ms)	Read & Write	It provides the transmission timeout value in milliseconds.
GEV MCRC	Read & 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

Parameter	Read/Write	Description
		message channel.
Gev IEEE 1588	Read & Write	It enables the IEEE 1588 Precision Time Protocol to control the timestamp register.
Gev IEEE 1588 Status	Read Only	The status of the IEEE 1588 Precision Time Protocol.
Gev GVSP Extended ID Mode	Read & Write	It enables the extended ID mode.

10.7 Transfer Control

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

⌐i⌐**Note**

The specific parameters of transfer control may differ by device models.
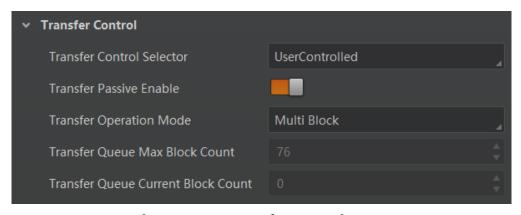
Figure 10-12 Transfer Control

Table 10-5 Parameters of Transfer Control

Parameter	Read/Write	Description
Transfer Control Selector	Read & Write	It selects the transfer mode. ● Basic: In this mode, the device sends images to the client software directly after acquiring images. ● UserControlled: In this mode, the device saves images in its internal cache first, and then sends to the client software after acquiring images.
Transfer Passive Enable	Read & Write	The transfer passive node will be displayed if it is enabled.

Parameter	Read/Write	Description
		📖**Note** You should select **User Controlled** as **Transfer Control Selector** first.
Transfer Operation Mode	Read & Write	It is the transfer operation mode: ● Single Block: Click **Execute** in **Transfer Strat** to let the device transfer one image each time. ● Multi Block: Click **Execute** in **Transfer Strat** to let the device transfer multiple images in cache.
Transfer Queue Max Block Count	Read Only	It displays the max. image quantity that the device's memory can save before the compression.
Transfer Queue Current Block Count	Read Only	It displays current image quantity saved by the memory.

10.8 Full Frame Transmission

Go to **Acquisition Control → FullFrame Transmission** to enable the function.
● When the function is enabled and the data stream is stopped during the transmission of the current frame, the stream stopping will not be executed until the current frame has been completely transmitted.
● When the function is disabled and the data stream is stopped during the transmission of the current frame, the stream stopping will be executed immediately and the current frame will be discarded.
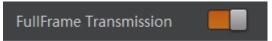
Figure 10-13 Full Frame Transmission

10.9 Multicast Function

The multicast function enables multiple PCs to access the same device at the same time. At the same time, the same device can only be connected by one client in controller and data receiver mode or controller mode, but can be connected by multiple clients in data receiver mode. The multicast mode of each device within the client is controlled individually. The description of three multicast modes is shown below.

Table 10-6 Multicast Mode Description

Multicast Mode	Description
Controller and Data Receiver	This mode allows you to read and edit the device's parameters, and get its image data.

Multicast Mode	Description
Controller	This mode allows you to read and edit the device's parameters, but you cannot get its image data.
Data Receiver	This mode allows you read the device's parameters and get its image data, but you cannot edit its parameters.

When the multicast function is enabled, the device icon on the client software of other PCs will change to ⬛📷 , and you can connect the device via the data receiver mode.

You can set multicast function for both the available device and connected device in the device list, but the specific settings are different.

10.9.1 Set Multicast (Available Status)

Follow steps below to set multicast function if the device is in available status.

Steps

1. Right click the available device, and click **Multicast Settings**.
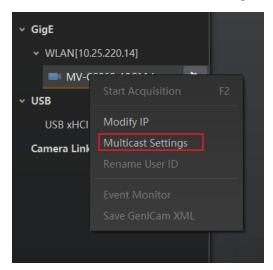
Figure 10-14 Multicast Settings

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

📖**Note**

● The available status device can use multicast function in **Controller and Data Receiver** mode or **Controller** mode.
● The IP address should be class D IP address, and the port ranges from 0 to 65535.
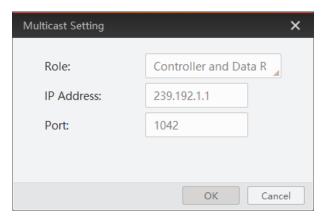
Figure 10-15 Set Parameters

3. Click **OK**.

10.9.2 Set Multicast (Connected Status)

Follow steps below to set multicast function if the device is in connected status.

Steps

1. Right click the available device, and click **Multicast Settings**.
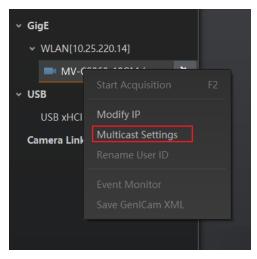
Figure 10-16 Multicast Settings

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

�**Note**

- The connected status device can use multicast function in Controller and Data Receiver mode only.
- The IP address should be class D IP address, and the port ranges from 0 to 65535.
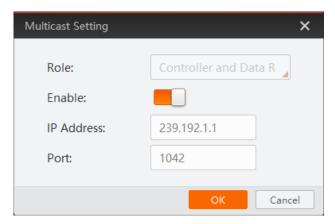
Figure 10-17 Set Parameters

3. Click **OK**.

10.10 Update Firmware

You can use the MVS Tool Kit to update the device's firmware.

> 📖 **Note**
>
> The MVS Tool Kit is installed by default when you install the MVS client software.

Steps

1. Go to **All** → **Configuration Tool** → **Firmware Upgrade Tool** after running MVS Tool Kit.
2. Click ⟳ in **GigE** to enumerate devices.
3. Click 📂 to select firmware upgrade package (dav file).
4. Click **Update** to start updating.
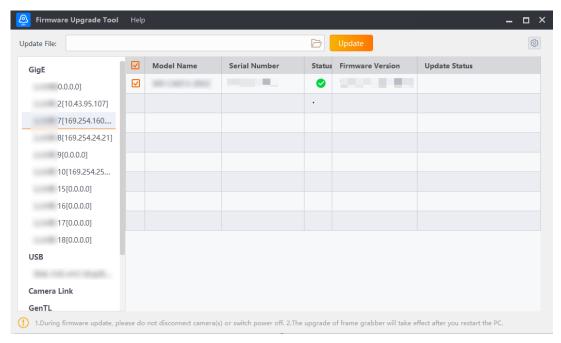
Figure 10-18 Update Firmware

Note

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

Chapter 11 FAQ (Frequently Asked Question)

11.1 Why the client software cannot list devices?

Table 11-1 Question 1

Possible Cause	Solution
The device is not powered on.	Check the device's power supply and network connection by observing the device's indicator and network link indicator.
Incorrect network cable connection.	

11.2 Why device connection fails after the device is listed in the client software?

Table 11-2 Question 2

Possible Cause	Solution
The device and the client software are not in the same network segment.	Use IP configurator tool to edit the device's IP address to make sure that the device and the client software are in the same network segment.
The device has been connected by other programs.	Disconnect the device with other programs, and reconnect it to the client software.

11.3 Why the live view is black?

Table 11-3 Question 3

Possible Cause	Solution
The device's lens aperture is not removed.	Remove the device's lens aperture.
The device exception occurs.	Power off and restart the device.

11.4 Why the device cannot be triggered although the live view is normal?

Table 11-4 Question 4

Possible Cause	Solution
The trigger mode is not enabled or the device is not triggered.	Enable the trigger mode and make sure that the selected trigger source matches with the corresponding I/O signal.
Incorrect trigger wiring.	Check if the input of trigger signal and wiring are correct or not.

11.5 Why the network changes from GigE Ethernet to Fast Ethernet?

Table 11-5 Question 5

Possible Cause	Solution
The network cable may be damaged.	Check the network cable, and replace it if it is damaged.

Chapter 12 Revision History

Table 12-1 Revision History

Version	Document No.	Revision Date	Revision Details
V1.0.0	UD41542B	Feb. 8, 2025	Original version.

Appendix A Device Parameter Index

Here list all parameters of the device mentioned in different sections of this user manual. You can quickly locate parameters in different sections by viewing tables below.

A.1 Device Control

Table A-1   Device Control

Parameters	Section
Device Type	Section Device Control
Device Scan Type	
Device Vendor Name	
Device Model Name	
Device Manufacturer Info	
Device Firmware Version	
Device Serial Number	
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)	

Parameters	Section
Device Event Channel Count	
Device Character Set	
Device Reset	
Device Temperature Selector	
Device Temperature	
Relative Humidity	
Device Fan Enable	
TEC Enable	
TEC Temperature	
TEC Voltage	
Find Me	
Device Max Throughput (Kbps)	
Device PJ Number	

A.2 Image Format Control

Table A-2   Image Format Control

Parameters	Section
Width Max	Section Set Resolution and ROI
Height Max	
Region Selector	
Region Destination	
Width	
Height	
Offset X	
Offset Y	
Reverse X	Section Set Image Reverse
Reverse Y	
Pixel Format	Section Set Pixel Format
Pixel Size	

Parameters	Section
Test Pattern Generator Selector	Section Set Test Pattern
Test Pattern	
Binning Mode	Section Set Binning
Binning Selector	
Binning Horizontal	
Binning Vertical	
Decimation Horizontal	Section Set Decimation
Decimation Vertical	

A.3 Acquisition Control

Table A-3   Acquisition Control

Parameters	Section
Acquisition Mode	Section Set Acquisition Mode
Acquisition Start	
Acquisition Stop	
Acquisition Burst Frame Count	Section Set Frame Rate
Acquisition Frame Rate (Fps)	
Acquisition Frame Rate Control Enable	
Resulting Frame Rate (Fps)	
Overlap Mode	Section Non-Overlap Exposure and Overlap Exposure
Trigger Selector	Section Trigger Input
Trigger Mode	
Trigger Software	
Trigger Source	
Trigger Activation	
Trigger Delay (µs)	
Trigger Cache Enable	

Parameters	Section
Exposure Time Mode	Section Set Exposure Mode
Exposure Mode	
Exposure Time (μs)	
Exposure Auto	
Auto Exposure Time Lower Limit (μs)	
Auto Exposure Time Upper Limit (μs)	
FullFrame Transmission	Section Full Frame Transmission

A.4 Analog Control

Table A-4   Analog Control

Parameters	Section
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	
Gamma	Section Set Gamma Correction
Gamma Selector	
Gamma Enable	
Sharpness	Section Set Sharpness
Sharpness Enable	
Digital Noise Reduction Mode	Section Set Digital Noise Reduction
Denoise Strength	
Noise Correct	

Parameters	Section
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	

A.5 LUT Control

Table A-5　LUT Control

Parameters	Section
LUT Selector	Section Set LUT
LUT Enable	
LUT Index	
LUT Value	
LUT Save	

A.6 Shading Correction

Table A-6　Shading Correction

Parameters	Section
Shading Selector	Section Set Shading Correction
Activate Shading	
LSC Enable	

A.7 Digital IO Control

Table A-7   Digital IO Control

Parameters	Section
Line Selector	Section Trigger Output
Line Mode	
Line Inverter	
Line Status	
Line Status All	
Line Debouncer Time (μs)	
Line Source	
Strobe Enable	
Strobe Line Duration (μs)	
Strobe Line Delay (μs)	
Strobe Line Pre Delay (μs)	

A.8 Action Control

Table A-8   Action Control

Parameters	Section
Action Device Key	Section Set Action Command
Action Queue Size	
Action Selector	
Action Group Mask	
Action Group Key	

A.9 Counter and Timer Control

Table A-9   Counter and Timer Control

Parameters	Section
Counter Selector	Section Set Trigger Source

Parameters	Section
Counter Event Source	
Counter Reset Source	
Counter Reset	
Counter Value	
Counter Current Value	

A.10 File Access Control

Table A-10 File Access Control

Parameters	Section
File Selector	
File Operation Selector	
File Operation Execute	
File Open Mode	Section File Access Control
File Operation Status	
File Operation Result	
File Size(B)	

A.11 Sequencer Control

Table A-11 Sequencer Control

Parameters	Section
Sequencer Mode	
Sequencer Configuration Mode	
Sequencer Feature Selector	
Sequencer Feature Enable	
Sequencer Restart	Section Set Sequencer Control
Sequencer Set Total Number	
Sequencer Set Selector	
Sequencer Set Active	

Parameters	Section
Sequencer Set Load	
Sequencer Set Save	

A.12 Event Control

Table A-12 Event Control

Parameters	Section
Event Selector	Section Event Control
Event Notification	

A.13 Chunk Data Control

Table A-13 Chunk Data Control

Parameters	Section
Chunk Mode Active	Section Embed Information into Image
Chunk Selector	
Chunk Enable	

A.14 Transport Layer Control

Table A-14 Transport Layer Control

Parameters	Section
Payload Size(B)	Section Transport Later 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	

Parameters	Section
GEV Supported Option	
GEV Current IP Configuration LLA	
GEV Current IP Configuration DHCP	
GEV Current IP Configuration Persistent IP	
GEV PAUSE Frame Reception	
GEV Current IP Address	
GEV Current Subnet Mask	
GEV Current Default Gateway	
GEV First URL	
GEV Second URL	
GEV Number Of Interfaces	
GEV Persistent IP Address	
GEV Persistent Subnet Mask	
GEV Persistent Default Gateway	
GEV Link Speed	
GEV Message Channel Count	
GEV Stream Channel Count	
GEV Heartbeat Timeout(ms)	
GEV Heartbeat Disable	
GEV Timestamp Tick Frequency(Hz)	
Timestamp Control Latch	
Timestamp Control Reset	
Timestamp Control Latch Reset	
Timestamp Value	
GEV CCP	
GEV MCP Host Port	
GEV MCDA	
GEV MCTT(ms)	
GEV MCRC	
GEV MCSP	

Parameters	Section
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	
Auto SCPD	
GEV SCDA	
GEV SCSP	
GEV IEEE 1588	
GEV IEEE 1588 Status	
GEV GVSP Extended ID Mode	

A.15 Transfer Control

Table A-15 Transfer Control

Parameters	Section
Transfer Control Selector	
Transfer Passive Enable	
Transfer Operation Mode	Section Transfer Control
Transfer Queue Max Block Count	
Transfer Queue Current Block Count	

A.16 User Set Control

Table A-16 User Set Control

Parameters	Section

Parameters	Section
User Set Current	Section User Set Customization
User Set Selector	
User Set Load	
User Set Load Status	
User Set Save	
User Set Default	

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