# HIKROBOT

# GigE Area Scan Camera

## User Manual

# Legal Information

## User Manual

## About This Manual

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

Please use this Manual with the guidance and assistance of professionals trained in supporting the Product.

## Trademarks

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## Disclaimer

YOU SHALL NOT USE THIS PRODUCT FOR ANY PROHIBITED END-USES, INCLUDING THE DEVELOPMENT OR PRODUCTION OF WEAPONS OF MASS DESTRUCTION, THE DEVELOPMENT OR PRODUCTION OF CHEMICAL OR BIOLOGICAL WEAPONS, ANY ACTIVITIES IN THE CONTEXT RELATED TO ANY NUCLEAR EXPLOSIVE OR UNSAFE NUCLEAR FUEL-CYCLE, OR IN SUPPORT OF HUMAN RIGHTS ABUSES.

THE PERFORMANCE DATA IN THIS PUBLICATION IS BASED ON HIKROBOT'S INTERNAL RESEARCH/EVALUATION. ACTUAL DATA MAY VARY DEPENDING ON SPECIFIC CONFIGURATIONS AND OPERATING CONDITIONS AND HIKROBOT SHALL NOT BEAR THE CONSEQUENCES ARISING THEREFROM. IN THE EVENT OF ANY CONFLICTS BETWEEN THIS MANUAL AND THE APPLICABLE LAW, THE LATER PREVAILS.

# Regulatory Information

## FCC Information

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

**FCC compliance:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

## FCC Conditions

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

1. This device may not cause harmful interference.

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

## EU Conformity Statement

This product and - if applicable - the supplied accessories too are marked with "CE" and comply therefore with the applicable harmonized European standards listed under the EMC Directive 2014/30/EU, LVD Directive 2014/35/EU, the RoHS Directive 2015/863/EU amending 2011/65/EU.

2012/19/EU (WEEE directive): Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points. For more information see: www.recyclethis.info

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

# Symbol Convention

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

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

# Available Model

This manual is applicable to the GigE Area Scan Camera.

# Safety Instructions

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

## Laws and Regulations

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

## Power Supply

● When wiring or dismounting, make sure that the device power is cut off, and do not operate under electrification.

● Avoid contact with exposed circuit. When the device is powered on, avoid contact with exposed junctions and parts.

● Use the power adapter provided by the regular manufacturer.

● Do not connect multiple devices to one power adapter, to avoid over-heating or fire hazards caused by overload.

● Make sure the plug is properly connected to the power socket.

## Transportation

● The device contains precision optical components and electronic components. During transportation, storage and installation, incorrect operations like heavy pressure and violent vibration should be avoided. Otherwise, the device may be damaged.

● Avoid sudden collision, and pack the device with the accompanied carton and cushioning material or similar package.

## Using Environment

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

## Electrostatic Protection

● Remove all conductive objects (such as jewelry, watch, etc.) on the device body before touching the device, and touch the grounding metal bracket by hand to release the static electricity.
● It is suggested to wear anti-static suit to prevent damage to the equipment caused by static electricity.

- When installing or maintaining the device, wear anti-static wristband or anti-static gloves. Make sure that the wristband is tightly attached to the skin and is reliably grounded.
- It is forbidden to touch exposed circuit boards with bare hands. Static electricity generated by human body may damage electrostatic sensitive components on circuit boards.
- When touching electrostatic sensitive components or devices, proper grounding measures must be taken.
- Put electrostatic sensitive components into anti-static bags for protection.
- It is suggested to place humidifier in dry environment to maintain suitable humidity and reduce static electricity generation.

## Maintenance

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

## Cleaning

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

## Installation

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

## Personnel Requirement

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

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

## Contact Information

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Website: en.hikrobotics.com

# Table of Contents

# Chapter 1 Overview

## 1.1 Introduction

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

## 1.2 Key Feature

- Supports auto and manual adjustment for gain, exposure time and white balance, manual adjustment for Look-Up Table (LUT), Gamma correction, etc.

- Adopts the image interpolation algorithm for the color reproduction.

- Supports the hardware trigger, software trigger, free run, etc.

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

[i] **NOTE**

- The camera functions may differ by camera models.

- For specific camera functions, refer to the camera's user manual.

# Chapter 2 Appearance

ⓘ **NOTE**

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



Figure 2-1 Appearance (Type I)
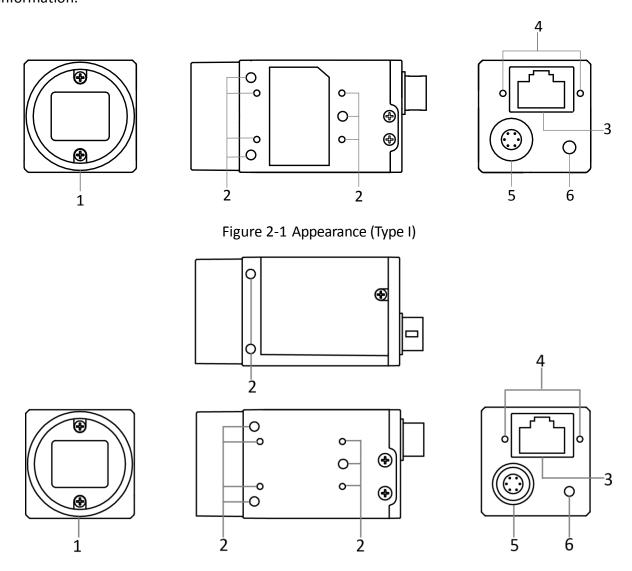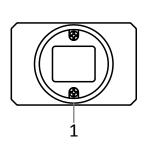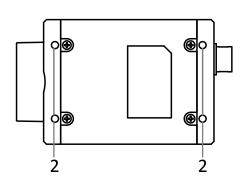


Figure 2-2 Appearance (Type II)
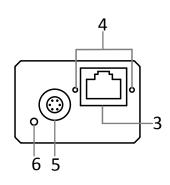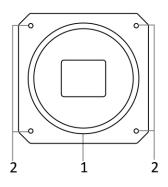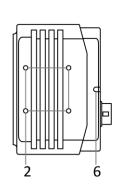
Figure 2-3 Appearance (Type III)
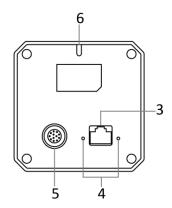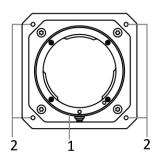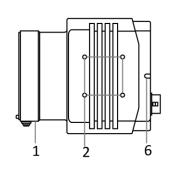


Figure 2-4 Appearance (Type IV)
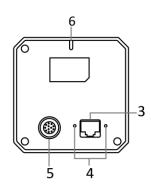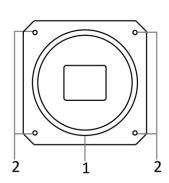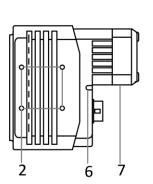


Figure 2-5 Appearance (Type V)
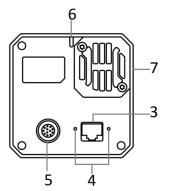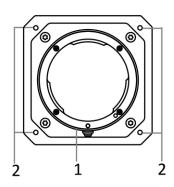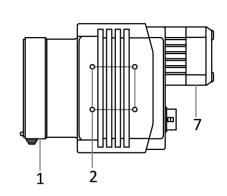


Figure 2-6 Appearance (Type VI)
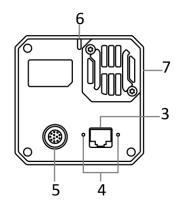
Figure 2-7 Appearance (Type VII)

Table 2-1 Description

| No. | Name | Description |
|---|---|---|
| 1 | Lens Mount | It is used to install the lens. |
| 2 | Screw Hole | It is used to fix the camera to the installation position. |
| 3 | Gigabit Ethernet Interface | It refers to the gigabit Ethernet interface for transmitting data. |
| 4 | Screw Hole | It refers to the M2 screw hole for securing the network cable. |
| 5 | Power and I/O Interface | It refers to the power and I/O interface that provides power, input/output signal, serial port, etc. |
| 6 | LED Indicator | It indicates the camera's status. |
| 7 | Fan | It is used to cool the camera. |

# Chapter 3 Interface and Indicator

## 3.1 Interface Description

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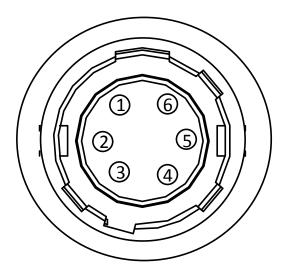


Figure 3-1 6-Pin Interface

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

Table 3-1 Pin Definitions (6-Pin)

| No. | Signal | I/O Signal Source | Description |
|-----|--------|-------------------|-------------|
| 1 | DC_PWR | -- | Camera power supply |
| 2 | OPTO_IN | Line 0+ | Opto-isolated input |
| 3 | GPIO | Line 2+ | Can be configured as input or output |
| 4 | OPTO_OUT | Line 1+ | Opto-isolated output |
| 5 | OPTO_GND | Line 0/1- | Opto-isolated signal ground |
| 6 | GND | Line 2- | Camera power supply ground |
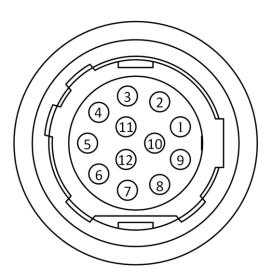
Figure 3-2 12-Pin Interface

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

Table 3-2 Pin Definitions (12-Pin)

| No. | Signal | I/O Signal Source | Description |
|---|---|---|---|
| 1 | GND | Line 2- | Camera power supply ground |
| 2 | DC_PWR | -- | Camera power supply |
| 3 | Reserved | | |
| 4 | Reserved | | |
| 5 | GND_IO | Line 0/1- | Opto-isolated signal ground |
| 6 | Reserved | | |
| 7 | Reserved | | |
| 8 | RS-232_RX | -- | RS-232 received data |
| 9 | RS-232_TX | -- | RS-232 transmitted data |
| 10 | GPIO | Line 2+ | Can be configured as input or output |
| 11 | OPTO_OUT | Line 1+ | Opto-isolated output |
| 12 | OPTO_IN | Line 0+ | Opto-isolated input |

## 3.2 Indicator Description

The camera indicator is used to display different camera status.

Table 3-3 Indicator Description

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

[i] **NOTE**

● When the indicator is flashing rapidly, flashing slowly, or flashing very slowly, its unlit interval is 0.2 s, 1 s, 2 s respectively.

● The indicator sometimes may show a purple color when red and blue colors flashing at the same time.

# Chapter 4 Camera Installation

## 4.1 Installation Preparation

You need to prepare following accessories before camera installation.

Table 4-1 Accessories

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

## 4.2 Install Camera

***Before you start***

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

***Steps:***

1. Fix the camera to the installation position.

2. Install the lens to the camera.

3. Use a network cable to connect the camera with a switch or a network interface card.

4. Select a power supply method.

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

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

# Chapter 5 Camera Connection

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

## 5.1 Install MVS Client

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

**ⓘ NOTE**

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

● The graphic user interface may differ by different versions of the client software you use.

● You can download Windows version client software from *en.hikrobotics.com*. For other versions, you can mail to tech_support@hikrobotics.com to get client software installation package.

***Steps:***

1. Double click the MVS installation package.

2. Select the language.

3. Read and check **Terms of the License Agreement**.
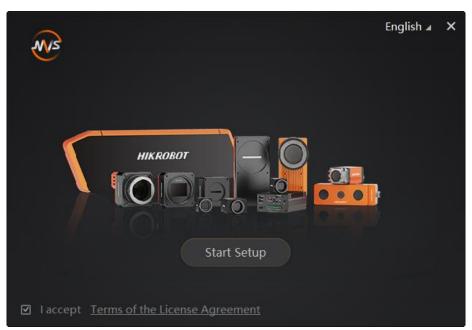


Figure 5-1 Installation Interface

4. Click **Start Setup**.
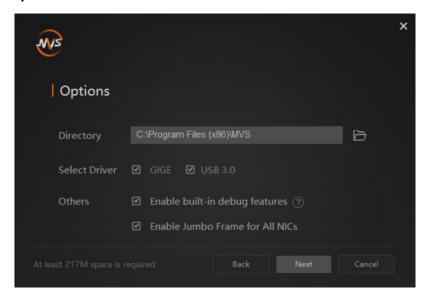


Figure 5-2 Default Settings

5. Keep default settings, and click **Next**.

6. Finish the installation according to the interface prompts.

## 5.2 Turn off Firewall

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

📖 **NOTE**

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

***Steps:***

1. Go to Windows Firewall.

● Windows XP system: Click **Start** > **Control Panel** > **Security Center** > **Windows Firewall**.

● Windows 7 system: Click **Start** > **Control Panel** > **Windows Firewall**.

● Windows 10 system: Click **Start** > **Control Panel** > **System and Security** > **Windows Defender Firewall**.

2. Click **Turn Windows Defender Firewall on or off** on the left.

3. Select **Turn off Windows Defender Firewall (not recommended)**.

Figure 5-3 Windows Defender Firewall

4.  Click **OK**.

# 5.3 Set PC Network

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

📖 **NOTE**

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

***Steps:***

1.  Go to PC network settings page: **Start** > **Control Panel** > **Network and Internet** > **Network and Sharing Center** > **Change adapter settings**.

2.  Select NIC and set the IP obtainment mode.

    ● Select **Obtain an IP address automatically** to get an IP address of the PC automatically.

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

3.  Set NIC property via the PC.

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

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

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

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

    1) Right click the Ethernet, and click **NIC Settings**.
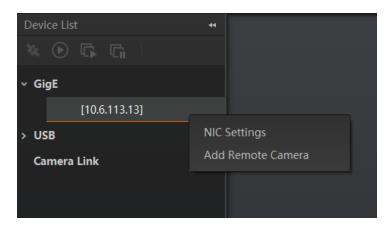
Figure 5-4 NIC Settings

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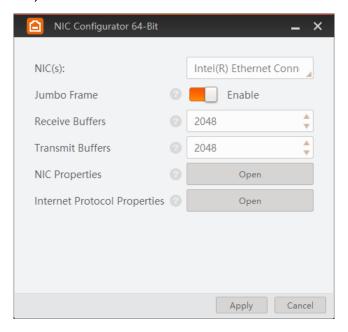


Figure 5-5 NIC Configurator

[i] **NOTE**

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

## 5.4 Set Camera Network

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

*Steps:*

1. Double click the client software to run it.

2. Click [⟳] in device list to search the device.

3.  Select a device to be connected.

4.  Right click the device, and click **Modify IP**.

5.  Set the IP address of the device in the same network segment with the PC

6.  Click **OK**.



Figure 5-6 Modify Device IP Address

## 5.5 Connect Camera to Client Software

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

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

# Chapter 6 Client Software Layout

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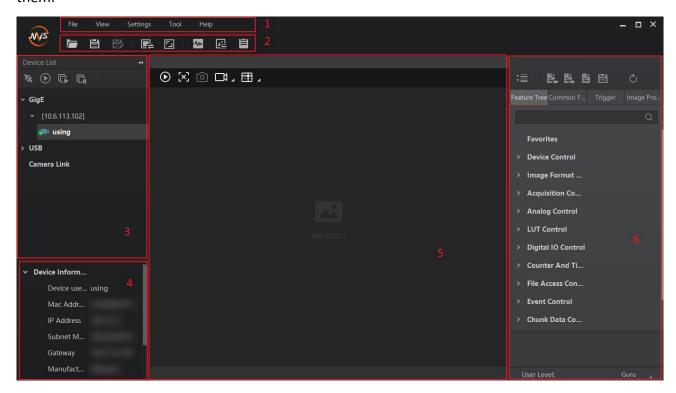


Figure 6-1 Main Window

**NOTE**

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

Table 6-1 Description of the Main Window

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

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

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

[i] **NOTE**

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

Table 6-2 Description

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

| Attribute | Description |
|---|---|
| File Access Control | You can view and set the device's file access control related parameters. |
| Event Control | You can view and set the device's event control related parameters to let the device generate an event and transmit a related event message to the computer. |
| Chunk Data Control | You can view and set the device's chunk data control related parameters to generate supplementary image data and append that data to every image that you acquire. |
| Transport Layer Control | You can view and set the parameters of the device's transport layer. |
| User Set Control | You can save or load the device's parameters. |

# Chapter 7 Camera Features

## 7.1 Global Shutter

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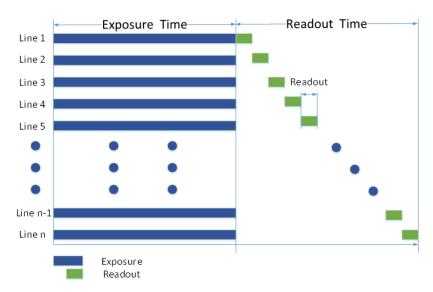


Figure 7-1 Global Shutter

## 7.2 Rolling Shutter

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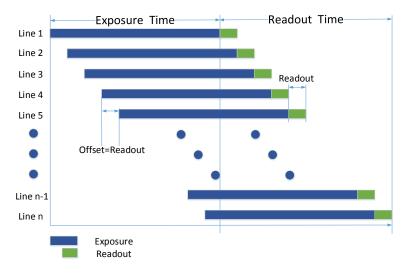


Figure 7-2 Rolling Shutter

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# 7.3 Sensor Shutter Mode

[i] **NOTE**

The sensor shutter mode may differ by camera models.

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

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

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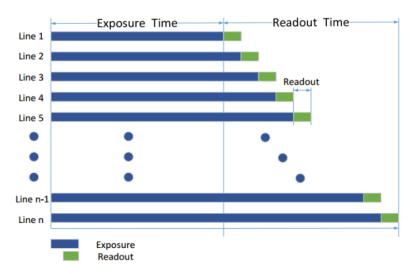


Figure 7-3 Global Reset

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

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



Figure 7-4 Sensor Shutter Mode

[i] **NOTE**

Only when the **Trigger Mode** is **Off**, you can select **Rolling** as **Sensor Shutter Mode**.

# 7.4 Non-Overlap Exposure and Overlap Exposure

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

## 7.4.1 Non-Overlap Exposure

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

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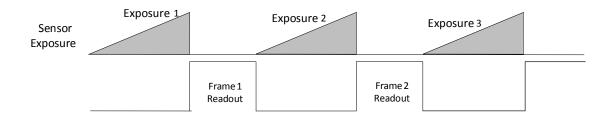


Figure 7-5 Internal Trigger Non-Overlap Exposure

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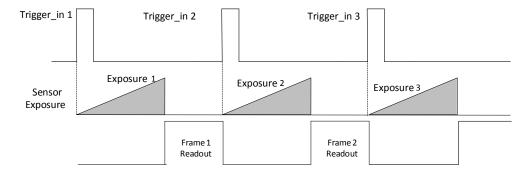


Figure 7-6 External Trigger Non-Overlap Exposure

⌊i⌉ **NOTE**

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

## 7.4.2 Overlap Exposure

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

● **Overlap Exposure under Internal Trigger Mode**
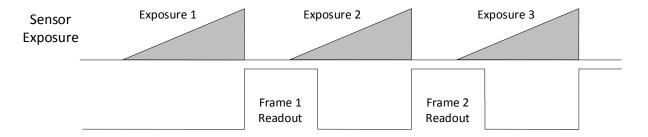
Figure 7-7 Internal Trigger Overlap Exposure

● **Overlap Exposure under External Trigger Mode**
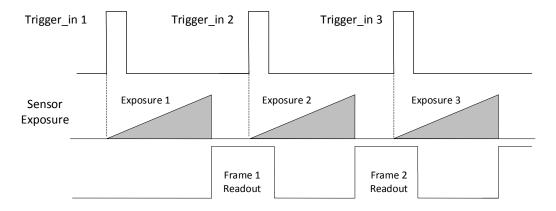
Figure 7-8 External Trigger Overlap Exposure

[ i ] **NOTE**

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

# Chapter 8 Image Acquisition

## 8.1 Set Frame Rate

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

● Frame readout time: the frame readout time is related with camera's sensor performance and image height. The lower the image height and less the frame readout time, and the higher the frame rate will be.

● Exposure time: if the reciprocal of max. frame rate that the camera supports is t, and when the configured exposure time is larger than t, the less the exposure time, the higher the frame rate will be. When the configured exposure time is less than or equal to t, exposure time will not influence the frame rate.

● Bandwidth: the larger the bandwidth, the higher the frame rate will be.

● Pixel format: the more bytes pixel format occupy, the lower the frame rate will be.

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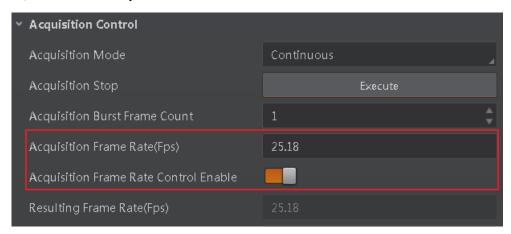


Figure 8-1 Set Frame Rate

ⓘ **NOTE**

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

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

You can click **Acquisition Control** > **Resulting Frame Rate** to view the camera's resulting frame rate, as shown below.
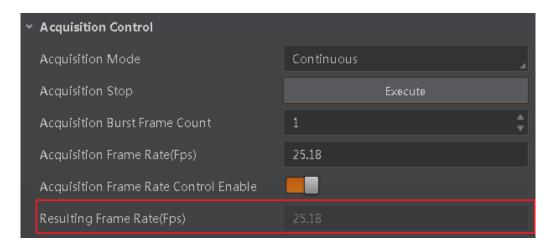
Figure 8-2 Resulting Frame Rate

## 8.2 Set Acquisition Mode

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

● SingleFrame mode: When camera starts image acquisition, it acquires one image only, and then stops.

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

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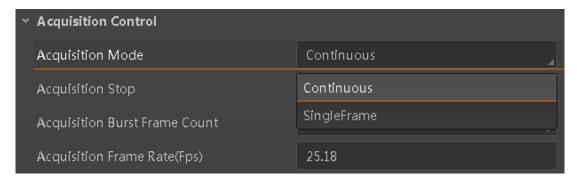


Figure 8-3 Set Acquisition Mode

[i] **NOTE**

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

## 8.3 Set Trigger Mode

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

- Internal trigger mode: The camera acquires images via its internal signals.

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

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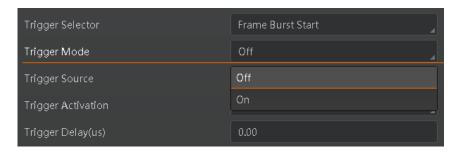


Figure 8-4 Set Trigger Mode

⊡ NOTE

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

# 8.4 External Trigger Mode

## 8.4.1 Set External Trigger Source

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

Table 8-1 Principle and Parameter of External Trigger Mode

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

| External Trigger Source | Parameter | Parameter Value | Principle |
|---|---|---|---|
| | Trigger Source | | signal to the camera to acquire images. |
| Action command trigger | Acquisition Control > Trigger Source | Action 1 | The action command sends trigger signal to the camera to acquire images. |
| Software trigger, hardware trigger and action command | Acquisition Control > Trigger Source | Anyway | Use software trigger, hardware trigger or action command to send trigger signal to the camera to acquire images. |

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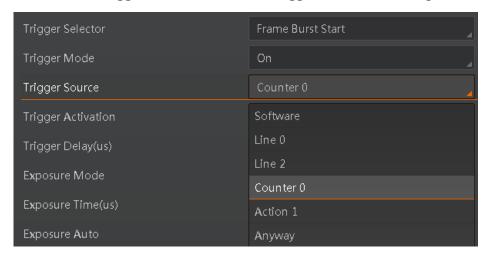


Figure 8-5 Set Trigger Source

### NOTE

These 5 external trigger sources are valid only when the **Trigger Mode** is **On**.

## 8.4.2 Set Software Trigger

*Steps:*

1. Click **Acquisition Control** > **Trigger Selector**.

2. Select **Frame Burst Start** as **Trigger Selector**, and **On** as **Trigger Mode**.

3. Select **Software** as **Trigger Source**, and click **Execute** in **Trigger Software** to send trigger commands.
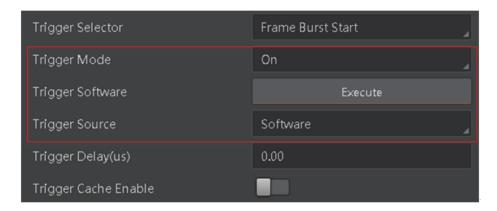
Figure 8-6 Set Software Trigger

## 8.4.3 Set Hardware Trigger

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

***Steps:***

1.  Click **Digital IO Control**.

2.  Select **Line 2** as **Line Selector**, and **Input** as **Line Mode** to set line 2 as input signal.
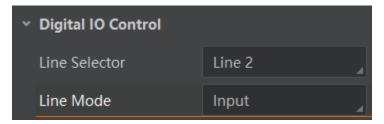


Figure 8-7 Set Line2 as Input Signal

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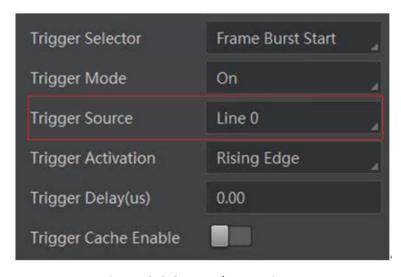


Figure 8-8 Set Hardware Trigger

## 8.4.4 Set Counter Trigger

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

***Steps:***

1. Click **Acquisition Control** > **Trigger Selector**.

2. Select **Frame Burst Start** as **Trigger Selector**, and **On** as **Trigger Mode**.

3. Select **Counter 0** as **Trigger Source**.
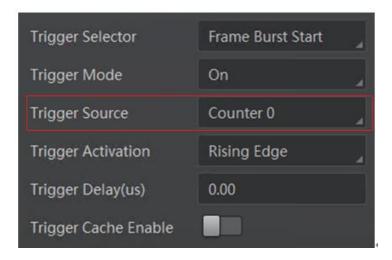


Figure 8-9 Set Counter Trigger

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

Table 8-2 Description of Counter And Timer Control

| Parameter | Read/Write | Description |
|---|---|---|
| Counter Selector | Read and write | It selects counter source. Counter 0 is available only at present. |
| Counter Event Source | Read and write | It selects the signal source of counter trigger. **Line 0** and **Line 2** are available. It is disabled by default. |
| Counter Reset Source | Read and write | It selects the signal source of resetting counter. **Software** is available only. It is disabled by default. |
| Counter Reset | Write is available under certain condition | It resets counter and it can be executed when selecting **Software** as **Counter Reset Source**. |

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| Parameter | Read/Write | Description |
|---|---|---|
| Counter Value | Read and write | It is the counter value with the range of 1 to 1023. |
| Counter Current Value | Read only | It displays the number of executed external trigger. |
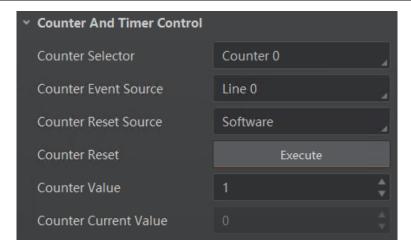


Figure 8-10 Counter Trigger Parameters

## 8.4.5 Set Action Command Trigger

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

***Steps:***

1. Click **Acquisition Control** > **Trigger Selector**.

2. Select **Frame Burst Start** as **Trigger Selector**, and **On** as **Trigger Mode**.

3. Select **Action 1** as **Trigger Source**.
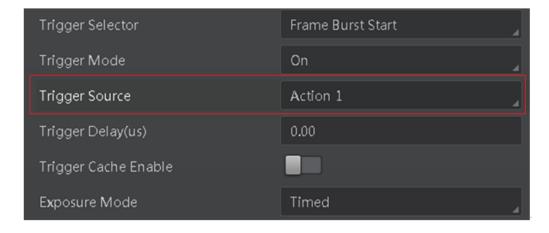


Figure 8-11 Set Action Command Trigger

**NOTE**

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

## 8.4.6 Set Anyway Trigger

When you need to use both hardware trigger and software trigger, you can set **Anyway** as **Trigger Source**.

***Steps:***

1. Click **Acquisition Control** > **Trigger Selector**.

2. Select **Frame Burst Start** as **Trigger Selector**, and **On** as **Trigger Mode**.

3. Select **Anyway** as **Trigger Source**.

| Trigger Selector | Frame Burst Start |
| Trigger Mode | On |
| Trigger Software | Execute |
| Trigger Source | Anyway |
| Trigger Activation | Rising Edge |
| Trigger Delay(us) | 0.00 |
| Trigger Cache Enable | |
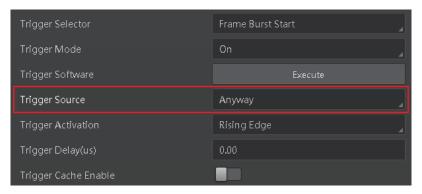
Figure 8-12 Set Anyway Trigger

# 8.5 Trigger Related Parameters

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

Table 8-3 Trigger Source and Trigger Parameter

| Trigger Source / Trigger Parameter | Software Trigger | Hardware Trigger | Counter Trigger | Action Command Trigger | Any Trigger |
|---|---|---|---|---|---|
| Burst Frame Count | √ | √ | √ | √ | √ |
| Trigger Delay | √ | √ | √ | √ | √ |
| Trigger Cache Enable | √ | √ | √ | √ | √ |

| Trigger Source / Trigger Parameter | Software Trigger | Hardware Trigger | Counter Trigger | Action Command Trigger | Any Trigger |
|---|---|---|---|---|---|
| Trigger Activation | × | √ | √ | × | √ |
| Trigger Debouncer | × | √ | √ | × | √ |

## 8.5.1 Set Burst Frame Count

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

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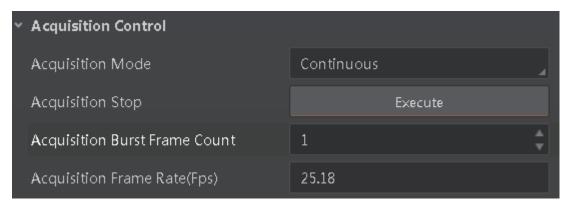


Figure 8-13 Set Burst Frame Count

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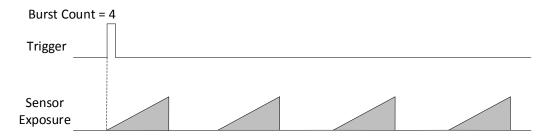


Figure 8-14 Sequence Diagram of Burst Frame Count

## 8.5.2 Set Trigger Delay

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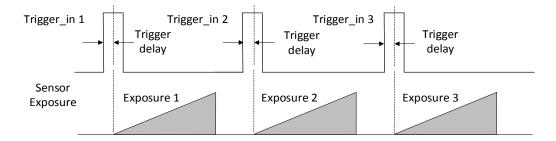


Figure 8-15 Signal Delay Sequence Diagram

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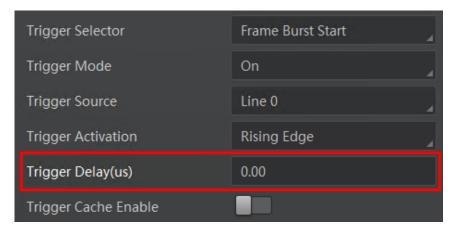


Figure 8-16 Set Trigger Delay

## 8.5.3 Set Trigger Cache Enable

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

Click **Acquisition Control > Trigger Cache Enable**, and enable **Trigger Cache Enable**.
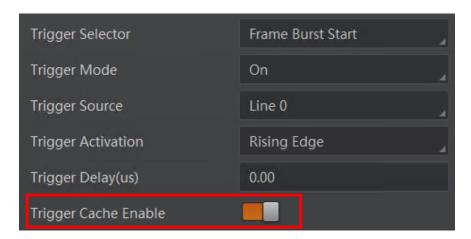
Figure 8-17 Enable Trigger Cache Enable

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

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

● Enable Trigger Cache Enable: the 2nd trigger signal will be saved.

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

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

## 8.5.4 Set Trigger Activation

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

Table 8-4 Trigger Activation Principle and Parameter

| Trigger Activation | Parameter | Parameter Value | Principle |
|---|---|---|---|
| Rising edge | Acquisition Control > Trigger Activation | Rising Edge | Rising Edge refers to the rising edge of the trigger signal is valid, that is camera exposure and acquisition at the beginning of the rising edge of the trigger signal. |
| Falling edge | Acquisition Control > Trigger Activation | Falling Edge | Falling Edge refers to the falling edge of the trigger signal is valid, that is camera exposure |

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

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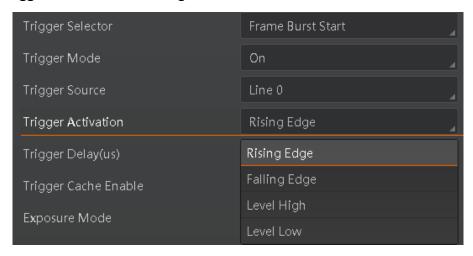


Figure 8-18 Set Trigger Activation

## 8.5.5 Set Trigger Debouncer

The external trigger input signal of the camera may have signal bounce that may cause false trigger. Thus, it is necessary to debounce the external trigger signal, and its sequence diagram is shown below.
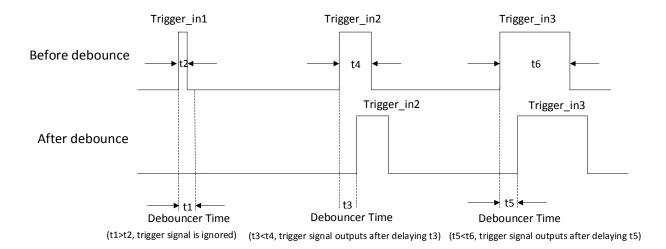
Figure 8-19 Trigger Debouncer Sequence Diagram

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



Figure 8-20 Set Trigger Debouncer

# 8.6 Set Event Control

☐**i NOTE**

The event control function may differ by camera models.

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

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

***Steps:***

1. Click **Event Control**, and select specific event in **Event Selector** according to actual demands.

2. Set **Notification On** as **Event Notification**.
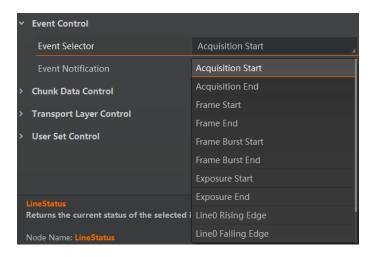
Figure 8-21 Select Event

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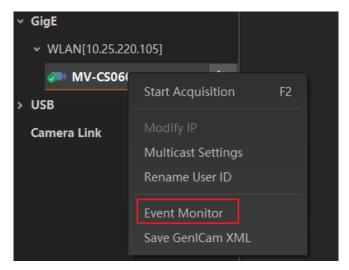


Figure 8-22 Click Event Monitor

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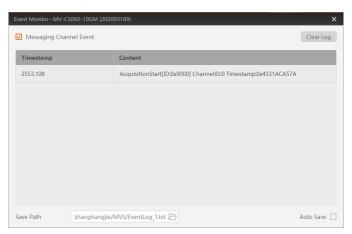


Figure 8-23 Event Monitor Interface

# 8.7 Set Action Command

[i] **NOTE**

The action command function may differ by camera models.

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

[i] **NOTE**

● The action command function is available only with client software version of V3.1.0 and higher.

● If you want to send action commands that are executed in multiple cameras at exactly the same time, it is recommended to enable **Gev IEEE 1588** first by clicking **Transport Layer Control > Gev IEEE 1588**.

*Steps:*

1. Click **Tool > GigE Vision Action Command**.

2. Select **Network Interfaces** to set the subnet that the command to be sent to.

3. Enter the **Device Key**, **Group Key**, and **Group Mask**.
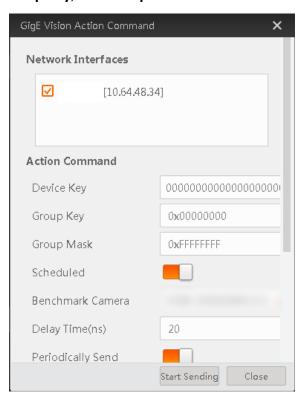


Figure 8-24 Set Action Command

**NOTE**

The specific contents entered in **Device Key**, **Group Key** and **Group Mask** here should be the same with those in **Action Device Key**, **Action Group Key** and **Action Group Mask** of the **Action Control** feature.

4.  Enable **Scheduled**.

5.  Click ⌁ in **Benchmark Camera** to select one camera as benchmark camera. Once benchmark camera is selected, other cameras keep time synchronization with it.

6.  (Optional) Enter **Delay Time** according to actual demands.

**NOTE**

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

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

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

**NOTE**

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

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

**NOTE**

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

9.  Click **Start Sending**.

# Chapter 9 I/O Output

## 9.1 Select Output Signal

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

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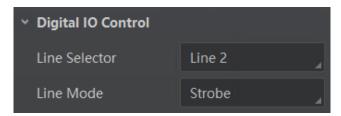


Figure 9-1 Set Line 2 as Output Signal

## 9.2 Set Output Signal

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

### 9.2.1 Enable Level Inverter

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

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



Figure 9-2 Enable Line Inverter

[i] **NOTE**

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

## 9.2.2 Enable Strobe Signal

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

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

[i] **NOTE**

The specific line source may differ by camera models.
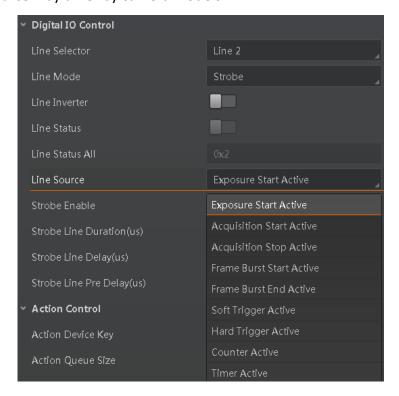


Figure 9-3 Set Line Source

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

Table 9-1 Line Source

| No. | Name | Description |
|-----|------|-------------|
| 1 | Exposure Start Active | It refers to output one I/O edge signal when starting exposure. |
| 2 | Acquisition Start Active | It refers to output one I/O edge signal when starting acquisition. |
| 3 | Acquisition Stop Active | It refers to output one I/O edge signal when stopping acquisition. |

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

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

● **Set Strobe Line Duration**

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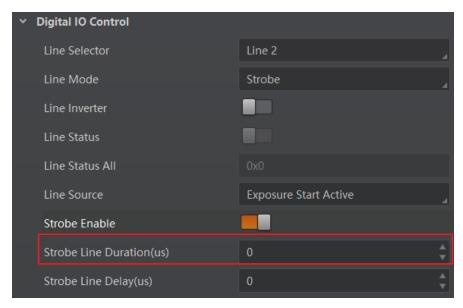


Figure 9-4 Set Strobe Line Duration

 **NOTE**

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

● **Set Strobe Line Delay**

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

Click **Digital IO Control** > **Strobe Line Delay**, and enter **Strobe Line Delay**, and its range is from 0 μs to 10000 μs.
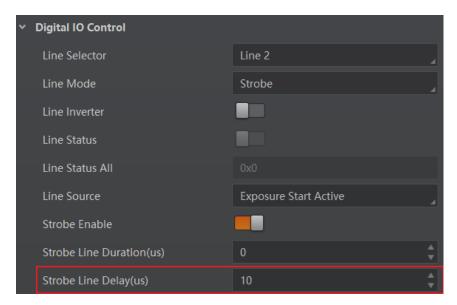


Figure 9-5 Set Strobe Line Delay

The sequence diagram of strobe line delay is shown below.
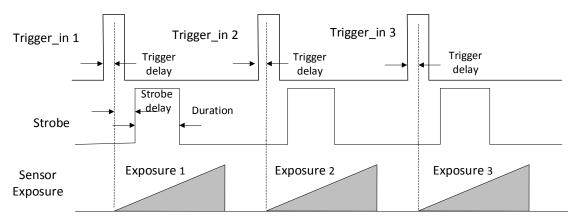


Figure 9-6 Sequence Diagram of Strobe Line Delay

● **Set Strobe Line Pre Delay**

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

Click **Digital IO Control** > **Strobe Line Pre Delay**, and enter **Strobe Line Pre Delay**, and its range is from 0 μs to 5000 μs.
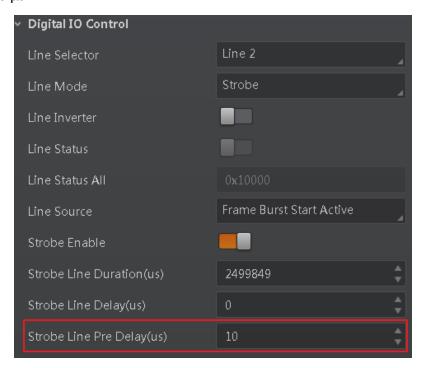


Figure 9-7 Set Strobe Line Pre Delay

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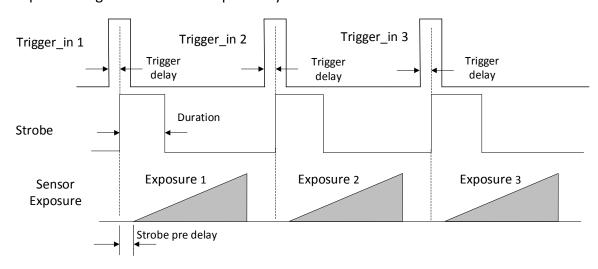


Figure 9-8 Sequence Diagram of Strobe Line Pre Delay

# Chapter 10 I/O Electrical Feature and Wiring

## 10.1 I/O Electrical Feature

### 10.1.1 Line 0 Opto-isolated Input Circuit

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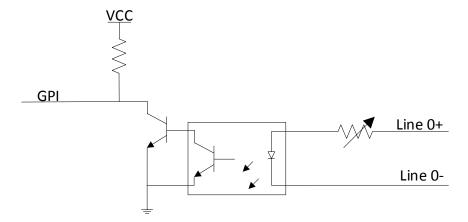


Figure 10-1 Line 0 Internal Circuit

 **NOTE**

The maximum input current of Line 0 is 25 mA.
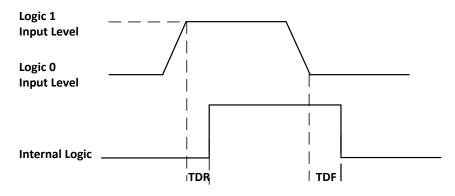


Figure 10-2 Input Logic Level

Table 10-1 Input Electrical Feature

| Parameter Name | Parameter Symbol | Value |
|---|---|---|
| Input Logic Level Low | VL | 0 VDC to 1 VDC |
| Input Logic Level High | VH | 1.5 VDC to 24 VDC |
| Input Rising Delay | TDR | 1.8 µs to 4.6 µs |
| Input Falling Delay | TDF | 16.8 µs to 22 µs |

📖 **NOTE**

● Make sure the input voltage is not from 1 VDC to 1.5 VDC as the electric status between these two values are not stable.

● The breakdown voltage is 30 VDC, and keep voltage stable.

## 10.1.2 Line 1 Opto-isolated Output Circuit

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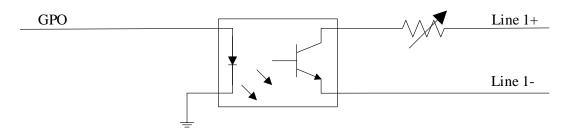


Figure 10-3 Line 1 Internal Circuit

📖 **NOTE**

The maximum output current of Line 1 is 25 mA.
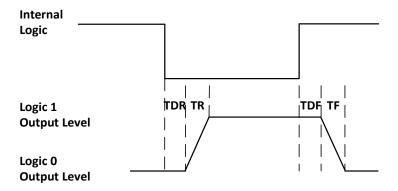


Figure 10-4 Output Logic Level

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

Table 10-2 Output Electric Feature

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

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

Table 10-3 Parameter of Output Logic Level Low

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

## 10.1.3 Line 2 Bi-direction I/O Circuit

The Line 2 bi-direction I/O circuit in camera I/O control is shown below. The Line 2 can be configured as input signal or as output signal.
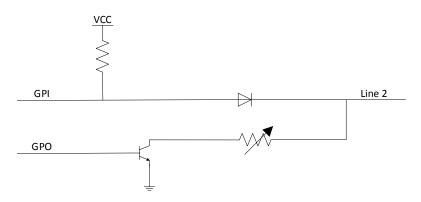
Figure 10-5 Line 2 Internal Circuit

**Line 2 Configured as Input**

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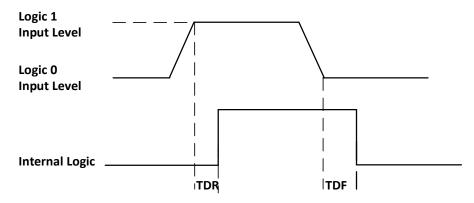


Figure 10-6 Input Logic Level

Table 10-4 Electrical Feature of Line 2 Input

| Parameter Name | Parameter Symbol | Value |
|---|---|---|
| Input Logic Level Low | VL | 0 VDC to 0.5 VDC |
| Input Logic Level High | VH | 1.5 VDC to 24 VDC |
| Input Rising Time | TDR | < 1 μs |
| Input Falling Time | TDF | < 1 μs |

**NOTE**

● Make sure the input voltage is not from 0.5 VDC to 1.5 VDC as the electric status between these two values are not stable.

45

● The breakdown voltage is 30 VDC, and keep voltage stable.

● To prevent damage to the GPIO pin, please connect GND first and then input voltage in Line 2.

**Line 2 Configured as Output**

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

Table 10-5 Parameter of Output Logic Level Low

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

⌈ⅈ⌉ **NOTE**

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

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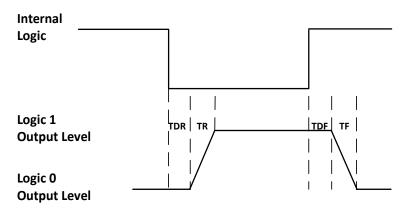


Figure 10-7 Output Logic Level

Table 10-6 Electrical Feature of Line 2 Output

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

# 10.2 I/O Wiring

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

📖 **NOTE**

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

## 10.2.1 Line 0 Wiring

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

● PNP Device
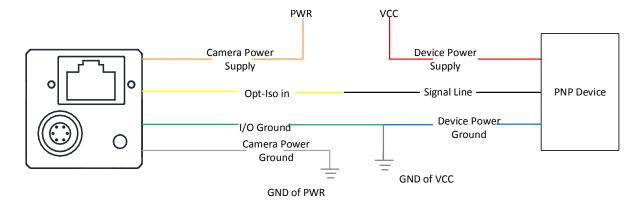


Figure 10-8 Line 0 Connecting to PNP Device

● NPN Device

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

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



Figure 10-9 Line 0 Connecting to NPN Device

● Switch

If the VCC of switch is 24 VDC, and it is recommended to use 1 KΩ to 4.7 KΩ resistor to protect circuit.
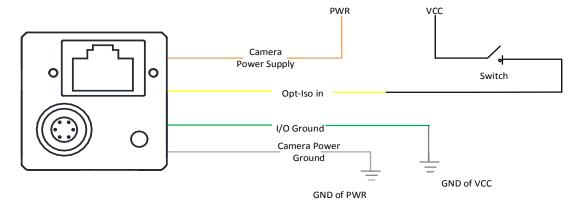


Figure 10-10 Line 0 Connecting to a Switch

## 10.2.2 Line 1 Wiring

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

● PNP Device
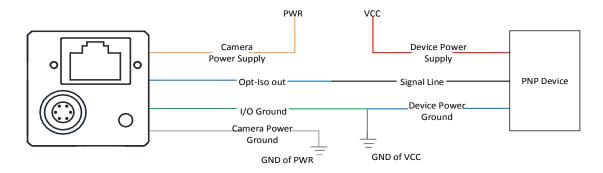
Figure 10-11 Line 1 Connecting to PNP Device

● NPN Device

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

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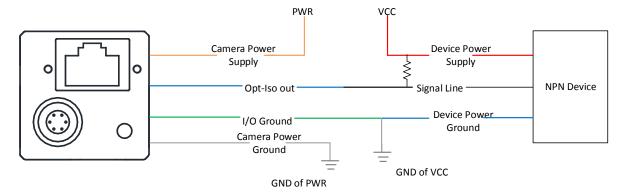


Figure 10-12 Line 1 Connecting to NPN Device

## 10.2.3 Line 2 Wiring

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

**Line 2 Configured as Input**

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

● PNP Device

It is recommended to use 330 Ω pull-down resistor.
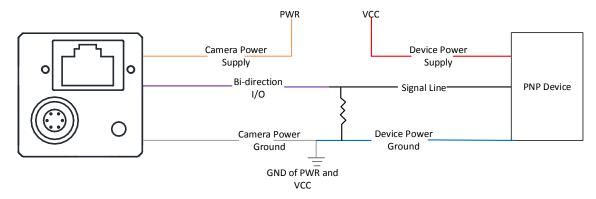
Figure 10-13 Line 2 Connecting to PNP Device as Input

● NPN Device

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

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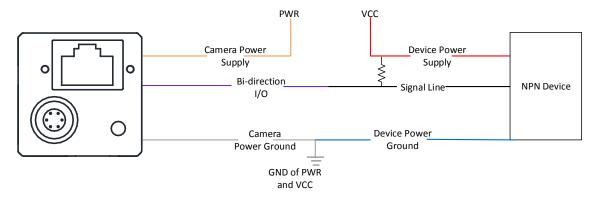


Figure 10-14 Line 2 Connecting to NPN Device as Input

● Switch

If the VCC of switch is 24 VDC, and it is recommended to use 1 KΩ to 4.7 KΩ resistor to protect circuit.
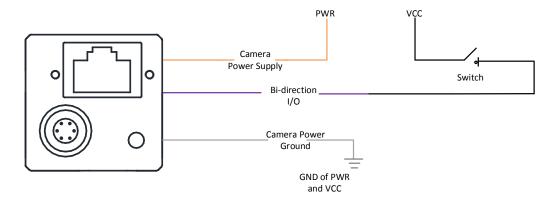


Figure 10-15 Line 2 Connecting to a Switch as Input

**Line 2 Configured as Output**

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

● PNP Device
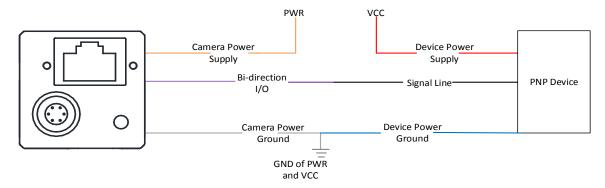


Figure 10-16 Line 2 Connecting to PNP Device as Output

● NPN Device

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

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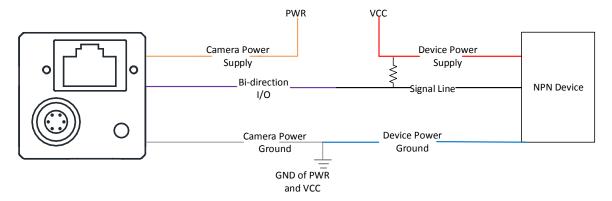


Figure 10-17 Line 2 Connecting to NPN Device as Output

# Chapter 11 Image Parameter

## 11.1 View Resolution

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



Figure 11-1 View Resolution

```
[i] NOTE
```

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

## 11.2 Set ROI

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

```
[i] NOTE
```

● The camera currently supports 1 ROI only, that is, there is **Region 0** for **Region Selector** parameter only.

● Region of interest can be set only when you stop real-time acquisition.

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

● Width: it stands for horizontal resolution in ROI area.

● Height: it stands for vertical resolution in ROI area.

● Offset X: it refers to the horizontal coordinate of the upper left corner of the ROI.

● Offset Y: it refers to the vertical coordinate of the upper left corner of the ROI.

Figure 11-2 Set ROI

i NOTE
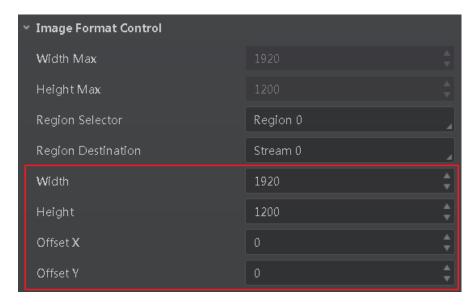
● The **Width** value plus **Offset X** value should not be larger than **Width Max** parameter value, **Height** value plus **Offset Y** value should not be larger than **Height Max** parameter value

● The ROI function may differ by camera models.

# 11.3 Set Image Reverse

i NOTE

The image reverse function may differ by camera models.

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

You can click **Image Format Control**, and enable **Reverse X** or **Reverse Y** according to actual demands.
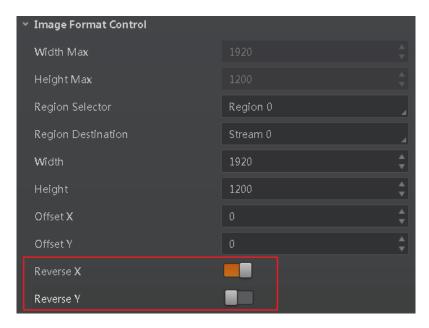
Figure 11-3 Set Image Reverse
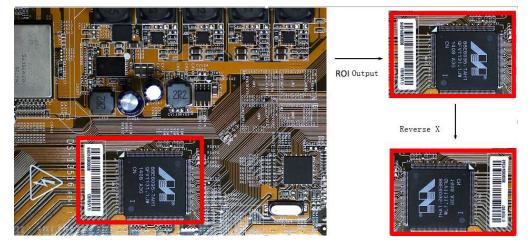


Figure 11-4 Image Reverse Comparison

# 11.4 Set Pixel Format

[i] NOTE

The pixel format may differ by camera models.

Table 11-1 Pixel Size of Different Pixel Formats

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

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

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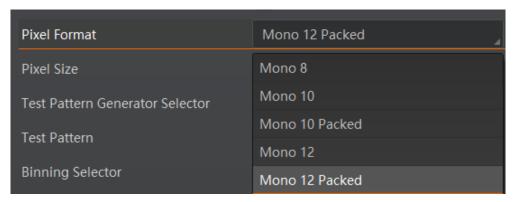


Figure 11-5 Set Pixel Format

# 11.5 Set Test Pattern

**NOTE**

The test pattern may differ by camera models.

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

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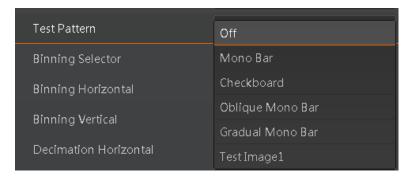


Figure 11-6 Set Test Pattern

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

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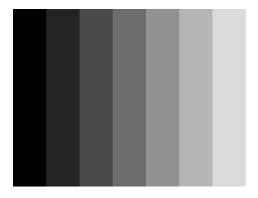


Figure 11-7 Mono Bar
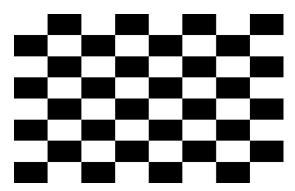


Figure 11-8 Checkboard
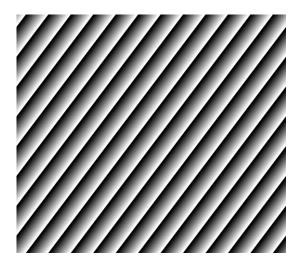


Figure 11-9 Oblique Mono Bar
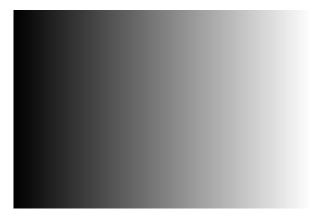
Figure 11-10 Gradual Mono Bar
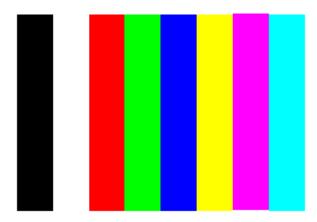


Figure 11-11 Vertical Color Bar



Figure 11-12 Horizontal Color Bar
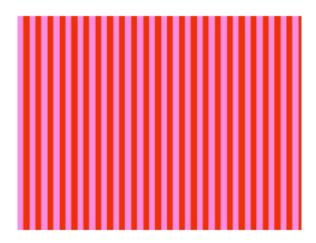
Figure 11-13 Test Image 1

[ i ] **NOTE**

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

# 11.6 Set Binning

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

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



Figure 11-14 Set Binning

[ i ] **NOTE**

● **Binning Horizontal** refers to the image's width, and **Binning Vertical** refers to the image's height.

● The binning function may differ by camera models.

# 11.7 Set Decimation

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

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



Figure 11-15 Set Decimation

 NOTE

●	**Decimation Horizontal** refers to the image's width, and **Decimation Vertical** refers to the image's height.

●	The decimation function may differ by camera models.

## 11.8 Set Exposure Time Mode

 NOTE

The exposure time mode may differ by camera models.

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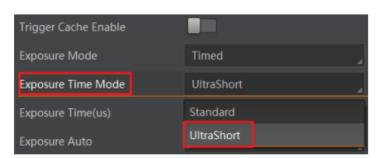


Figure 11-16 Set Exposure Time Mode

 NOTE

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

## 11.9 Set Exposure Auto

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

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

Table 11-2 Exposure Method and Principle

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

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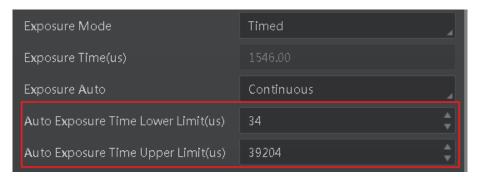


Figure 11-17 Set Exposure Time under Once or Continuous Mode

ⓘ **NOTE**

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

## 11.10 Set HDR

ⓘ **NOTE**

The HDR function may differ by camera models.

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

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



Figure 11-18 Set HDR
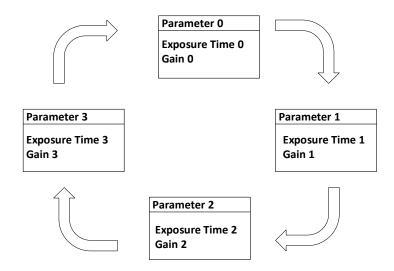


Figure 11-19 HDR Polling

# 11.11 Set Gain

### ⓘ NOTE

The gain function may differ by camera models.

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

## 11.11.1 Set Analog Gain

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

Table 11-3 Analog Gain Mode and Principle

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

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



Figure 11-20 Set Gain under Once or Continuous Mode

[i] **NOTE**

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

## 11.11.2 Set Digital Gain

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

Click **Analog Control**, enable **Digital Shift Enable**, and enter **Digital Shift** according to actual demands. The range of **Digital Shift** is from -6 to 6.
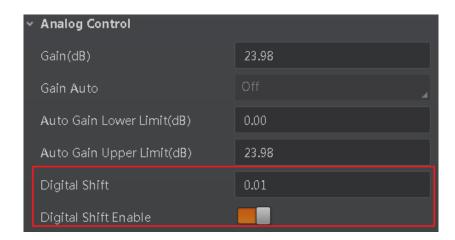
Figure 11-21 Set Digital Gain

## 11.12 Set Brightness

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

ℹ️ **NOTE**

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

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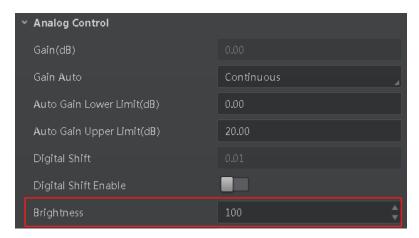


Figure 11-22 Set Brightness

ℹ️ **NOTE**

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

## 11.13 Set Black Level

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

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

| Black Level | 240 |
|---|---|
| Black Level Enable | |

Figure 11-23 Set Black Level

## 11.14 Set White Balance

[i] NOTE

White balance is only available for color cameras.

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

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

Table 11-4 White Balance Status Description

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

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

***Steps:***

1.  Put a white paper in the range of the camera's field of view, and make sure the paper covers the entire field of view.

2. Set exposure and gain. It is recommended to set image brightness value between 120 and 160.

3. Select **Once** as **Balance White Auto**, and the camera will automatically adjust white balance for once.

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

*Steps:*

1. Select **Off** as **Balance White Auto**. At this time, **Balance Ratio** is **1024**.

2. Find corresponding R/G/B channel in **Balance Ratio Selector**. Here we take **Green** as an example.

3. Find camera's R/G/B value.

4. Take **Green** as correction standard, and manually adjust other two channels (R channel and B channel) to let these three channels have same value.

☐i **NOTE**

● Here we take **Green** as an example. For specific **Balance Ratio Selector** value, please refer to the actual condition.

● In order to avoid repeated correction after rebooting the camera, it is recommended to save white balance parameter to **User Set** after white balance correction. You can refer to the Section **Save and Load User Set** for details.

● If the light source and color temperature in environment change, you need to correct white balance again.

# 11.15 Set Gamma Correction

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

● Gamma value between 0.5 and 1: image brightness increases, dark area becomes brighter.

● Gamma value between 1 and 4: image brightness decreases, dark area becomes darker.
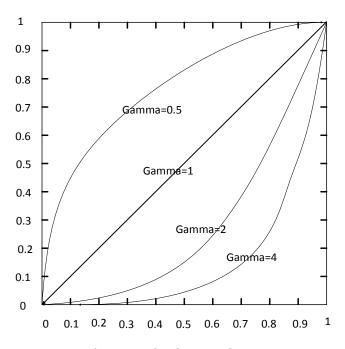
Figure 11-24 Gamma Curve

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

***Steps:***

1. Click **Analog Control** > **Gamma Selector**.

2. Select **User** as **Gamma Selector**.

3. Enable **Gamma Enable**.

4. Enter **Gamma** according to actual demands, and its range is from 0 to 4.



Figure 11-25 Set User Mode

You can set sRGB mode as shown below.

***Steps:***

1. Click **Analog Control** > **Gamma Selector**.

2. Select **sRGB** as **Gamma Selector**.

3. Enable **Gamma Enable**.
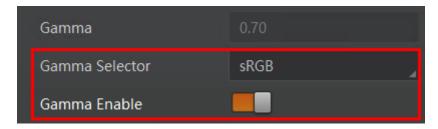
Figure 11-26 Set sRGB Mode

## 11.16 Set Sharpness

⬛ NOTE

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

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

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



Figure 11-27 Set Sharpness

## 11.17 Set Channel Correct Mode

⬛ NOTE

The channel correction function may differ by camera models.

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

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



Figure 11-28 Set Channel Correct Mode

## 11.18 Set AOI

[i] **NOTE**

The AOI function may differ by camera models.

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

***Steps:***

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

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

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

| Auto Function AOI Selector | AOI 1 |
| --- | --- |
| Auto Function AOI Width | 2432 |
| Auto Function AOI Height | 2048 |
| Auto Function AOI Offset X | 0 |
| Auto Function AOI Offset Y | 0 |
| Auto Function AOI Usage Intensity | |
| Auto Function AOI Usage White Balance | |
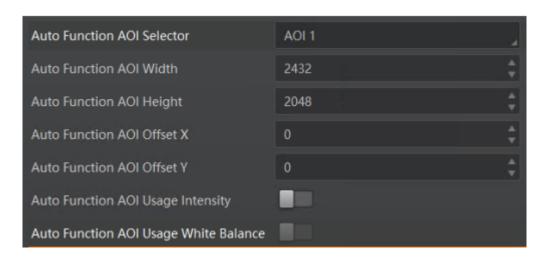
Figure 11-29 Set AOI

## 11.19 Set Color Transformation Control

[i] **NOTE**

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

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

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

Figure 11-30 Set Color Transformation Control

📖 **NOTE**

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

# 11.20 Set Hue and Saturation

📖 **NOTE**

Hue and saturation are only available for color cameras.

● **Hue**

Adjusting the hue shifts the colors of the image.

Click **Analog Control**, enable **Hue Enable**, enter **Hue** according to actual demands, and its range is from 0 to 255.



Figure 11-31 Set Hue

● **Saturation**

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

Click **Analog Control**, enable **Saturation Enable**, enter **Saturation** according to actual demands, and its range is from 0 to 255.



Figure 11-32 Set Saturation

## 11.21 Set LUT

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

***Steps:***

1.  Click **LUT Control**, and enable **LUT Enable**.

2.  Enter **LUT Index** according to actual demands, and its range is from 0 to 1023.

3.  Enter **LUT Value** according to actual demands, and its range is from 0 to 4095.
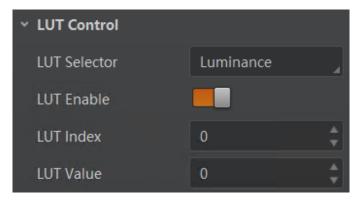


Figure 11-33 Set LUT

⌷**i** **NOTE**

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

## 11.22 Set Shading Correction

⌷**i** **NOTE**

The shading correction function may differ by camera models.

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

● **NUC, FPNC and PRNUC Correction**

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

Figure 11-34 NUC Enable

● **LSC Correction**

📖 **NOTE**

The steps for LSC correction may differ by camera models.

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

*Steps:*

1. Click **Shading Correction**, select **LSC Correction** as **Shading Selector**.

2. Click **Execute** in **Activate Shading**.

3. Enable **LSC Enable**.
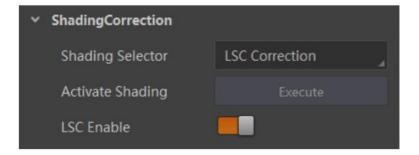


Figure 11-35 LSC Correction

# Chapter 12 Other Functions

## 12.1 Device Control

**i NOTE**

The specific device control parameters may differ by camera models.

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

Table 12-1 Device Control Parameter Description

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

| Parameter | Read/Write | Description |
|---|---|---|
| Board Device Type | Read only | It is the device type. |
| Device Connection Selector | Read and write | It is the ID of GenICam XML. |
| Device Connection Speed (Mbps) | Read only | It is the device connection speed. |
| Device Link Selector | Read and write | It selects device link. |
| Device Link Speed(Mbps) | Read only | It is the link speed. |
| Device Link Connection Count | Read only | It is the link connection quantity. |
| Device Link Heartbeat Mode | Read and write | It enables heartbeat mode or not. |
| Device Stream Channel Count | Read only | It counts data packet quantity. |
| Device Stream Channel Selector | Read and write | It is the character set used in register. |
| Device Stream Channel Type | Read only | It is the stream channel type. |
| Device Stream Channel Link | Read only | It is the stream channel link quantity. |
| Device Stream Channel Endianness | Read only | It is the image data endianness. |
| Device Stream Channel Packet Size(B) | Read and write | It is the data packet size. |
| Device Event Channel Count | Read only | It is the channel quantity that the device supports. |
| Device Character Set | Read only | It is the character set used in register. |

| Parameter | Read/Write | Description |
|---|---|---|
| Device Reset | Read and write | Click **Execute** to reset the device. |
| Device Temperature Selector | Read and write | It selects device component temperature. |
| Device Temperature | Read only | It displays the real-time temperature of the device component you selected in **Device Temperature Selector**. |
| Find Me | Read and write | Click **Execute** to let red indicator flash once, and find device. |
| Device Max Throughput(Kbps) | Read only | It is the maximum flow of device operation. |

# 12.2 Embedded Information in Image

☐ **NOTE**

The embedded information function and chunk data function may differ by camera models.

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

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

Each category of embedded information has its unique data format.

Table 12-2 Embedded Information Data Format

| No. | Information Type | Byte | Data Format Description |
|---|---|---|---|
| 1 | Timestamp | 4 Bytes | 4 bytes are used to transfer the timestamp information. |
| 2 | Gain | 4 Bytes | 4 bytes are used to transfer the gain information. Each low 8 bits of the 4 valid data are combined to transfer the gain information. Value Range: 0 to 1023. Note: High bits will be complemented with 0 automatically. |

| No. | Information Type | Byte | Data Format Description |
|-----|-----------------|------|-------------------------|
| 3 | Exposure | 4 Bytes | 4 bytes are combined to show the exposure time, and the unit is μs. |
| 4 | Brightness Info | 4 Bytes | 4 bytes are used to transfer the brightness information. Value Range: 0 to 4095. Note: High bits will be complemented with 0 automatically. |
| 5 | Frame Counter | 4 Bytes | Value Range: 0 to $2^{32}$-1. |
| 6 | Ext Trigger Count | 4 Bytes | Value Range: 0 to $2^{32}$-1. |
| 7 | Line Input Output | 4 Bytes | 4 bytes are used to transfer the line input and output information. |
| 8 | ROI Position | 8 Bytes | 4 bytes stand for the start point, and 4 bytes stand for the length and width. In specific, the column coordinate occupies 2 bytes, and the row coordinate occupies 2 bytes. The column coordinate information comes first. In specific, the length and width occupy 2 bytes respectively, and the length information comes first. |

NOTE

● The specific embedded information categories may differ by camera models.

● The camera embeds category that you select into the image data. The ROI area do not influence collection information embedding. If the ROI area is small and there is not enough space in first line image, and then the collection information will be embedded into the second line image.

● The low 8-bit of each valid data storages image embedded information.

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

You can click [icon] in the control toolbar to view the embedded information.
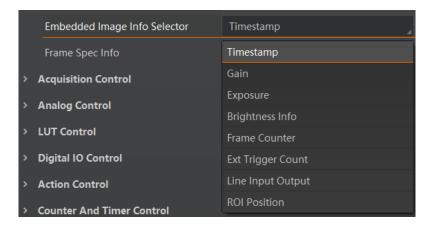
Figure 12-1 Set Embedded Information

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

**NOTE**

The chunk data function may differ by camera models.

***Steps:***

1. Click **Chunk Data Control**.

2. Enable **Chunk Mode Active**.

3. Select specific parameters in **Chunk Selector** according to actual demands.

4. Enable **Chunk Enable**.



Figure 12-2 Set Chunk Data Control

## 12.3 Set Multicast

**NOTE**

The multicast function may differ by camera models.

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

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

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

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

### ⓘ NOTE

- The same camera can be connected to only one MVS client software via the controller and data receiver or the controller mode at the same time, while in the data receiver mode, the same camera can be connected to multiple client software.

- When the multicast function is enabled, the camera icon on the client software of other PCs will become  📹 , and you can connect the camera via the data receiver mode.

- When you connect the camera via the data receiver mode, the camera icon on the client software of your PC will become  📹 , and at this time, you can read its parameters only.

- You can set multicast function for both the available camera and connected camera, but the specific settings are different.

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

***Steps:***

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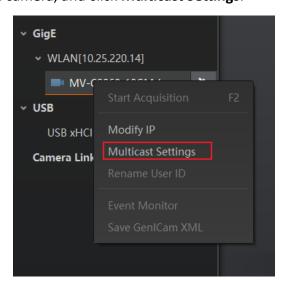


Figure 12-3 Click Multicast Settings

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

3. Click **OK**.
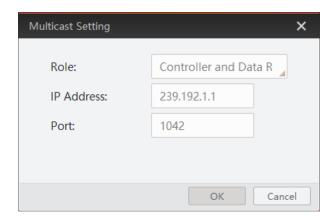
Figure 12-4 Set Multicast for Available Camera

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

☐ **NOTE**

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

*Steps:*

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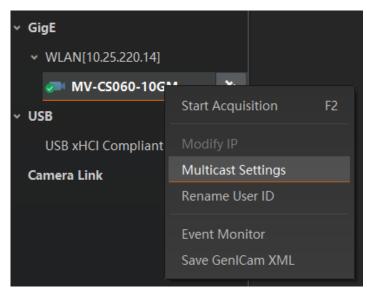


Figure 12-5 Click Multicast Settings

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

3.  Click **OK**.
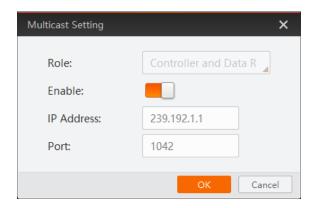
Figure 12-6 Set Multicast for Connected Camera

## 12.4 File Access Control

### ⓘ NOTE

The file access control function may differ by camera models.

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

***Steps:***

1. Select a camera in the device list.

2. Click [icon] to open the **File Access** interface.
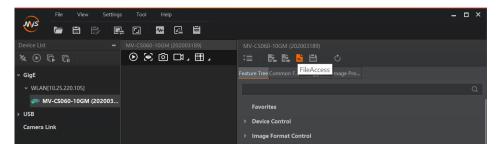


Figure 12-7 File Access

3. Select a User Set (**User Set 1**, **User Set 2**, or **User Set 3**) or **DPC** from the drop-down list.
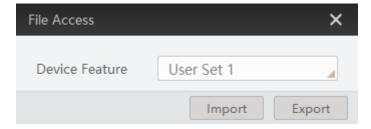


Figure 12-8 File Access Interface

4. Click **Import** or **Export** to import or export the camera's feature configuration or DPC data according to actual demands.

 **NOTE**

Importing and exporting the camera's feature configuration or DPC data among the same model cameras are supported.

# 12.5 Transport Layer Control

 **NOTE**

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

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

Table 12-3 Transport Layer Control Description

| Parameter | Read/Write | Description |
|---|---|---|
| Paylode Size (B) | Read only | It is the camera's load size. |
| GEV Version Major | Read only | It is the major version in GEV version. |
| GEV Version Minor | Read only | It is the minor version in GEV version. |
| GEV Device Mode Is Big Endian | Read only | It is the endianness in device's register. |
| GEV Device Mode Character Set | Read only | It is the character set in device's register. |
| GEV Interface Selector | Read only | It sets which physical network interface to be controlled. |
| GEV MAC Address | Read only | It is the MAC address of the network interface. |
| GEV Supported Option Selector | Read and write | It selects the GEV option to interrogate for existing support. |
| GEV Supported Option | Read only | It indicates whether the selected GEV option is supported or not. |
| GEV Current IP Configuration LLA | Read only | It indicates whether the Link Local Address IP configuration scheme is activated on the given |

| Parameter | Read/Write | Description |
|---|---|---|
| | | network interface. |
| GEV Current IP Configuration DHCP | Read and write | It indicates whether the DHCP IP configuration scheme is activated on the given network interface. |
| GEV Current IP Configuration Persistent IP | Read and write | It indicates whether persistent IP configuration scheme is activated on the given network interface. |
| DEV PAUSE Frame Reception | Read and write | It controls whether incoming pause frames are handled on the given logical link. |
| GEV Current IP Address | Read only | It is the current IP address for the given network interface. |
| GEV Current Subnet Mask | Read only | It is the current subnet mask of the given interface. |
| GEV Current Default Gateway | Read only | It is the default gateway IP address to be used on the given network interface. |
| GEV First URL | Read only | It is the first choice of URL for the XML device description file. |
| GEV Second URL | Read only | It is the second choice of URL to the XML device description file. |
| GEV Number Of Interfaces | Read only | It indicates the number of physical network interfaces supported by this device. |
| GEV Persistent IP Address | Read and write | It indicates the persistent IP address for this network interface. It is only used when the device boots with the persistent IP configuration scheme. |
| GEV Persistent Subnet Mask | Read and write | It indicates the persistent subnet mask associated with the persistent IP address on this network interface. It is only used when the device boots with the persistent IP configuration scheme. |
| GEV Persistent Default Gateway | Read and write | It indicates the persistent default gateway for this network interface. It is only used when the device boots with the persistent IP configuration scheme. |

| Parameter | Read/Write | Description |
|---|---|---|
| GEV Link Speed | Read only | It indicates the speed of transmission negotiated by the given network interface in Mbps. |
| GEV Message Channel Count | Read only | It indicates the number of message channels supported by this device. |
| GEV Stream Channel Count | Read only | It indicates the number of stream channels supported by this device. |
| GEV Heartbeat Timeout(ms) | Read and write | It indicates the current heartbeat timeout in milliseconds. |
| GEV Heartbeat Disable | Read and write | It disables the GEV Heartbeat. |
| GEV Timestamp Tick Frequency(Hz) | Read only | It indicates the number of timestamp ticks in 1 second (frequency in Hz). |
| Timestamp Control Latch | Read and write | It latches the current timestamp value of the device. |
| Timestamp Control Reset | Read and write | It resets the timestamp value for the device. |
| Timestamp Control Latch Reset | Read and write | It resets the timestamp control latch. |
| Timestamp Value | Read only | It is a read only element. It indicates the latched value of the timestamp. |
| GEV CCP | Read and write | It controls the device access privilege of an application. |
| GEV MCP Host Port | Read and write | It controls the port to which the device must send messages. Setting this value to 0 closes the message channel. |
| GEV MCDA | Read and write | It controls the destination IP address for the message channel. |

| Parameter | Read/Write | Description |
|---|---|---|
| GEV MCTT (ms) | Read and write | It provides the transmission timeout value in milliseconds. |
| GEV MCRC | Read and write | It controls the number of retransmissions allowed when a message channel message times out. |
| GEV MCSP | Read only | It indicates the source port for the message channel. |
| GEV Stream Channel Selector | Read only | It selects the stream channel to control. |
| GEV SCP Interface Index | Read only | It is the Index of network interface to be used. |
| GEV SCP Host Port | Read and write | It is the host port of the channel |
| GEV SCP Direction | Read only | It transmits or receives the channel. |
| GEV SCPS Fire Test Packet | Read only | It sends a test packet. |
| GEV SCPS Do Not Fragment | Read and write | The state of this feature is copied into the "do not fragment" bit of the IP header of each stream packet. |
| GEV SCPS Big Endian | Read only | It is the Endianness of multi-byte pixel data for this stream. |
| GEV SCPS Packet Size(B) | Read and write | It specifies the stream packet size (in bytes) to send on this channel. |
| GEV SCPD | Read and write | It indicates the delay (in timestamp counter units) to insert between each packet for this stream channel. |
| GEV SCDA | Read and write | It indicates the destination IP address for this stream channel. |
| GEV SCSP | Read only | It indicates the source UDP port address for this stream channel. |

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

# 12.6 Set Fan

ℹ️ **NOTE**

The fan function may differ by camera models.

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

| Fan Open Threshold | 30 |
|---|---|

Figure 12-9 Set Fan

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

ℹ️ **NOTE**

The temperature unit here is Celsius degree.

# 12.7 Save and Load User Set

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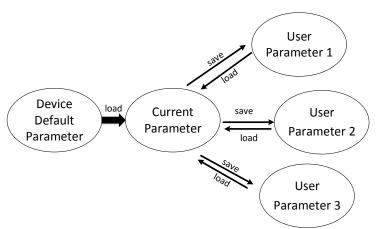


Figure 12-10 Parameter Relation

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

● **Save Parameters**

*Steps:*

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

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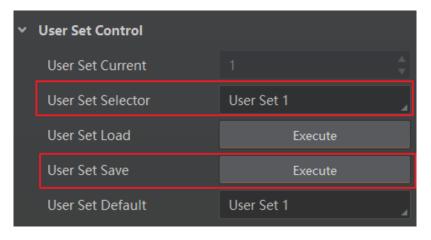


Figure 12-11 Save User Set

● **Load Parameters**

*Steps:*

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

2.  Click **Execute** in **User Set Load** to load parameters to the camera, as shown below.
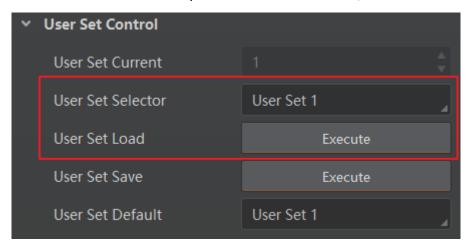


Figure 12-12 Load User Set

[i] **NOTE**

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

● **Set User Default**

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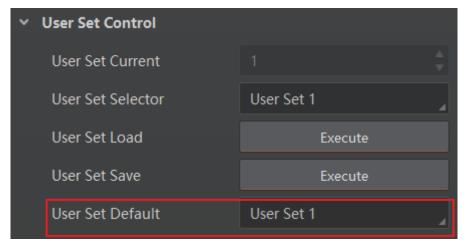


Figure 12-13 Set User Default

## 12.8 Update Firmware

The camera supports firmware updating via the MVS client software.

[i] **NOTE**

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

● Please use the firmware package of the corresponding camera model for updating.

***Steps:***

1. Click **Tool > Firmware Updater** to open the update interface.

2. Select corresponding device type like GigE, USB, or Camera Link.

3. Click ▫ to select the camera you want to update.

4. Click 🗁 to select the update file in the local computer.

5. Click **Update** to start updating.
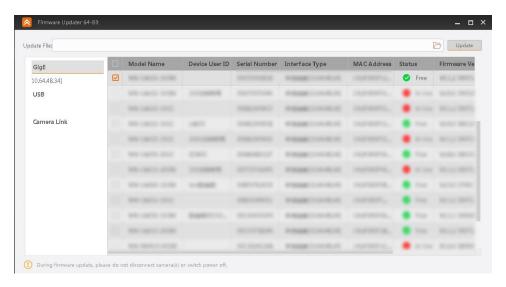
Figure 12-14 Update Firmware

**NOTE**

● The camera will reboot automatically after updating the firmware.

● The firmware updating process may take a few minutes, please wait patiently.

● During firmware updating, do not disconnect the camera or switch power off.

# Chapter 13 Trouble Shooting

Table 13-1 Trouble Shooting

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

# Chapter 14 Revision History

Table 14-1 Revision History

| No. | Version No. | Document No. | Date | Revision Details |
|---|---|---|---|---|
| 1 | 1.0.0 | UD12911B | Jan. 9, 2019 | Original version. |
| 2 | 1.0.1 | UD15735B | Jul. 24, 2019 | ● Add Section Set Anyway Trigger.<br>● Modify Section Set Action Command.<br>● Add Section Set Color Transformation Control.<br>● Add Section Set Output Signal.<br>● Adjust user manual structure. |
| 3 | 3.4.9 | UD19137B | April 8, 2020 | ● Add Section Overview.<br>● Modify Section Appearance.<br>● Modify Section Client Software Layout.<br>● Add Section Sensor Shutter Mode.<br>● Modify Section Set Pixel Format.<br>● Modify Section Set Test Pattern.<br>● Add Section Set Shading Correction.<br>● Modify Section Transport Layer Control.<br>● Add Section Set Fan |

# Appendix A Camera Parameter Index

Table Appendix A-1 Camera Parameter Index

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

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

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

| | HDR Gain | |
|---|---|---|
| Analog Control | Gain (dB) | Section Set Gain |
| | Gain Auto | |
| | Auto Gain Lower Limit (dB) | |
| | Auto Gain Upper Limit (dB) | |
| | Digital Shift | |
| | Digital Shift Enable | |
| | Brightness | Section Set Brightness |
| | Black Level | Section Set Black Level |
| | Black Level Enable | |
| | Balance White Auto | Section Set White Balance |
| | AWB Color Temperature Mode | |
| | Balance Ratio Selector | |
| | Balance Ratio | |
| | Gamma | Section Set Gamma Correction |
| | Gamma Selector | |
| | Gamma Enable | |
| | Sharpness Enable | Section Set Sharpness |
| | Sharpness | |
| | Hue | Section Set Hue and Saturation |
| | Hue Enable | |
| | Saturation | |
| | Saturation Enable | |
| | Channel Correct Mode | Section Set Channel Correct Mode |
| | Fan Open Threshold | Section Set Fan |
| | Auto Function AOI Selector | Section Set AOI |
| | Auto Function AOI Width | |
| | Auto Function AOI Height | |

| | Auto Function AOI Offset X | |
|---|---|---|
| | Auto Function AOI Offset Y | |
| | Auto Function AOI Usage Intensity | |
| | Auto Function AOI Usage White Balance | |
| Color Transformation Control | Color Transformation Selector | Section Set Color Transformation Control |
| | Color Transformation Enable | |
| | Color Transformation Value Selector | |
| | Color Transformation Value | |
| LUT Control | LUT Selector | Section Set LUT |
| | LUT Enable | |
| | LUT Index | |
| | LUT Value | |
| Shading Correction | NUC Enable | Section Set Shading Correction |
| | FPNC Enable | |
| | PRNUC Enable | |
| | Shading Selector | |
| | Activate Shading | |
| | LSC Enable | |
| Digital IO Control | Line Selector | Section I/O Output |
| | Line Mode | |
| | Line Inverter | |
| | Line Status | |
| | Line Status All | |
| | Line Debouncer Time (µs) | |
| | Line Source | |
| | Strobe Enable | |
| | Strobe Line Duration (µs) | |

| | Strobe Line Delay (µs) | |
| --- | --- | --- |
| | Strobe Line Pre Delay (µs) | |
| Action Control | Action Unconditional Mode | Section Set Action Command |
| | Action Device Key | |
| | Action Queue Size | |
| | Action Selector | |
| | Action Group Mask | |
| | Action Group Key | |
| Counter And Timer Control | Counter Selector | Section Set Counter Trigger |
| | Counter Event Source | |
| | Counter Reset Source | |
| | Counter Reset | |
| | Counter Value | |
| | Counter Current Value | |
| File Access Control | File Selector | Section File Access Control |
| | File Operation Selector | |
| | File Operation Execute | |
| | File Open Mode | |
| | File Operation Status | |
| | File Operation Result | |
| | File Size (B) | |
| Event Control | Event Selector | Section Set Event Control |
| | Event Notification | |
| Chunk Data Control | Chunk Mode Active | Section Embedded Information in Image |
| | Chunk Selector | |
| | Chunk Enable | |
| Transport Layer Control | Paylode Size (B) | Section Transport Layer Control |
| | GEV Version Major | |

| | | |
|---|---|---|
| | GEV Version Minor | |
| | GEV Device Mode Is Big Endian | |
| | GEV Device Mode Character Set | |
| | GEV Interface Selector | |
| | GEV MAC Address | |
| | GEV Supported Option Selector | |
| | GEV Supported Option | |
| | GEV Current IP Configuration | |
| | GEV Current IP Configuration Persistent IP | |
| | DEV PAUSE Frame Reception | |
| | GEV Current IP Address | |
| | GEV Current Subnet Mask | |
| | GEV Current Default Gateway | |
| | GEV First URL | |
| | GEV Second URL | |
| | GEV Number Of Interfaces | |
| | GEV Persistent IP Address | |
| | GEV Persistent Subnet Mask | |
| | GEV Persistent Default | |
| | GEV Link Speed | |
| | GEV Message Channel Count | |
| | GEV Stream Channel Count | |
| | GEV Heartbeat Timeout (ms) | |
| | GEV Heartbeat Disable | |
| | GEV Timestamp Tick Frequency (Hz) | |

| | | |
|---|---|---|
| | Timestamp Control Latch | |
| | Timestamp Control Reset | |
| | Timestamp Control Latch | |
| | Timestamp Value | |
| | GEV CCP | |
| | GEV MCP Host Port | |
| | GEV MCDA | |
| | GEV MCTT (ms) | |
| | GEV MCRC | |
| | GEV MCSP | |
| | GEV Stream Channel Selector | |
| | GEV SCP Interface Index | |
| | GEV SCP Host Port | |
| | GEV SCP Direction | |
| | GEV SCPS Fire Test Packet | |
| | GEV SCPS Do Not Fragment | |
| | GEV SCPS Big Endian | |
| | GEV SCPS Packet Size (B) | |
| | GEV SCPD | |
| | GEV SCDA | |
| | GEV SCSP | |
| | Gev IEEE 1588 | |
| | Gev GVSP Extended ID Mode | |
| User Set Control | User Set Current | Section Save and Load User Set |
| | User Set Selector | |
| | User Set Load | |
| | User Set Save | |
| | User Set Default | |

See Far, Go Further

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