

# LEO Series GigE Area Scan Camera User Manual

V2.5.8, Aug. 2025

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## Preface

### Purpose

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This Manual is a basic description of LEO series GigE Area Scan Cameras, which mainly includes the product description, quick installation guide and Simple introduction of SDK(iDatum). This manual may be updated due to product upgrades or other reasons. If you need, please contact the sales engineer for the latest version of this manual.

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### Disclaimer

The information and specifications described in this manual are subject to change without notice.

### Latest Manual Version

For the latest version of this manual, see the Download Center on our web site at: <http://www.contrastech.com/en/service/005001.html>

### Technical Support

For technical support, e-mail: [support@contrastech.com](mailto:support@contrastech.com).

### Warranty

To ensure that your warranty remains in force, adhere to the following guidelines:

**Do not remove the camera's serial number label**

If the label is removed and the serial number can't be read from the camera's registers, the warranty is void.

**Prevent ingress or insertion of foreign substances into the camera housing**

Prevent liquid, flammable, or metallic substances from entering the camera housing. If operated with any foreign substances inside, the camera may fail or cause a fire.

**Avoid electromagnetic fields**

Do not operate the camera in the vicinity of strong electromagnetic fields. Avoid electrostatic charging.

**Clean with care**

Avoid cleaning the sensor if possible.

**Handle this camera with care**

Do not abuse the camera. Avoid striking, shaking, etc. The camera could be damaged by improper handling.

**Read the manual**

Read the manual carefully before using the camera.

## CHAPTER 1

## PRODUCT DESCRIPTION

## Product Introduction

LEO series industrial cameras compatible with GigE、USB3.0 and Cameralink data bus standards, support GenICam、USB3 Vision® and GigE Vision®, Smoothly connect with third-party software, like HALCON and Vision Pro, not need for secondary development. LEO series cameras with excellent cost performance and very suitable for various inspections measurement and high-speed imaging applications. This series cameras won customers high praise because its outstanding performance in cellphone and tablet PC screen inspection, LED automatic packaging, defect inspection, and electronic components manufacturing, wafer positioning and other applications.

With this variety of sensors and interfaces, combined with the extensive features offered, LEO series cameras are fit for a wide range of vision applications.

## Product Features

- Ethernet interface provides 1Gbps bandwidth, with maximum 100m transmission;
- 128MB on-board frame buffer for data transmission and image retransmission;
- Supports software trigger, hardware trigger, free run mode and etc;
- Supports sharpness, noise reduction, gamma correction, LUT, black level correction, brightness,contrast and other ISP function;
- Supports interpolation algorithm, white balance algorithm, color conversion matrix, hue,saturation and etc. for color camera;
- Supports various output formats for image data and supports ROI, binning, mirror and etc.;
- Conforms GigE Vision protocol and GenICam standards;

\* The camera functions may differ by camera models,please refer to actual functions.

## Status LED Description

Status LED	Description
Slow Flashing Red (the interval between on and off is 2000 milliseconds)	The camera wiring exception occurs.
Red light is always on	The camera exception occurs.
Blue light is always off	The camera is in idle status.
Fast Flashing Blue (the interval between on and off is 200 milliseconds)	The camera is acquiring images normally.
Slow Flashing blue (the interval between on and off is 1000 milliseconds)	The camera is acquiring images in trigger mode.
Flashing Alternately Red and Blue	_The firmware is updating. _The function of finding me is executed,

## Mechanical Dimensions

The dimensions is in millimeters:

The cameras are interfaced to an external circuitry via connectors located on the back of the housing. The Industrial camera rear appearance contains standard RJ45 GigE interface, 6pin/12pin power, I/O input connector and camera working status indicator light. There are two M2 screw holes on both side of GigE interface, which used to fix cable to reduce the loosening caused by vibration.

Camera Housing and Base Mounting Hole Size(mm):

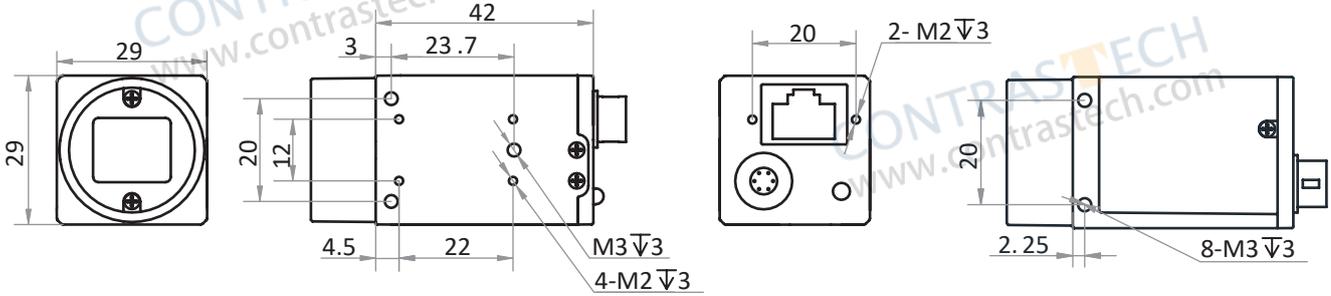


Fig. 1-1: Mechanical Dimensions of the C-mount GigE Cameras with 29\*29\*42mm housing (The installation uses M2 and M3 screws).

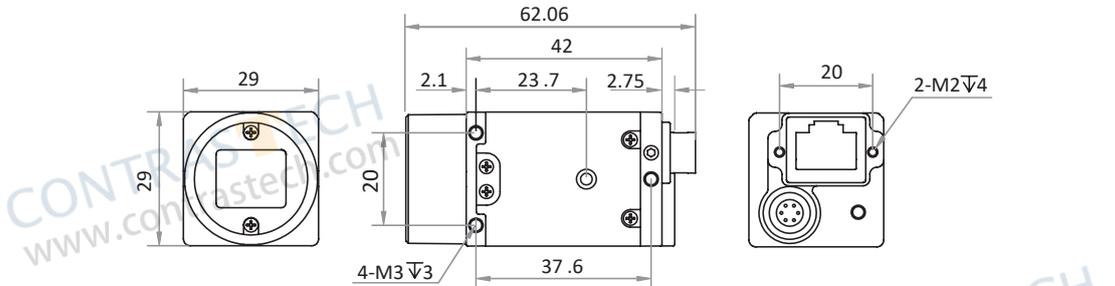


Fig. 1-2: Mechanical Dimensions of the C-mount GigE Cameras with 29\*29\*42mm housing (The installation uses M3 screws).

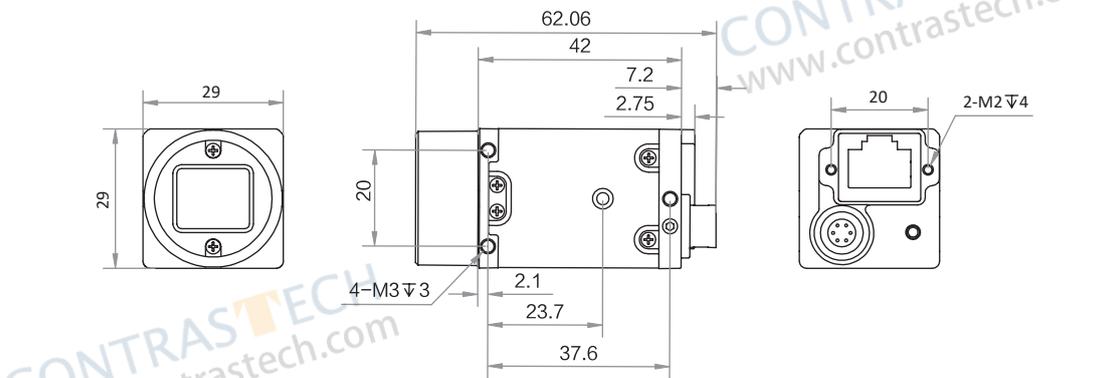


Fig. 1-3: Mechanical Dimensions of the C-mount GigE Cameras with 29\*29\*42mm housing (The installation uses M3 screws).

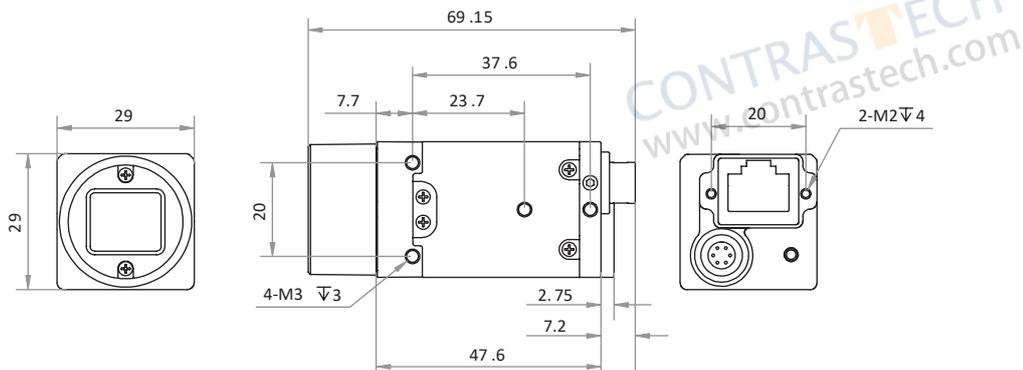


Fig. 1-4: Mechanical Dimensions of the C-mount GigE Cameras with 29\*29\*42mm housing (The installation uses M3 screws).

## Mechanical Dimensions

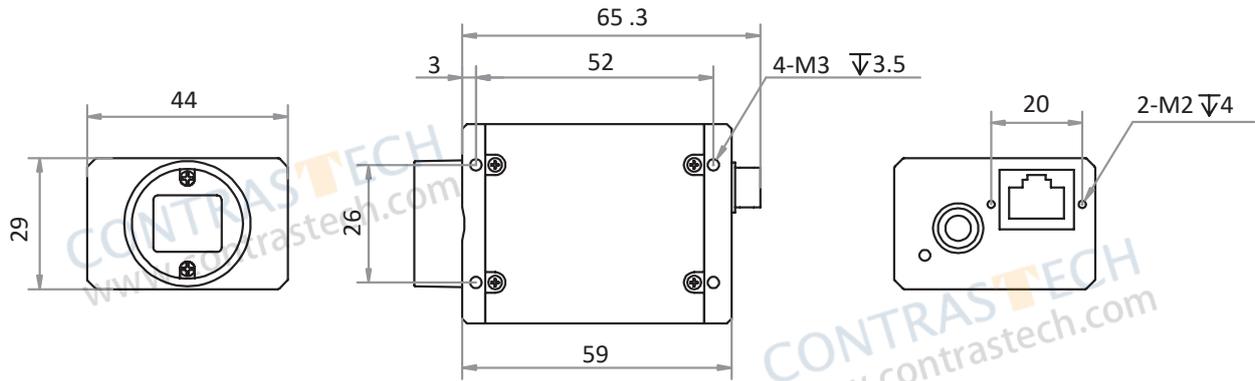


Fig. 1-5: Mechanical Dimensions of the C-mount GigE Cameras with 29 \* 44 \* 59 mm housing (The installation uses M3.5 screws).

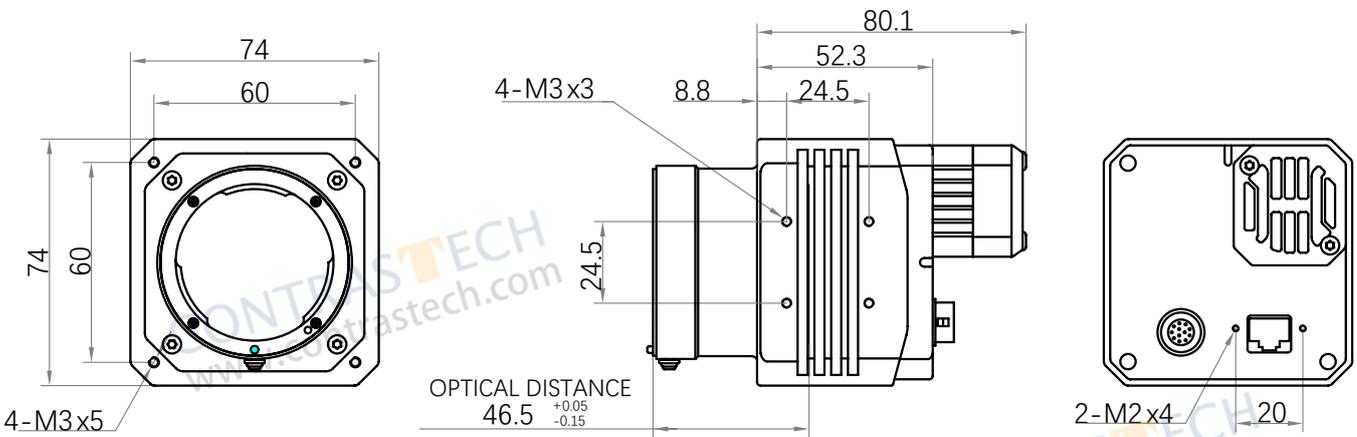


Fig. 1-6: Mechanical Dimensions of the F-mount GigE Cameras with 74 \* 74 \* 80.1 mm housing (With fan, the installation uses M3 screws).

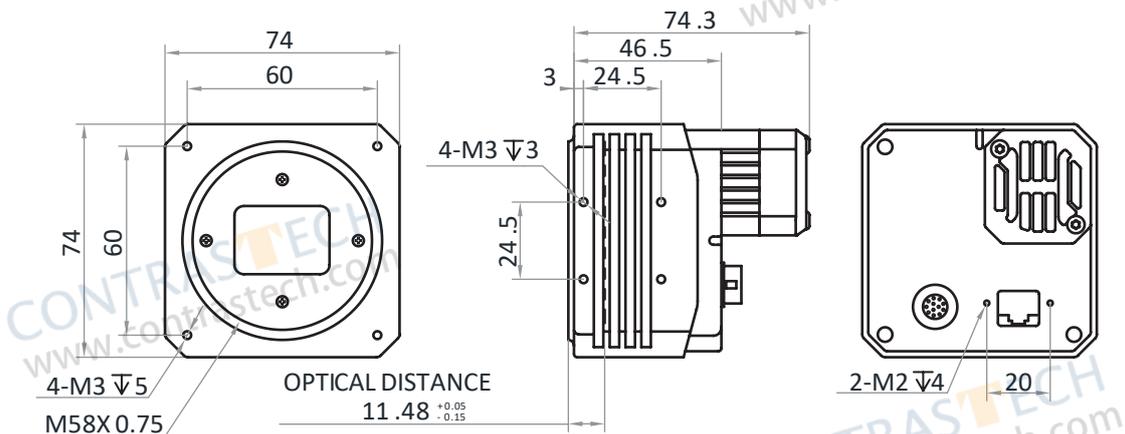


Fig. 1-7: Mechanical Dimensions of the M58 GigE Cameras with 74 \* 74 \* 74.3mm housing (With fan, the installation uses M3 screws).

## Mechanical Dimensions

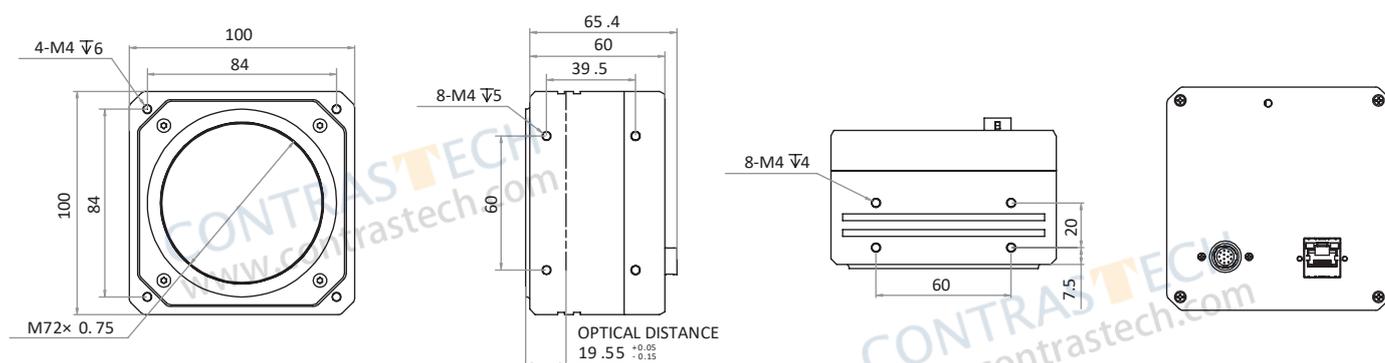


Fig. 1-8: Mechanical Dimensions of the M72 GigE Cameras with 100 \* 100 \* 60mm housing (Without fan,the installation uses M4 screws).

Fig.	Model
Fig.1-1	LEO2 Series; LEO 4096S-13gm/gc; LEO 4112X-10gm/gc; LEO2 5000D-23Qgm/gc; LEO 12MS-9gm/gc
Fig.1-2	LEO 720S-125gm/gc-HR; LEO 1300D-90gm/gc-HR; LEO 1440S-65gm/gc-HR; LEO 2000S-54gm/gc-HR; LEO 2000G-49gm/gc-HR; LEO 6000D-19gm/gc-HR ; LEO 5120A-6gm/gc-HR
Fig.1-3	LEO 1300S-90gm/gc-HR; LEO 2000S-56gm/gc-HR; LEO 5000A-24gm/gc-HR ; LEO 6000S-20gm/gc-HR; LEO 4020S-10gm/gc-HR
Fig.1-4	LEO 5000G-20gm/gc-HR
Fig.1-5	LEO 4096D-10gm/gc; LEO 4708D-9gm/gc; LEO 16MD-7gm; LEO 25MG-5gm/gc/gNIR
Fig.1-6	LEO 31MS-4gm/gc-F
Fig.1-7	LEO 31MS-4gm/gc-M58
Fig.1-8	LEO 152MS-5gm-M72

Fig. 1-7: Mechanical Dimensions (in mm) of the M58 GigE Cameras with 74 \* 74 \* 74.3mm housing (With fan,the installation uses M3 screws).

# CHAPTER 2 POWER AND I/O INTERFACE DEFINITION

## I/O Connection Definition and Assignments

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

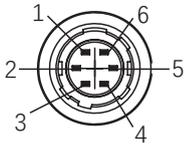
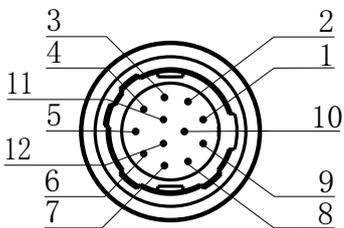


Table 2-1:  
Numbering and assignments for  
6pin Power and I/O Input Connector:

Color	Pin	Signal	Signal Source	Designation
Red	1	DC_PWR	-	DC Camera Power
Green	2	OPTO_IN	Line 0+	Opto-isolated IN
White	3	GPIO	Line 2+	Can be configured as input or output
Blue	4	OPTO_OUT	Line 1+	Opto-isolated OUT
Brown	5	OPTO_GND	Line 0/1-	Opto-isolated Signal Ground
Black	6	GND	Line 2-	Camera Power Supply Ground



Color	Pin	Signal	Signal Source	Designation
Black	1	GND	Line 2-	Camera Power Supply Ground
Red	2	DC_PWR	-	DC Camera Power
Brown	3	DC_PWR	-	DC Camera Power
Orange	4	OPT_IN-	Line 0-	Opto-isolated input signal ground
Yellow	5	OPT_OUT-	Line 1-	Opto-isolated output signal ground
Green	6	GND	-	Device power supply ground
Blue	7	GND	-	Device power supply ground
Purple	8	RS232_RX	-	RS232 Received Data
Gray	9	RS232_TX	-	RS232 Transmitted Data
White	10	GPIO2	Line 2+	Can be Configured as Input or Output
Pink	11	OPTO_OUT	Line 1+	Opto-isolated OUT
Light green	12	OPTO_IN	Line 0+	Opto-isolated IN

The wire color of this user manual is the color of ContrasTech. If you use other manufacturers' cable color definitions may be different, random connection may cause the camera to burn out, please connect according to the I/O port type and pin definition or contact our technical staff for advise.

## CHAPTER 3

## INSTALLATION AND SETUP

You should perform the software installation procedure first and the hardware installation procedure second.

## Software Installation

### ■ iDatum Installation

If you use a firewall on your computer, disable the firewall for the network adapter to which your camera is connected.

#### Close the Firewall

In order to ensure the camera software keep running and image transmission stability, please close the firewall before using the software.

#### System Requirements

LEO Camera Software Suite for Windows requirements that one of the following operating systems is installed on your computer:

- Windows XP (32 bit)
- Windows 7 (32 bit or 64 bit)
- Windows 10 (32 bit or 64 bit)
- Linux 32 Bit/64 Bit : Ubuntu 14.04(32/64)、Ubuntu 16.04(32/64)、Redhat7(64)、Centos7(32/64)、gcc/g++ version requires 4.6.3 and above
- ARM: NVIDIA TX2、RaspberryPiB3.0+

#### Installation Steps

- 1.You can download the iDatum software (LEO Series Industrial Cameras SDK For xxx) from:  
<http://www.contrastech.com/en/service/005001.html>
- 2.Double click iDatum installation package to install the client.
- 3.Follow the instructions on the screen. The installer will guide you through the installation process.

#### Environment Testing

After successful installation, please connect the camera and turn on iDatum client software to check the result of camera connection and image preview. You can start secondary development base on the SDK when all environment testing is normal.

You should notice follow items when using GigE Camera:

- FrameRate      Whether the frame rate is consistent with the actual set frame rate.
- Errors          If not 0, it means there is a frame skip, it is abnormal.
- Lost Packets    If not 0, it is abnormal.

## Hardware Installation

### ■ Camera Installation

*The installation procedures assume that you will be making a peer-to-peer connection between your camera and a computer.*

Make sure that the following items are available before starting the installation:

- LEO GigE Area scan camera
- Applicable power supply or a Gigabit Ethernet Switch
- It refers to the lens that matches with lens mount of the camera.
- The computer with a GigE network adapter installed
- The computer must be equipped with appropriate operating system
- Standard Ethernet cable (CAT-5e or above).

#### Steps:

- Mount lens that matches with lens mount of the camera
- Connect the camera to the computer and power

PoE:

- 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.

Direct supply:

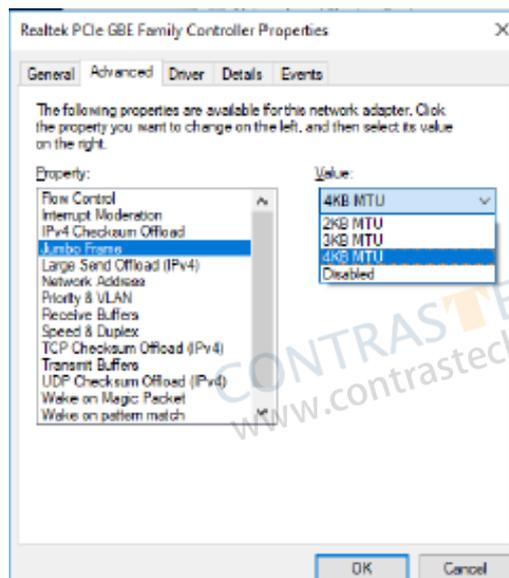
- Use the 6-pin or 12-pin power and I/O cable to connect the camera to a power adapter.

### Network Settings

Before using the camera, you need to configure IP in the same network segment with the computer. You can modify it in "Local Connection" to ensure network communication is normal.

Local Network Configuration :

- Click "Control Panel"> "Network and Internet"> "Network and Sharing Center"> "Change Adapter Configuration." Then select corresponding network card to configure it automatically obtain IP address or manually assign it as same network segment address with the camera. Shown as below:
- Open "Advanced" in the properties, set "Jumbo Frame" as its maximum value:9014bytes, both of transmit buffer and receive buffer set as 2048bytes, the Interrupt Throttle Rate set as extremum value. These maximum values mentioned above depend on the specific network card. Shown as below:



## Software Operation

### ■ iDatum Operation

- 1、 Double-click the iDatum shortcut on the desktop to open up the client software.
- 2、 Click in device list  to search the device.
- 3、 Select a device to be connected.
- 4、 Click ">" in the camera's feature panel to unfold the specific camera parameters, and set them according to actual demands. Please see the table below for the introduction of each attribute classification.

Attribute	Description
<i>Device Control</i>	You can view the device information, edit its name, reset the device, etc.
<i>Image Format Control</i>	You can view and set the device's resolution, image reverse function, pixel format, region of interest, test pattern, etc.
<i>Acquisition Control</i>	You can view and set the device's acquisition mode, frame rate, trigger mode, exposure time, etc.
<i>Analog Control</i>	You can view and set the device's gain, black level, Gamma correction, sharpness, etc.
<i>Color Transformation Control</i>	You can view and set the device's color transformation related parameters like hue and saturation.
<i>LUT Control</i>	You can view the Look-Up Table (LUT), and set its index and value.
<i>Shading Correction</i>	You can set shading correction to correct shade.
<i>Digital IO Control</i>	You can set the different input and output signals.
<i>Action Control</i>	You can view and set the device's action control related parameters.
<i>Counter And Timer Control</i>	You can view and set the counter related parameters.
<i>File Access Control</i>	You can view and set the device's file access control related parameters.
<i>Sequencer Control</i>	You can view and set the device's sequencer related parameters.
<i>Event Control</i>	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.
<i>Chunk Data Control</i>	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.
<i>Transport Layer Control</i>	You can view and set the parameters of the device's transport layer.
<i>User Set Control</i>	You can save or load the device's parameters.

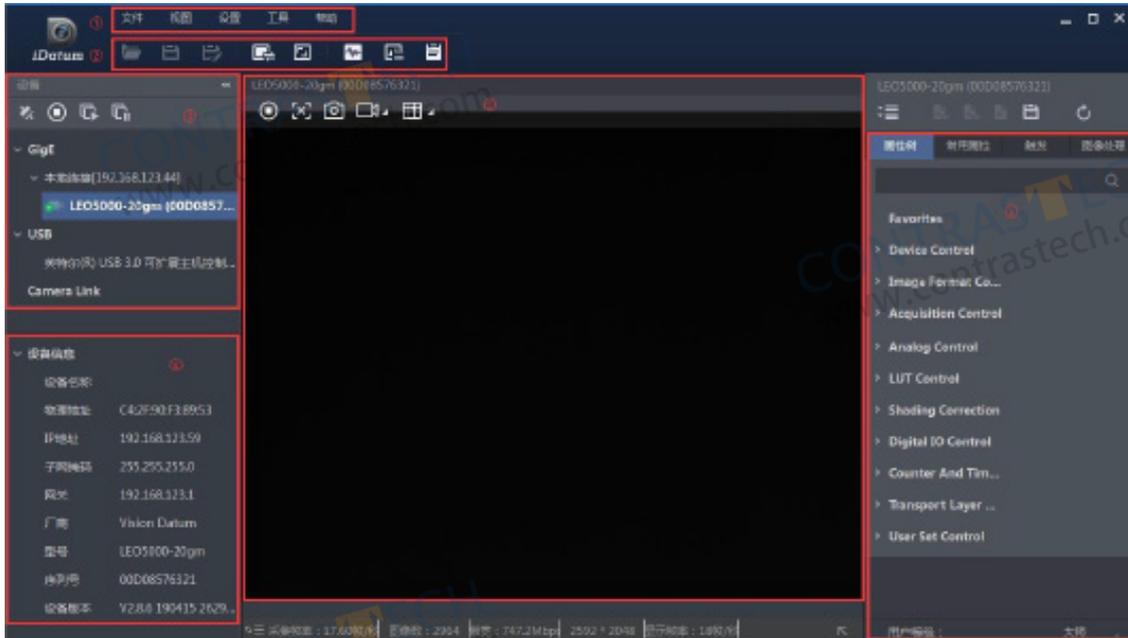


The camera's attribute tree and parameters may differ by camera models.

## Software Operation

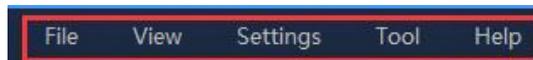
### ■ Main interface

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



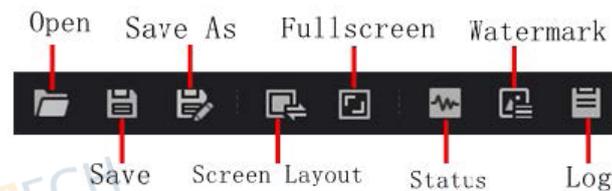
### ■ Menu Bar

The menu bar for iDatum client provides following functions: File, View, Settings, Tool and Help, as shown in the figure below.

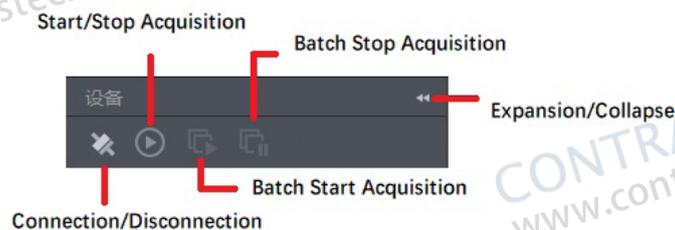


### ■ Control Toolbar

The control toolbar provides quick operations for the device. the icon meaning is shown in the figure below. The operation buttons in the tool bar can quickly and conveniently edit camera images.



The meaning of shortcut icons in Device List is shown as below.



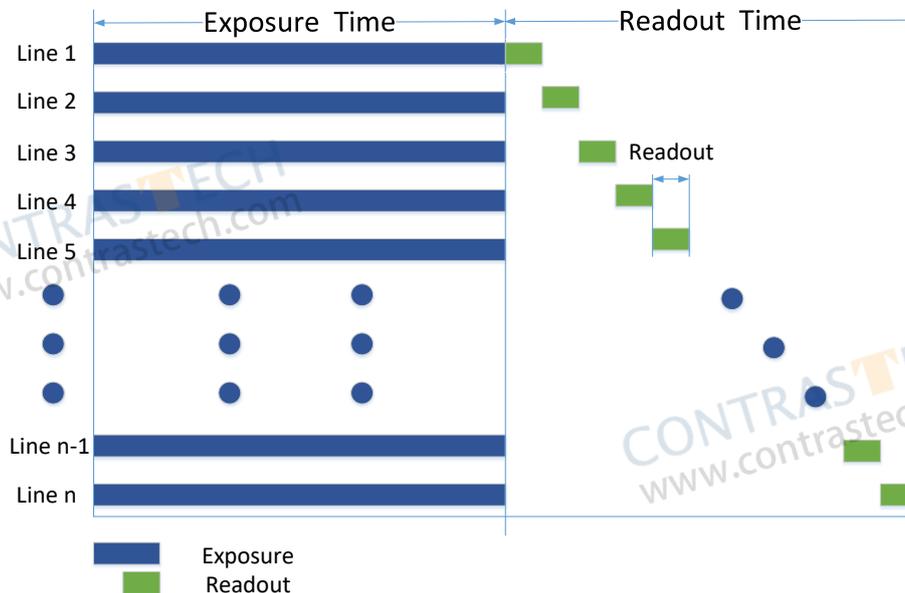
- Connection/Disconnection: After you selecting the camera, click "Connect" to connect the camera; click "Disconnect" to disconnect the camera.
- Start/Stop Acquisition: For current connected camera, click "Start Acquisition" to acquire image data; click "Stop Acquisition" to stop image data acquisition.
- Batch Start Acquisition: click "Batch Start Acquisition" to start image data acquisition for all currently connected camera by iDatum.
- Batch Stop Acquisition: click "Batch Stop Acquisition" to stop image data acquisition for all currently connected camera by iDatum.
- Expansion/Collapse: This function can be used to expand or collapse the Device List and Device Information which list on the left side of iDatum, and the default state is expansion. In the "Collapse" state, the iDatum left side only display the searched cameras.

## CHAPTER 4 CAMERA FEATURES

### Global Shutter and Rolling Shutter

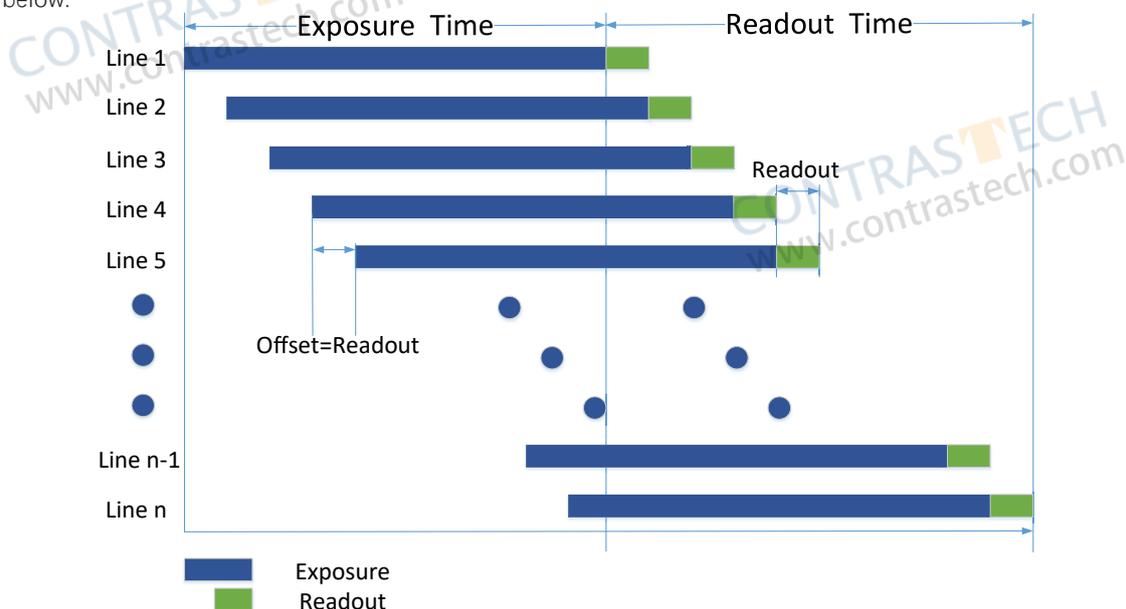
#### ■ Global Shutter

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.



#### ■ Rolling Shutter

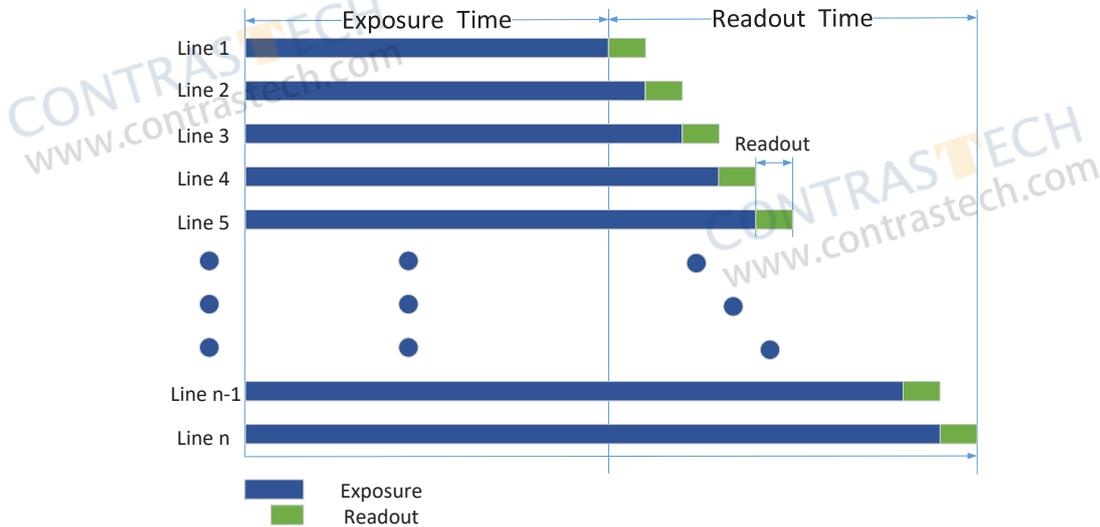
For cameras that support rolling shutter: as soon as the exposure ends, and the data readout starts simultaneously. After the whole action, the rest of rows start to expose and read out one by one. All pixels expose at the same time, then readout at different time, as shown below.



## Global Shutter and Rolling Shutter

### Global Reset

Only some models of cameras with rolling shutter support the Global Reset function. Global reset means that all of the sensor's pixels start exposing at the same time, but stop exposing at different time.



When you need to use the Global Reset function, You can go to Acquisition Control > Sensor Shutter Mode, and select Sensor Shutter Mode to Global Reset.

### Trigger Rolling

The Trigger Rolling function is mainly used in rolling shutter cameras. This function can increase the maximum frame rate in trigger mode, thereby increasing the drawing time. But this function does not support overlap exposure.

When you need to use the Trigger Rolling function, You can go to Acquisition Control > Sensor Shutter Mode, and select Sensor Shutter Mode to Trigger Rolling .



- Whether the camera supports Global Reset/Trigger Rolling function depends on the specific model.
- After the Global Reset function is turned on, due to the different exposure time of each line of the image, the brightness of each line of the image may vary from top to bottom. Therefore, if this function is turned on, it is recommended to use it with a visual light source in a dark environment. Turn on the light source during the exposure time shown in the figure above, and turn off the light source at other times, so that each line of the image gets the same illumination during the same exposure time, so as to control the brightness of each line of the image.

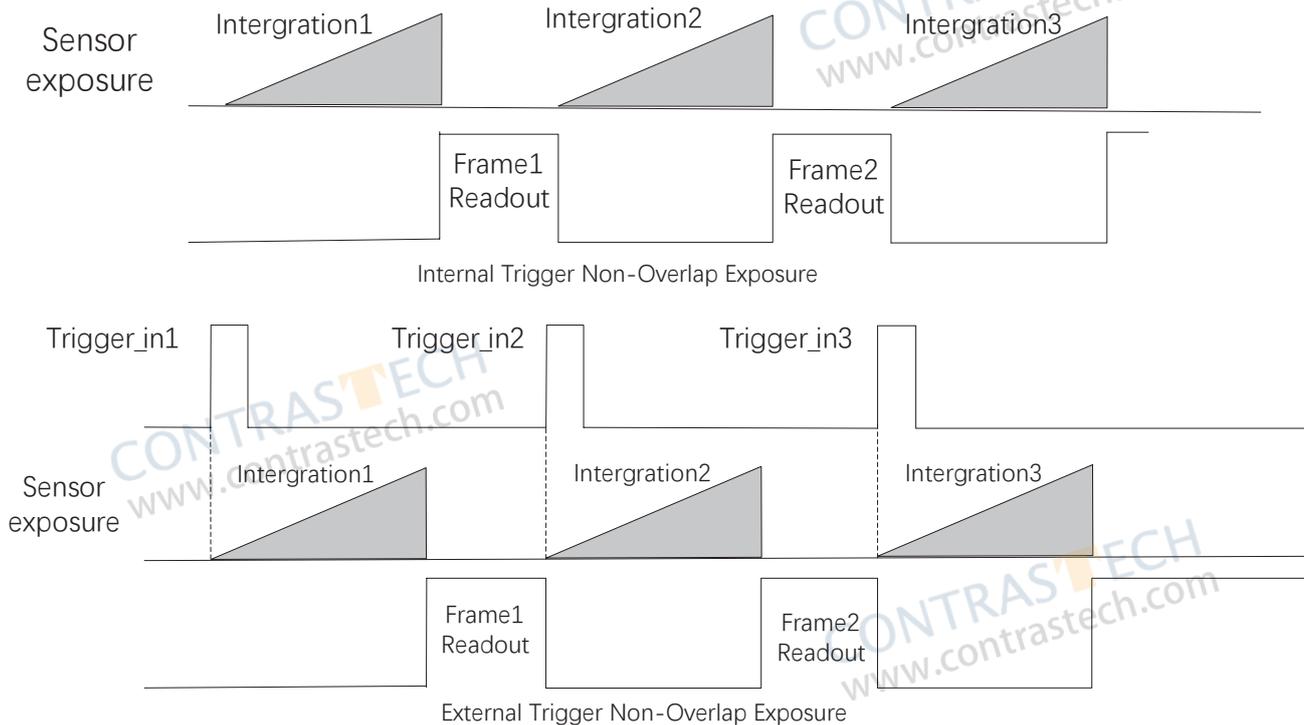
## Non-Overlap Exposure and Overlap Exposure

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. Compared with non-overlap exposure, overlap exposure can reduce the influence of exposure time on grabbing time.

The products mentioned in this manual use overlap exposure to process image data.

### ■ 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.

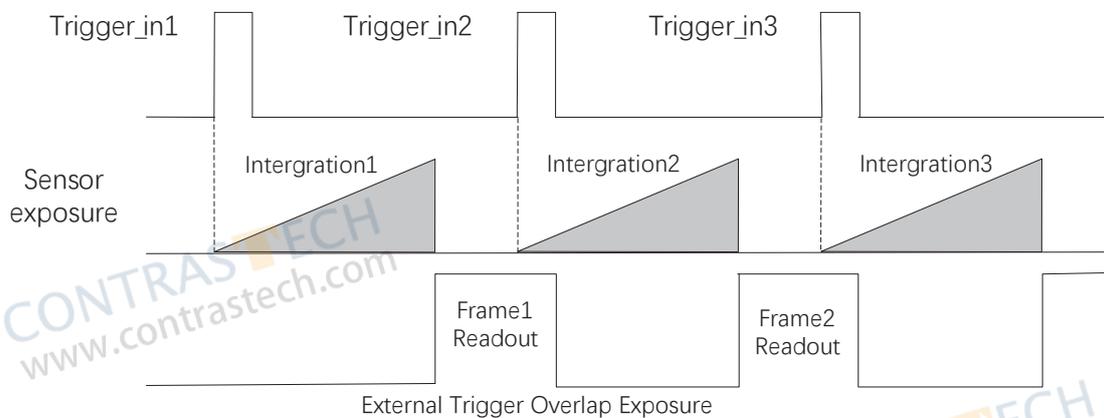
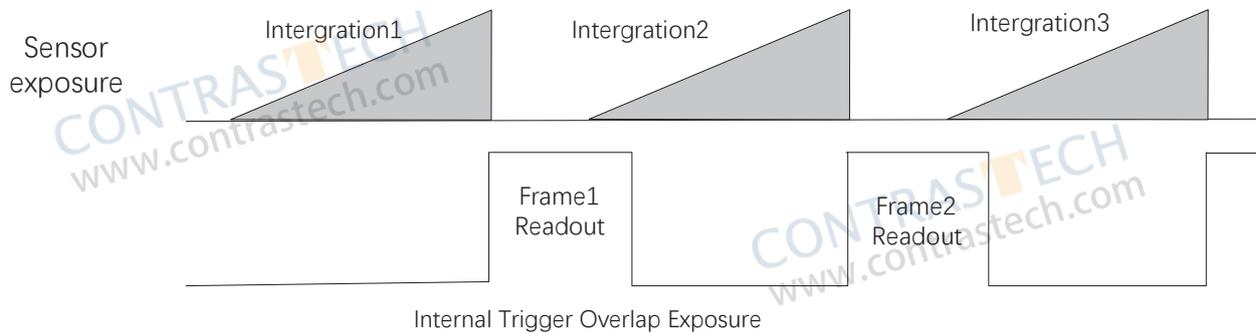


The camera will ignore the external signal in the readout section under this mode.

## Non-Overlap Exposure and Overlap Exposure

### 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.



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

## CHAPTER 5 IMAGE ACQUISITION

### Frame Rate

Frame rate refers to the image number that is acquired by the camera per second. The higher frame rate, and shorter time used for image acquisition will be.

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



For different models of camera, the Image compression mode may be different, please refer to the actual one you got.

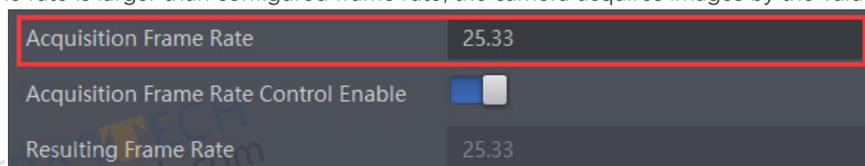
The camera can also manually control the real-time frame rate.

The specific steps are as follows:

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

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

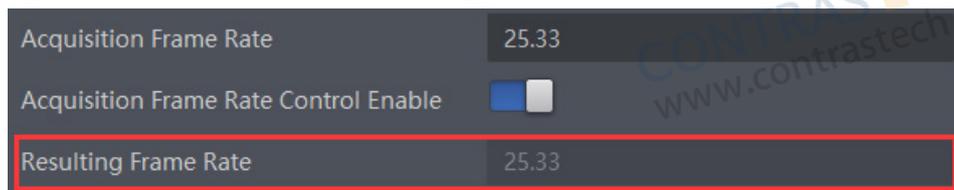
\_If the current real-time frame rate is larger than configured frame rate, the camera acquires images by the value you set.



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

In the most undesirable situation, the actual frame rate should be less than the resulting frame rate value.

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



## Full Frame Transmission

The full frame transmission function is used to continue frame transmission action and have a full frame when frame acquisition stops during the process, and the frame will be discarded if this parameter is not enabled.

Go to Acquisition Control → Full Frame Transmission, and enable it according to actual demands.



The full frame transmission function may differ by device models.

## Packet Size

Packet size refers to the network packet size (in bytes) of the device to transmit stream channel data to the host. The total length, including the IP header, UDP header, and GVSP header, is 36 bytes, so the payload in a stream channel network packet is 1464 bytes by default. You can set it via GEV SCPS Packet Size(B) of Transport Layer Control, and it is recommended to set as 8164 bytes to improve network transmission performance.



- If the packet size is larger than 1500, network devices such as NICs and switches are required to support jumbo frames.
- When changing the packet size, the two parameters of packet size and packet interval will jointly affect the network transmission performance.

## Reserved Bandwidth

The reserved bandwidth is used to reserve a portion of the bandwidth for packet retransmission and control data transmission between the device and the host, and can also be used for multi-machine transmission when allocating limited bandwidth per device.

For example, if the network bandwidth value is 1 Gbps and the reserved bandwidth value is configured to 20%, the device will calculate the frame rate at the maximum of 0.8 Gbps.

The device's reserved bandwidth can be set via Bandwidth Reserve of Transport Layer Control, and the unit is %.

## Packet Interval

The packet interval is used to control the bandwidth over which the device transmits image stream data. The packet interval is the number of idle clocks inserted between adjacent network packets transmitted by a stream channel. Increasing the packet interval can reduce the device's utilization of network bandwidth, and may also reduce the device's frame rate.

The device's packet size, packet interval, and reserved bandwidth settings determine the effective network bandwidth. The effective network bandwidth is calculated as follows:

Time required to transmit a single stream datagram:

$$T_{data} = (\text{Size}_{pkt} \times 8\text{bits}) / \text{Speed}_{link}$$

Packet delay time:

$$T_{delay} = \text{Delay}_{pkt} \times 125000000$$

Packet size:  $\text{Size}_{pkt}$ 、packet interval:  $\text{Delay}_{pkt}$ 、reserved bandwidth  $\text{BandW}_{reserve}$ 、and link speed  $\text{Speed}_{link}$

Effective network bandwidth:

$$\text{BandW}_{avail} = \left( \frac{\text{Size}_{pkt} \times 8\text{bits}}{T_{data} \times T_{delay}} \right) \times \frac{100 - \text{BandW}_{reserve}}{100}$$

You can set the device's packet interval via GEV SCPD of Transport Layer Control. You can also enable Auto SCPD to let the client software automatically adjust SCPD value and optimize data transmission process. The device's actual SCPD value is displayed in Actual SCPD.

## Pause Frame

The pause frame is used to control the amount of image stream data transmitted by the device. When the host receives too much image stream data, a part of the transmitted frames will be discarded by the host. Therefore, the pause frame may be used for flow control. When the device receives the pause frame sent by the host, the device slows down the transmission rate.

The received pause frame can be processed by enabling GEV PAUSE Frame Reception of Transport Layer Control.

## Trigger Mode

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

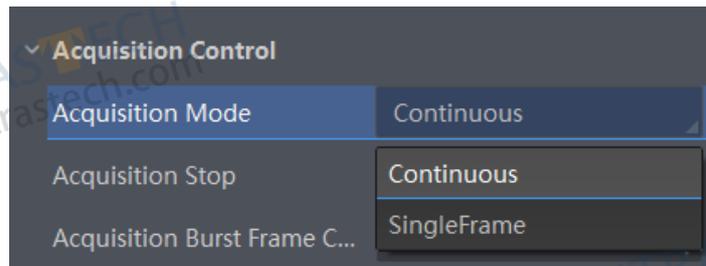
Internal trigger mode(acquisition modes), including SingleFrame mode and Continuous mode;external trigger mode, including software trigger, hardware trigger.

Trigger Mode	Parameter	Parameter Value	Principle
Internal trigger mode	Acquisition Control > Trigger Mode	Off	The camera acquires images via its internal signals.
External trigger mode		On	The camera acquires images via external signals. These signals can be software signal and hardware signal, including software trigger, hardware trigger, counter trigger, etc..

### Internal trigger mode

Their principle and parameter setting are shown below.

Internal trigger mode	Parameter	Parameter Value	Principle
SingleFrame mode	Acquisition Control > Acquisition Mode	SingleFrame	When camera starts image acquisition, it acquires one image only, and then stops.
Continuous mode		Continuous	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.



### External trigger mode

The external trigger signals types of trigger camera acquisition can be given by software or external device. Under external trigger signal mode, the camera output image via following several working modes: SingleFrame Trigger mode, Burst Trigger mode and Long Exposure Trigger mode.

#### External Trigger Source

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

External trigger mode	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		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		Counter 0	The counter sends trigger signal to the camera to acquire images.
Action Command Trigger		Action 1	The action command sends trigger signal to the camera to acquire images.
Free Trigger		Anyway	Use software trigger, hardware trigger, counter or action command to send trigger signal to the camera to acquire images.

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

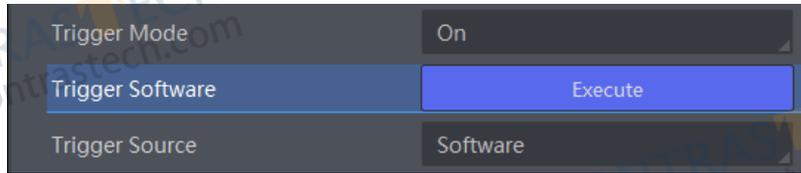
	These 5 external trigger sources are valid only when the Trigger Mode is On
---	---

## Trigger Mode

### ■ Software Trigger

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

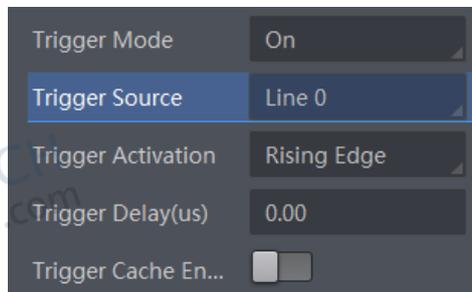
1. Click Acquisition Control > Trigger Mode, and select On as Trigger Mode.
2. Select Software as Trigger Source, and click Execute in Trigger Software to send trigger commands.



### ■ Hardware Trigger

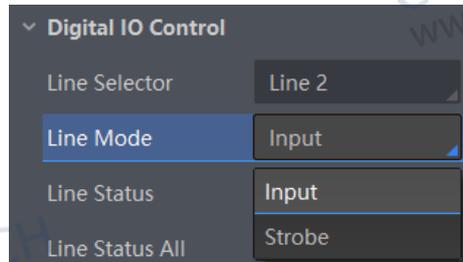
In hardware trigger, external device sends trigger signal to the device to acquire images via I/O connector.

1. Go to Acquisition Control → Trigger Mode, and select On as Trigger Mode.
2. Select Line 0 or Line 2 as Trigger Source according to actual demands.



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

1. Go to Digital IO Control and select Line 2 as Line Selector.
2. Select Input as Line Mode.



## Trigger Mode

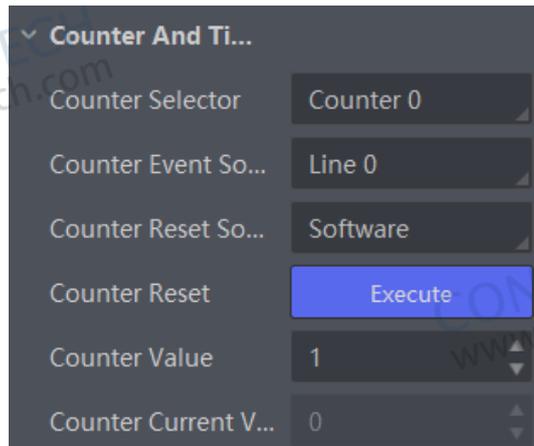
### ■ Counter Trigger

The counter trigger provides frequency division to the external trigger signal. The camera performs an external trigger after receiving multiple hardware trigger signals.

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

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

Parameter	Read/Write	Description
Counter Selector	Read and write	It selects counter source. Counter 0 is available only at present.
Counter Event Source	Read and write	It selects the signal source of counter trigger. Line 0 and Line 2 are available. It is disabled by default.
Counter Reset Source	Read and write	It selects the signal source of resetting counter. Software is available only. It is disabled by default.
Counter Reset	Write is available under certain condition	It resets counter and it can be executed when selecting Software as Counter Reset Source.
Counter Value	Read and write	It is the counter value with the range of 1 to 1023. For example, if the parameter is set to n, then the trigger signal n times can execute the counter trigger once to obtain 1 frame of image.
Counter Current Value	Read only	It displays the number of executed external trigger.



### ■ Anyway Trigger

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

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

## Trigger Mode

### ■ Trigger Related Parameters

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

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

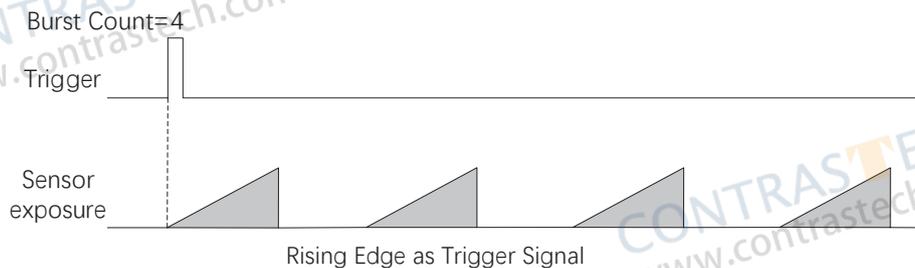
### ■ Burst Frame Count

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.

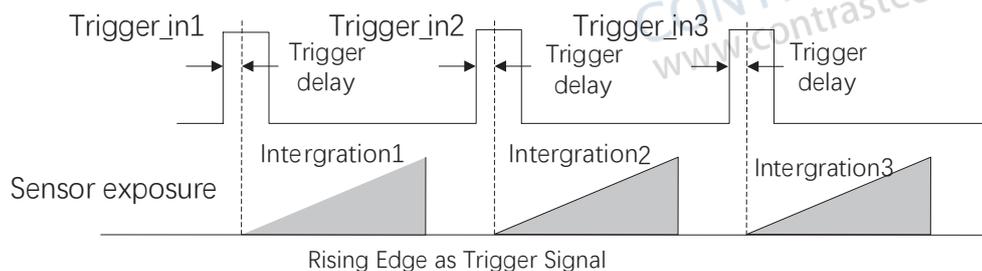
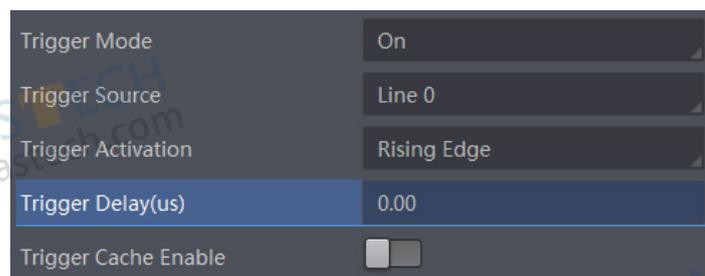


When Acquisition Burst Frame Count is 1, it is in single frame trigger mode. When Acquisition Burst Frame Count is larger than 1, it is in multi-frame trigger mode. If Acquisition Burst Frame Count is n and when inputting 1 trigger signal, the camera stops acquiring images after exposing n times and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



### ■ Trigger Delay

The trigger delay function allows the device to add a delay between the receipt of trigger signal and the moment the trigger becomes active. Go to Acquisition Control → Trigger Delay, and enter Trigger Delay, and the unit is  $\mu\text{s}$ .

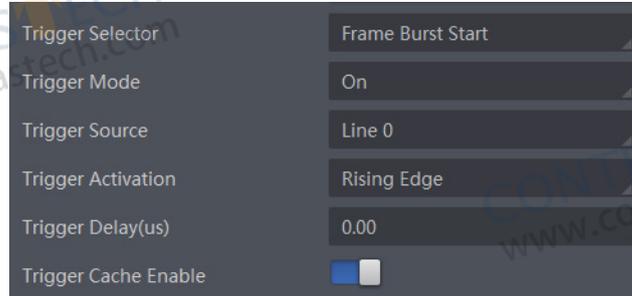


## Trigger Mode

### ■ Trigger Cache Enable

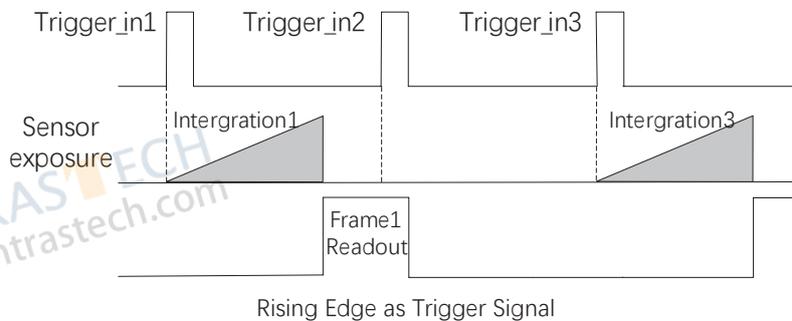
The camera has the function of Trigger Cache Enable. During the triggering process, if the camera receives new trigger signal, it will save and process the signal if you enable this function. Trigger cache enable can save up to 2 trigger signals.

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



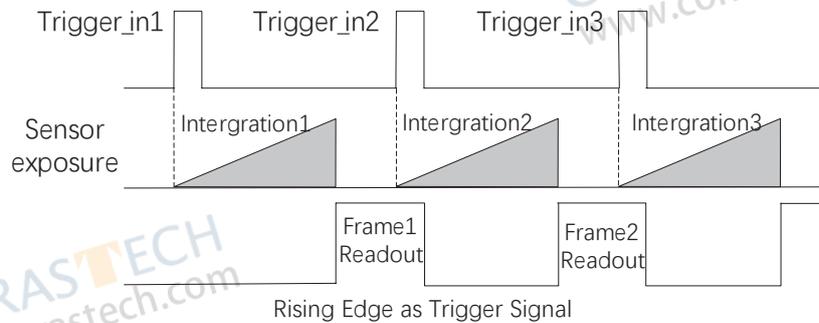
If the camera receives the 1st trigger signal first, and the camera receives the 2nd trigger signal during processing the 1st trigger signal.

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

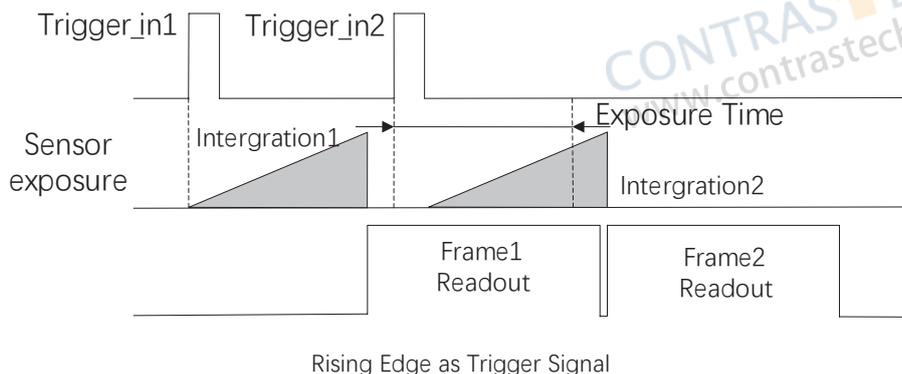


- Enable Trigger Cache Enable: the 2nd trigger signal will be saved.

\_ 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.

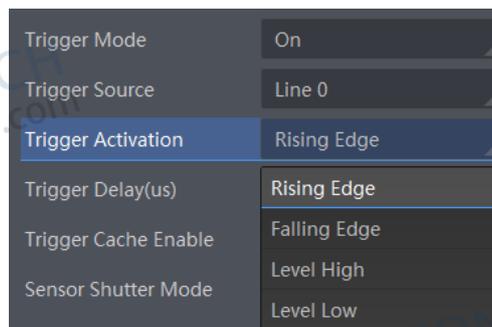


## Trigger Mode

### ■ Trigger Activation

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

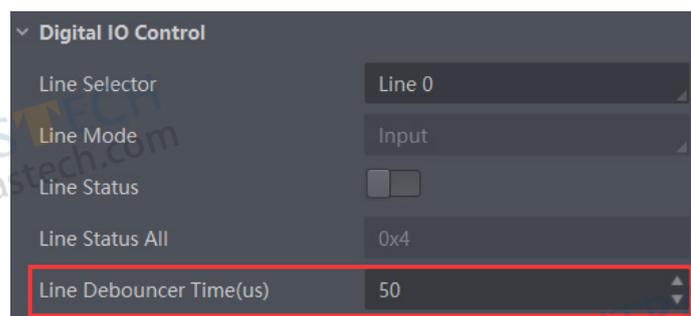
Trigger Activation	Parameter	Parameter Value	Principle
Rising Edge	Acquisition Control > Trigger Activation	Rising Edge	Rising Edge refers to the rising edge of the trigger signal is valid, that is camera exposure and acquisition at the beginning of the rising edge of the trigger signal.
Falling Edge		Falling Edge	Falling Edge refers to the falling edge of the trigger signal is valid, that is camera exposure and acquisition at the beginning of the falling edge of the trigger signal.
Level High		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		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.
Any Edge		Level Low	It means that when the level signal sent by external device is in rising edge, falling edge, level high or level low, the device receives trigger signal and starts to acquire images.



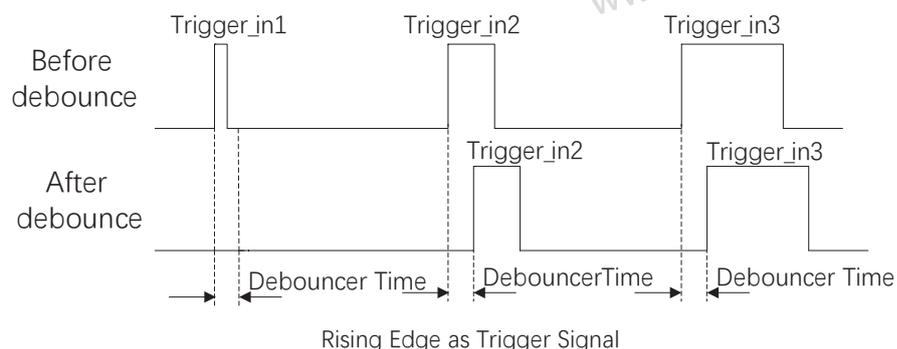
### ■ Trigger Debouncer

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.

Click Digital IO Control > Line Debouncer Time, and enter Line Debouncer Time according to actual demands. and its range is from 1  $\mu$ s to 1000000  $\mu$ s.



When the set Debouncer time is greater than the trigger signal time, the trigger signal is ignored.

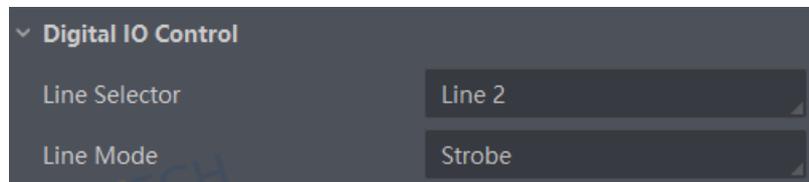


## CHAPTER 6 I/O OUTPUT

### Select Output Signal

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

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



- Here we take Line 2 as an example to introduce how to select output signal. You select Line 1 or Line 2 as line selector according to actual demands.
- For details about the electrical characteristics and wiring of the IO interface, please refer to Chapter I/O Electrical Characteristics and Wiring.

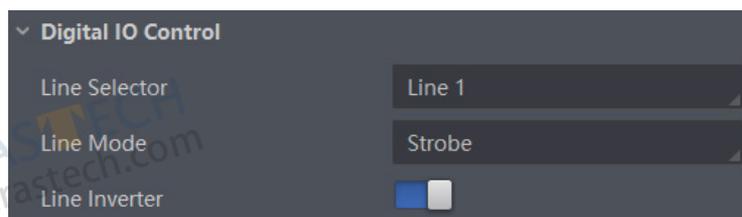
### Set Output Signal

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

#### ■ 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.

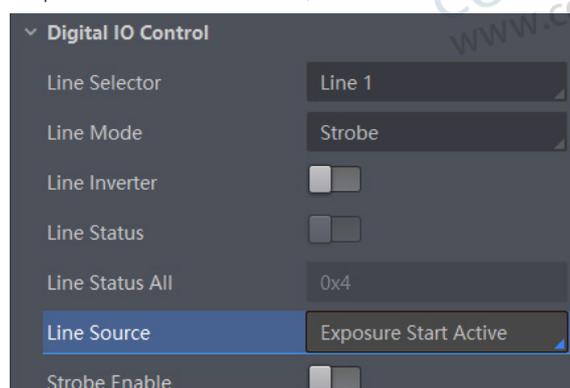
Click Digital IO Control > Line Selector, select line for Line Selector, and enable Line Inverter. The Line Inverter parameter is disabled by default.



#### ■ 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.

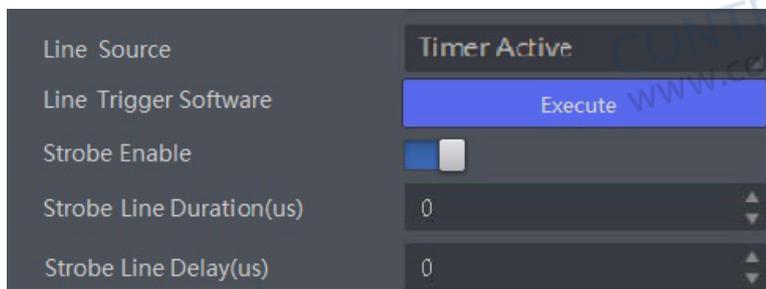


## Set Output Signal

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

Name	Description
Exposure Start Active	It refers to output one I/O edge signal when starting exposure.
Exposure End Active	The device outputs signals to external devices when it stops exposure.
Acquisition Start Active	It refers to output one I/O edge signal when starting acquisition.
Acquisition Stop Active	It refers to output one I/O edge signal when stopping acquisition.
Frame Burst Start Active	It refers to output one I/O edge signal when starting triggering and acquiring images under Burst mode.
Frame Burst End Active	It refers to output one I/O edge signal when stopping triggering and acquiring images under Burst mode.
Frame Trigger Wait	The device is currently waiting for a frame start trigger.
Frame Start Active	The device outputs signals to external devices when it starts doing the capture of a frame.
Frame End Active	The device outputs signals to external devices when it stops doing the capture of a frame.
Soft Trigger Active	It refers to output one I/O edge signal when software trigger acquisition.
Hard Trigger Active	It refers to output one I/O edge signal when hardware trigger acquisition.
Counter Active	It refers to output one I/O edge signal when counter output is enabled.
Timer Active	It refers to output one I/O edge signal when timer output is enabled.

If Timer Active is selected as Line Source, you can set Strobe Line Duration and Strobe Line Delay, and the camera will output signal correspondingly after click Execute in Line Trigger Software.



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

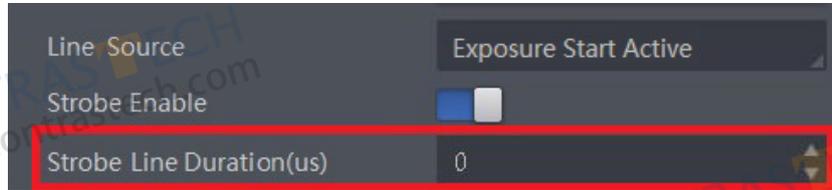


- The specific line source may differ by camera models.
- When the Strobe Line Duration value is 0, the strobe duration is equal to the exposure time. When the Strobe Line Duration value is not 0, the strobe duration is equal to Strobe Line Duration value.

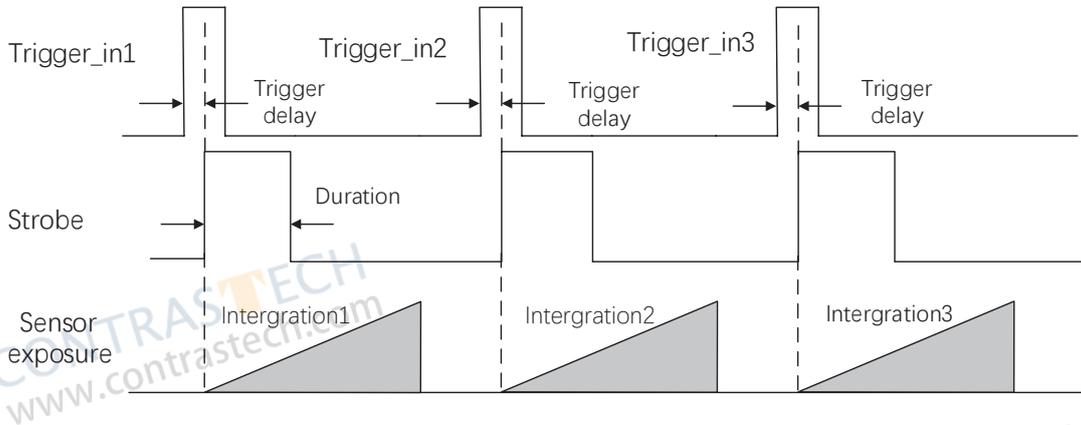
## Set Output Signal

### ■ Strobe Line Duration

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



For example, select Line Source as Exposure Start Active. When the camera starts to expose, Strobe outputs immediately. 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.

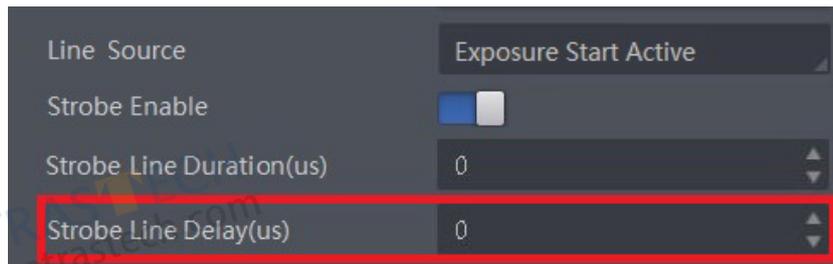


### ■ Strobe Line Delay

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

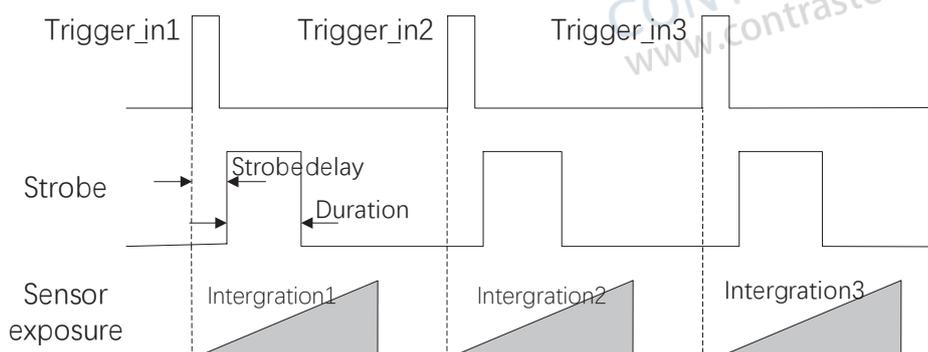
Click Digital IO Control > Strobe Line Delay, and enter Strobe Line Delay according to actual demands.

The unit is  $\mu\text{s}$  and the range is 0~10000, that is, 0~10 ms.



For example, select Line Source as Exposure Start Active.

When the camera starts to expose, the Strobe output does not take effect immediately, but delays the output according to the value set by Strobe Line Delay. The sequence diagram of strobe line delay is shown below.

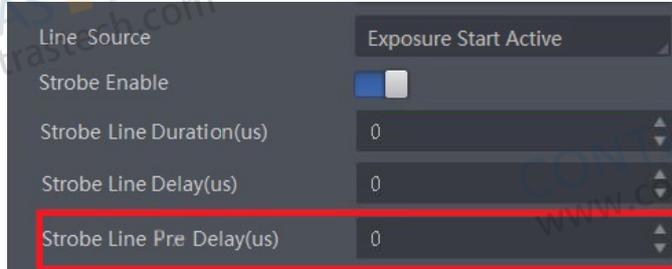


## Set Output Signal

### ■ Strobe Line Pre Delay

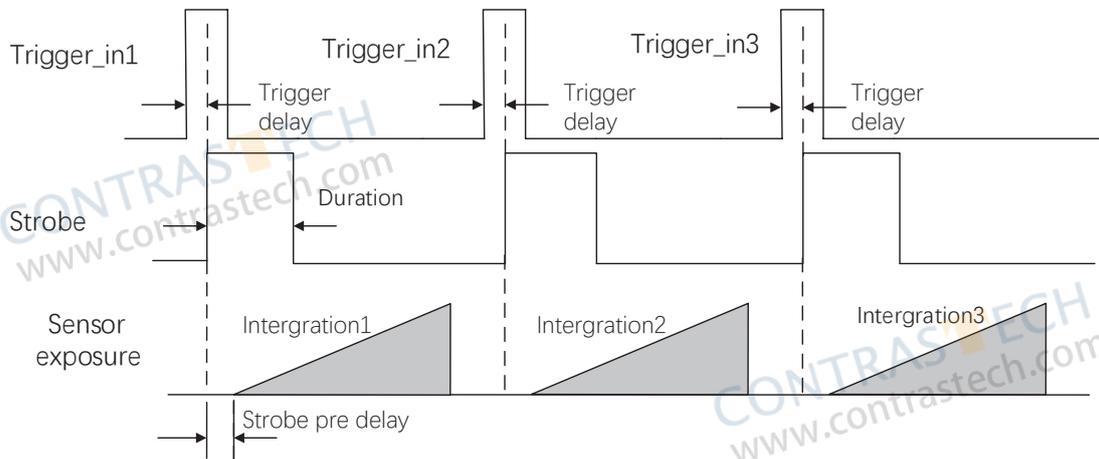
The camera also supports the function of strobe line pre delay, which means that the strobe signal takes effect early than exposure. This function is applied to the external devices that have slow response speed.

Click Digital IO Control > Strobe Line Pre Delay, and enter Strobe Line Pre Delay according to actual demands. The unit is  $\mu\text{s}$  and the range is 0~5000, that is, 0~5 ms.



For example, select Line Source as Exposure Start Active.

The camera will delay the exposure according to the value set by Strobe Line Pre Delay. The sequence diagram of strobe line pre delay is shown below.



# I/O ELECTRICAL FEATURE AND WIRING

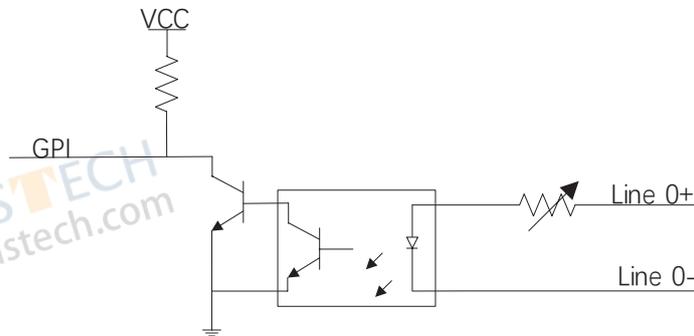
## CHAPTER 7

### I/O Electrical Feature

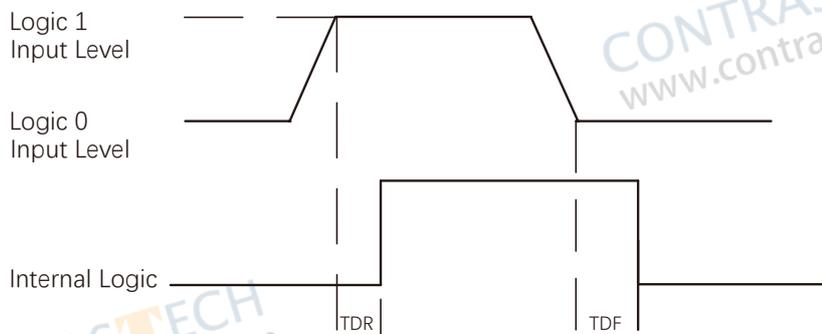
#### Line 0 Opto-isolated Input Circuit

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

The maximum input current of Line 0 is 25 mA.



Input Logic Level:



Input Electrical Feature:

Parameter Name	Parameter Symbol	when the external voltage is 12 VDC and the external resistance is 1 K $\Omega$ Value	when the external voltage is 24 VDC and the external resistance is 4.7 K $\Omega$ Value
Input Logic Level Low	VL	0 ~ 1 VDC	0 ~ 1 VDC
Input Logic Level High	VH	3.3 ~ 24 VDC	3.3 ~ 24 VDC
Input Rising Delay	TDR	1.28 ~ 2.04 $\mu$ s	2.32 ~ 3.08 $\mu$ s
Input Falling Delay	TDF	25.6 ~ 28 $\mu$ s	22.6 ~ 27.2 $\mu$ s



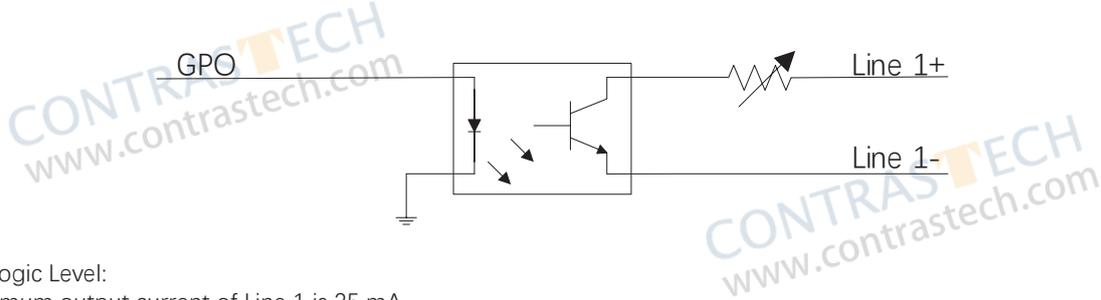
- Make sure the input voltage is not from 1 VDC to 3.3 VDC as the electric status between these two values are not stable.
- The breakdown voltage is 30 VDC, and keep voltage stable.

## I/O Electrical Feature

### Line 1 Opto-isolated Output Circuit

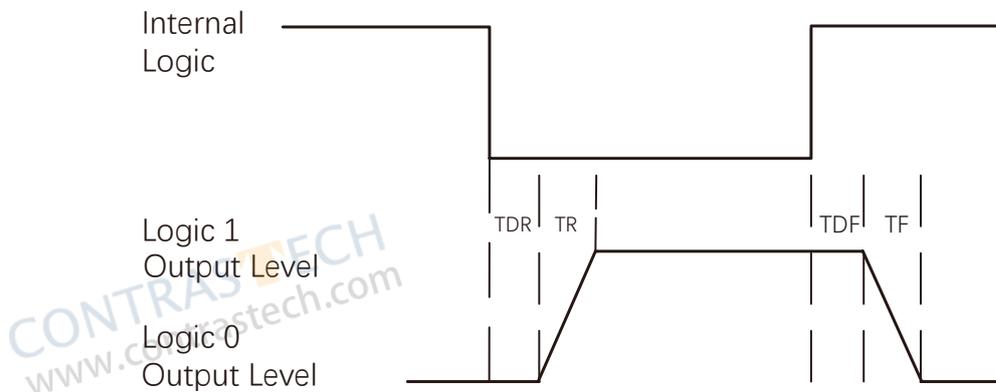
The Line 1 opto-isolated output circuit in camera I/O control is shown below.

The maximum output current of Line 1 is 25 mA.



Output Logic Level:

The maximum output current of Line 1 is 25 mA.



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

Parameter Name	Parameter Symbol	when the external voltage is 12 VDC and the external resistance is 1 K $\Omega$ Value	when the external voltage is 24 VDC and the external resistance is 4.7 K $\Omega$ Value
Output Logic Level Low	VL	1.1 ~ 1.46 V	1.1 ~ 1.46 V
Output Logic Level High	VH	2.54 ~ 11.3 V	2.26 ~ 22.4 V
Output Rising Time	TR	17.6 ~ 104 $\mu$ s	21.6 ~ 144 $\mu$ s
Output Falling Time	TF	0.4 ~ 2 $\mu$ s	0.4 ~ 1.6 $\mu$ s
Output Rising Delay	TDR	26.8 ~ 72 $\mu$ s	22.4 ~ 96 $\mu$ s
Output Falling Delay	TDF	0.44 ~ 1.92 $\mu$ s	0.44 ~ 1.12 $\mu$ s

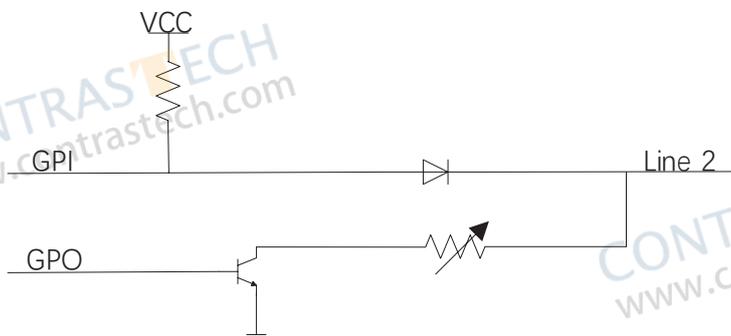
With different external voltage and resistance, the corresponding current and the parameter of output logic level low are shown below.

External Voltage	External Resistance	VL	Output Current
3.3 V	1 K $\Omega$	575 mV	2.7 mA
5 V	1 K $\Omega$	840 mV	4.1 mA
12 V	2.4 K $\Omega$	915 mV	4.6 mA
24 V	4.7 K $\Omega$	975 mV	4.9 mA

## I/O Electrical Feature

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

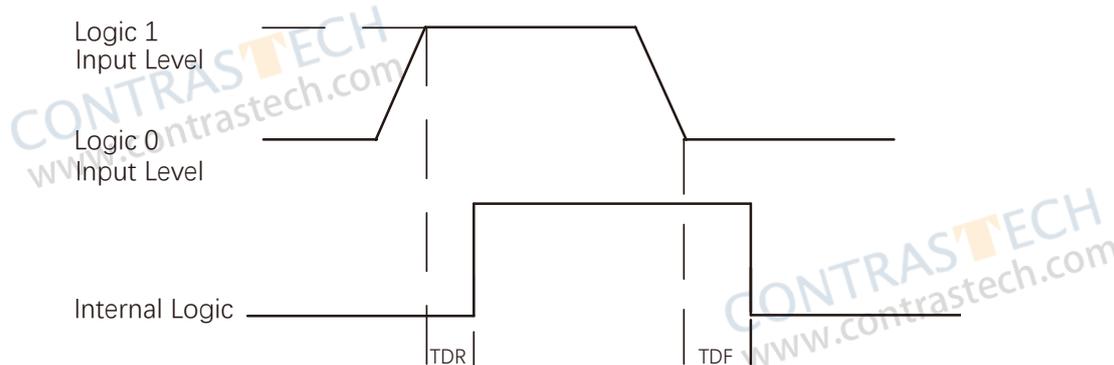
The Line 2 bi-direction I/O circuit in camera I/O control is shown below. The Line 2 can be configured as input signal or as output signal.



### Line 2 Configured as Input

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

Input Logic Level:



Electrical Feature of Line 2 Input:

Parameter Name	Parameter Symbol	when the external voltage is 12 VDC and the external resistance is 1 K $\Omega$ Value	when the external voltage is 24 VDC and the external resistance is 4.7 K $\Omega$ Value
Input Logic Level Low	VL	0 ~ 1 VDC	0 ~ 1 VDC
Input Logic Level High	VH	3.3 ~ 24 VDC	3.3 ~ 24 VDC
Input Rising Time	TDR	1.28 ~ 2.04 $\mu$ s	2.32 ~ 3.08 $\mu$ s
Input Falling Time	TDF	25.6 ~ 28 $\mu$ s	22.6 ~ 27.2 $\mu$ s



- Make sure the input voltage is not from 0.3 VDC to 3.3 VDC as the electric status between these two values are not stable.
- The breakdown voltage is 30 VDC, and keep voltage stable.
- To prevent damage to the GPIO pin, please connect GND first and then input voltage in Line 2.

## I/O Electrical Feature

### Line 2 Configured as Output

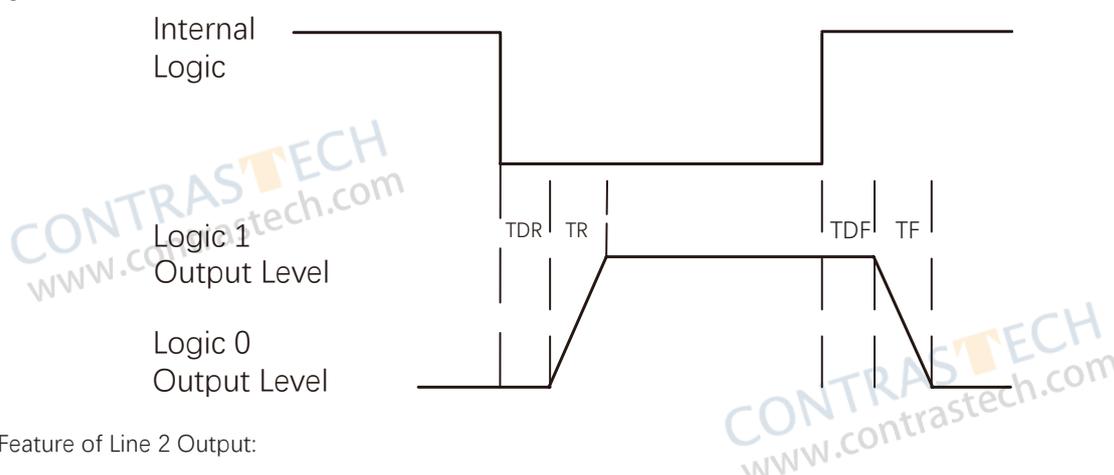
The maximum current is 25 mA and the output impedance is 40  $\Omega$ .

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

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

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

Output Logic Level:



Electrical Feature of Line 2 Output:

Parameter Name	Parameter Symbol	when the external voltage is 12 VDC and the external resistance is 1 K $\Omega$ Value	when the external voltage is 24 VDC and the external resistance is 4.7 K $\Omega$ Value
Output Logic Level Low	VL	0 V	0 ~ 0.2 V
Output Logic Level High	VH	7.8 ~ 11.8 V	5 ~ 23.2 V
Output Rising Time	TR	0.46 ~ 0.9 $\mu$ s	0.44 ~ 4.48 $\mu$ s
Output Falling Time	TF	42 ~ 70 ns	34 ~ 88 ns
Output Rising Delay	TDR	500 ~ 600 ns	0.54 ~ 1.52 ns
Output Falling Delay	TDF	24 ~ 42 ns	34 ~ 232 ns

## I/O Wiring

The camera has different appearance with varied models. Here we take type with Fan camera as an example to introduce I/O wiring. Other cameras can be analogized according to the cable definition in the wiring diagram, combined with the power supply and I/O interface definition chapter.

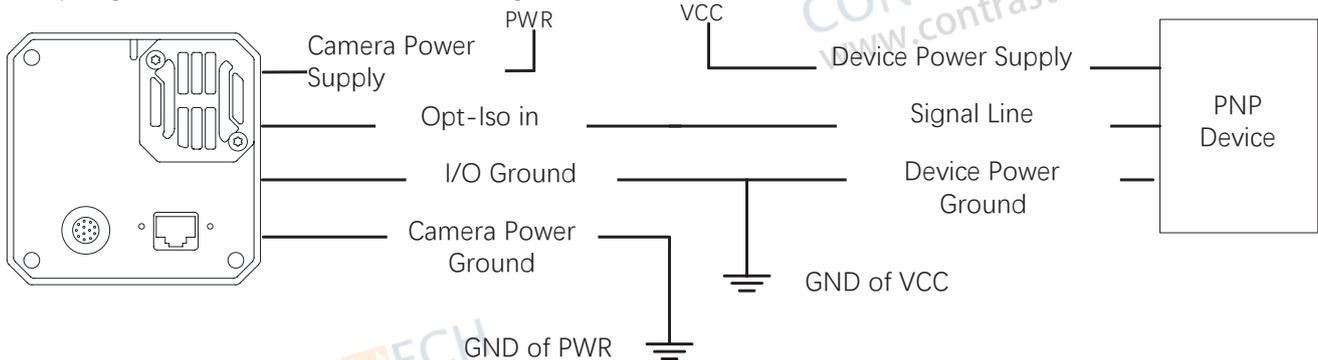


For specific camera appearance, cable color and I/O wiring, please refer to the actual one you got.

### Line 0 Wiring

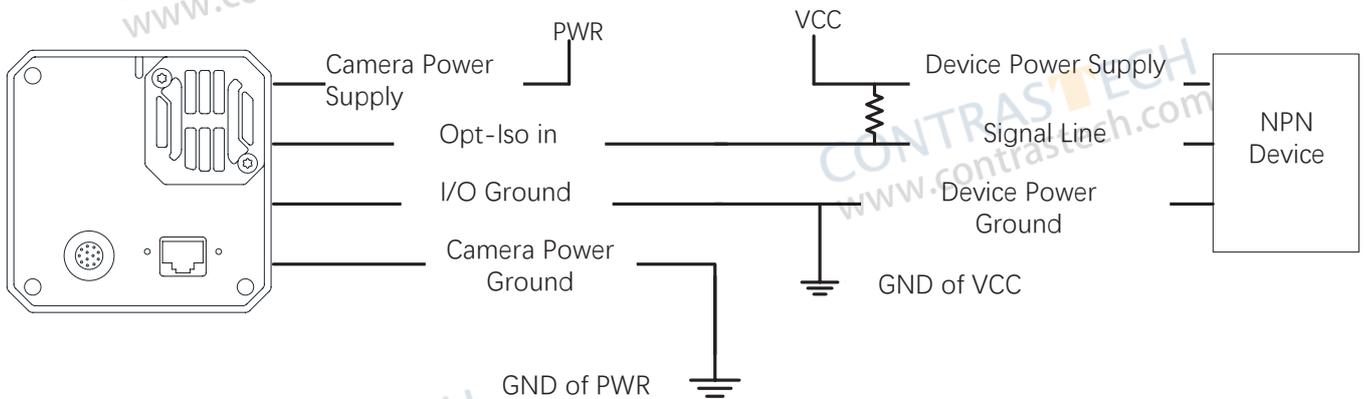
When the camera uses Line 0 as hardware trigger source, wirings are different with different external devices of input signal.

The input signal is PNP Device, that is, Line 0 Connecting to PNP Device:



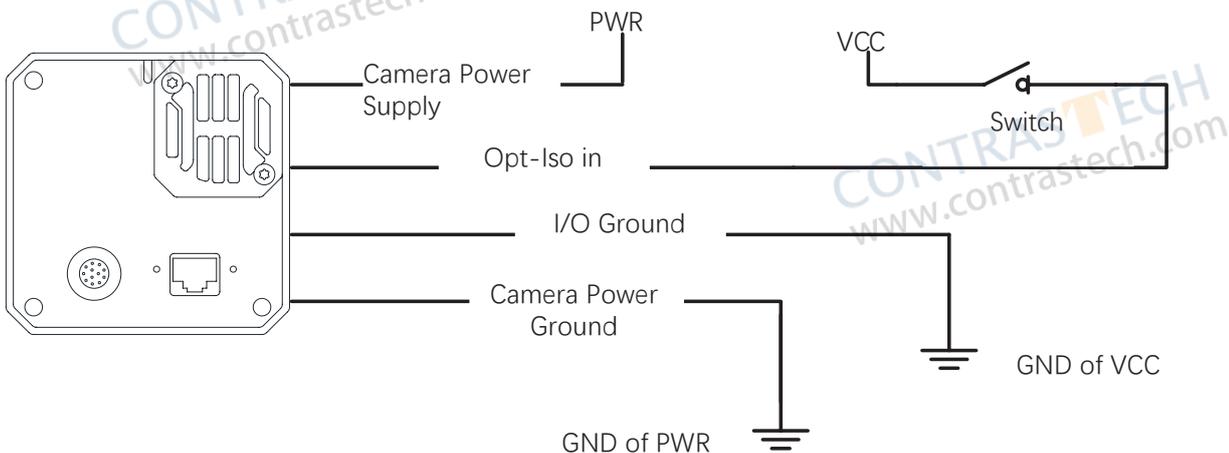
The input signal is NPN Device, that is, Line 0 Connecting to NPN Device:

\_If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 K $\Omega$  pull-up resistor.  
\_If the VCC of NPN device is 12 VDC, and it is recommended to use 1 K $\Omega$  pull-up resistor.



The input signal is Switch, that is, Line 0 Connecting to Switch:

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

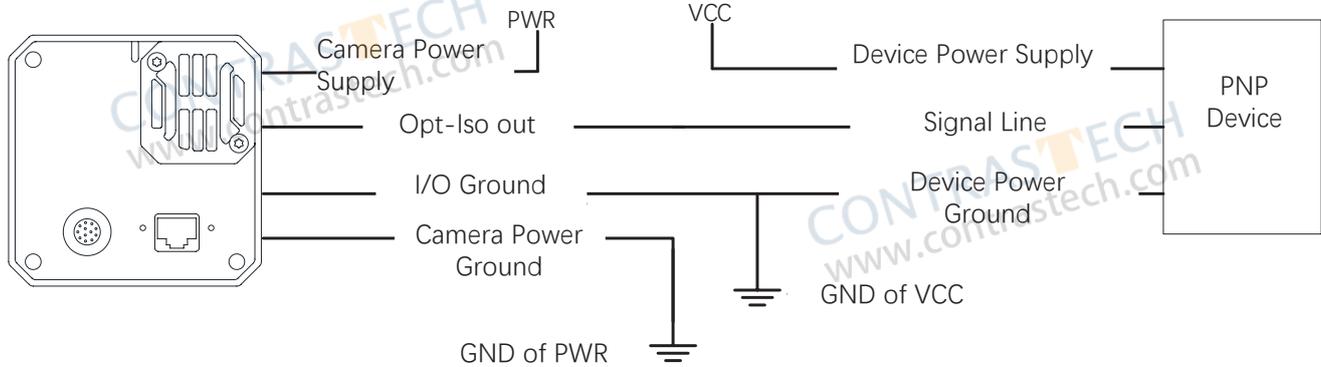


## I/O Wiring

### Line 1 Wiring

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

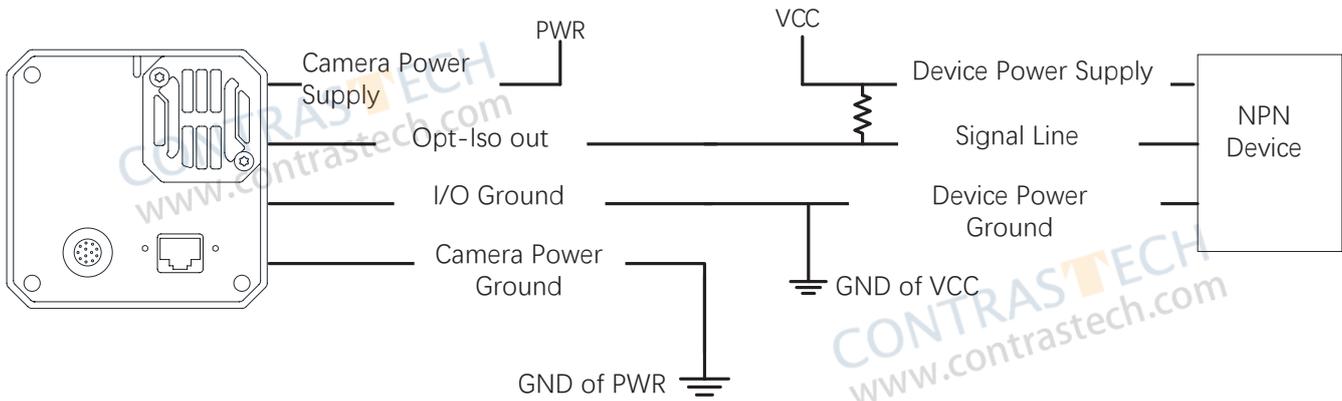
The external devices is PNP Device, that is, Line 1 Connecting to PNP Device:



The external devices is NPN Device, that is, Line 1 Connecting to NPN Device:

\_If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 K $\Omega$  pull-up resistor.

\_If the VCC of NPN device is 12 VDC, and it is recommended to use 1 K $\Omega$  pull-up resistor.



## I/O Wiring

### Line 2 Wiring

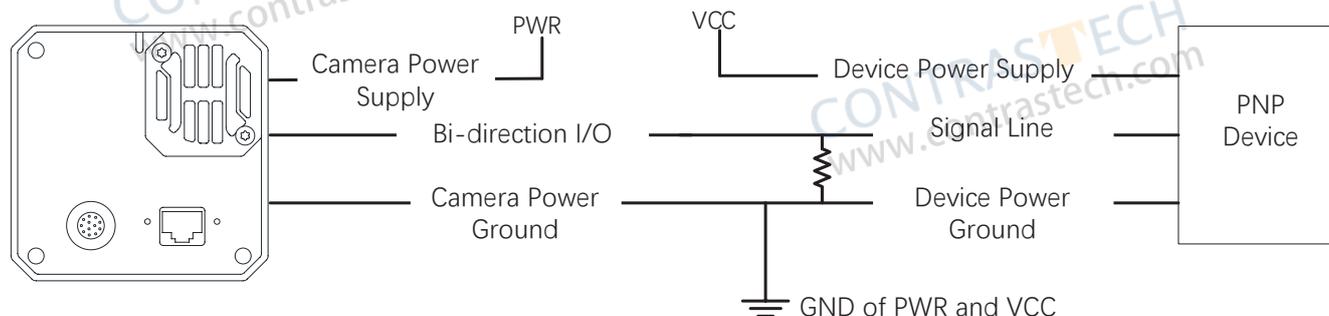
As bi-direction I/O Circuit, Line 2 can be used as both input signal and output signal.

#### 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.

The input signal is PNP Device, that is, Line 2 Connecting to PNP Device as Input:

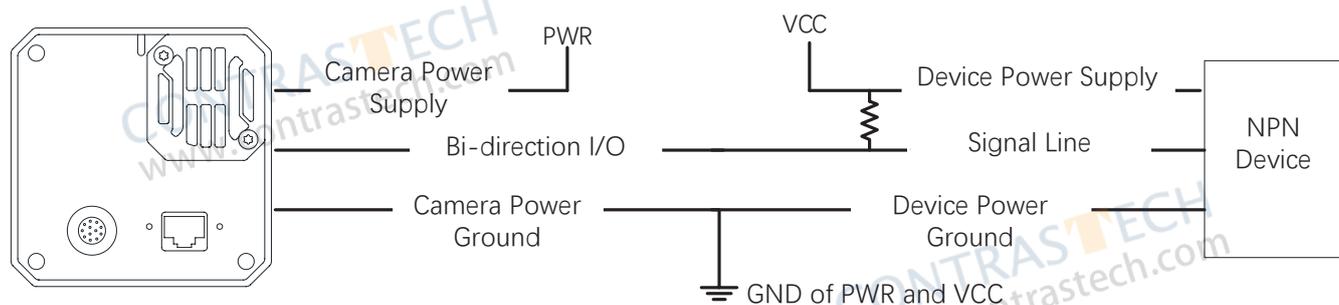
It is recommended to use 330  $\Omega$  pull-down resistor.



The input signal is NPN Device, that is, Line 2 Connecting to NPN Device as Input:

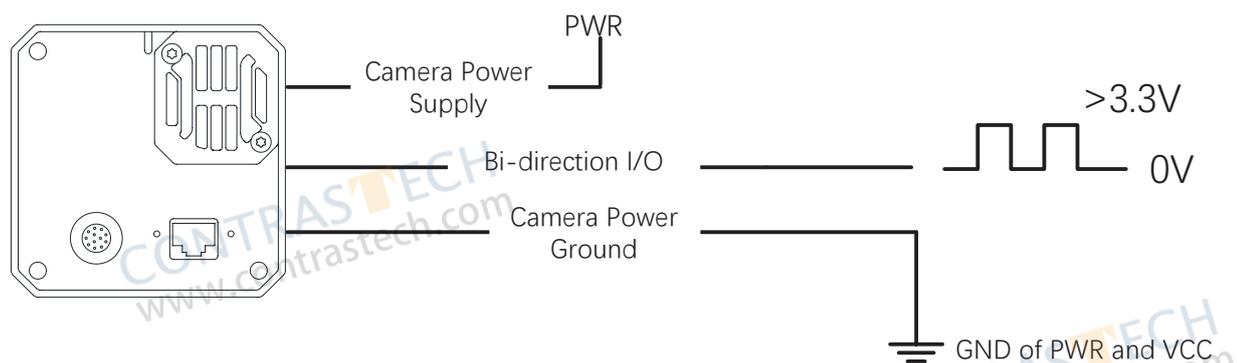
\_If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 K $\Omega$  pull-up resistor.

\_If the VCC of NPN device is 12 VDC, and it is recommended to use 1 K $\Omega$  pull-up resistor.



The input signal is Switch, that is, Line 2 Connecting to a Switch as Input:

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

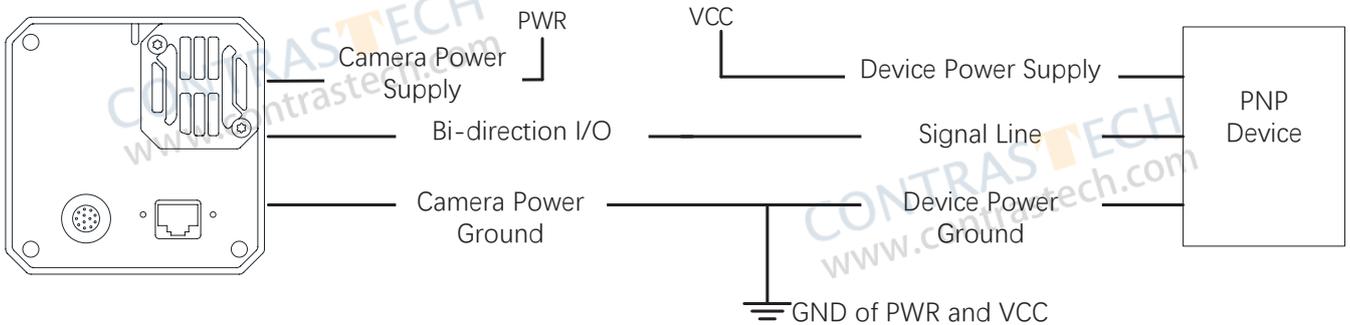


## I/O Wiring

### ■ Line 2 Configured as Output

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

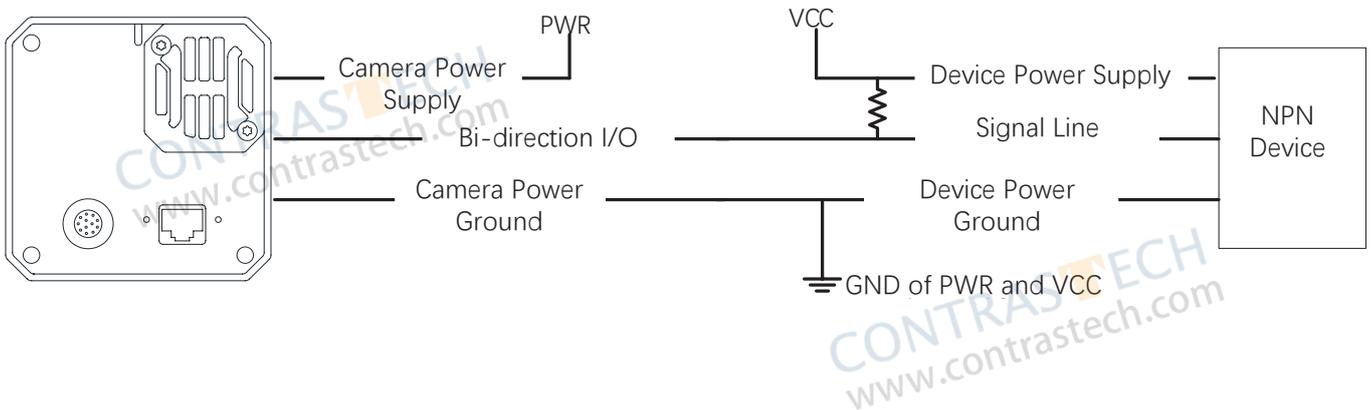
The external devices is PNP Device, that is, Line 2 Connecting to PNP Device as Output:



The external devices is NPN Device, that is, Line 2 Connecting to NPN Device as Output:

\_If the VCC of NPN device is 24 VDC, and it is recommended to use 4.7 K $\Omega$  pull-up resistor.

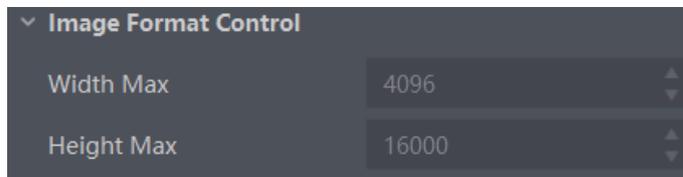
\_If the VCC of NPN device is 12 VDC, and it is recommended to use 1 K $\Omega$  pull-up resistor.



## CHAPTER 8 IMAGE PARAMETER

### Resolution and ROI

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



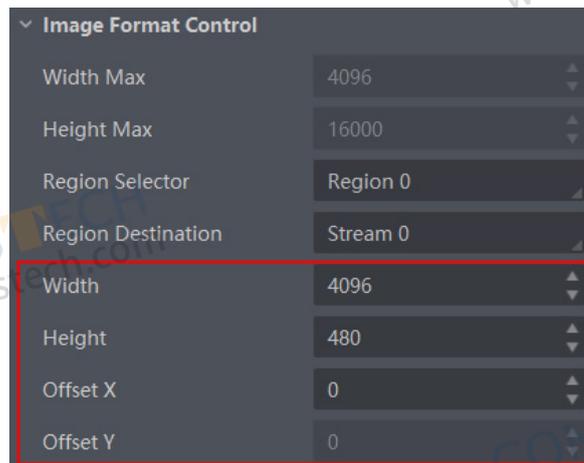
If you are only interested in a certain region of the image, you can set a Region of Interest (ROI) for the camera. Setting Region of Interest can reduce the bandwidth of the image being transmitted. Thus increasing the frame rate to some extent.



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

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.



- 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.

## Image Reverse

There are two types of Image Reverse, Reverse X and Reverse Y. The principle and parameter of Image Reverse are shown below.

Image Reverse	Parameter	Principle
Reverse X	Image Format Control > Reverse X	the image reverses in a horizontal way
Reverse Y	Image Format Control > Reverse Y	the image reverses in a vertical way

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



The image reverse function may differ by camera models.

## Pixel Format

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



- The specific pixel formats may differ by device models.
- With different ADC bit depth, the pixel format and pixel size may differ.

ADC Bit Depth	Pixel Format	Pixel Size (Bits/Pixel)
8	Mono 8, Bayer 8	8
	Mono10 Packed、Mono 12 packed、Bayer 10 Packed、Bayer 12 Packed	12
	Mono 10/12、Bayer 10/12、YUV422Packed、YUV 422 (YUYV) Packed	16
	RGB 8、BGR 8	24
10	Mono 8、Bayer GB 8	8
	Mono 10 Packed、Mono 12 Packed、Bayer GB 10 Packed、Bayer GB 12 Packed	12
	Mono 10/12、Bayer GB 10/12、YUV422Packed、YUV 422 (YUYV) Packed	16
	RGB 8、BGR 8	24
12	Mono 8, Bayer 8	8
	Mono10 Packed、Mono 12 packed、Bayer 10 Packed、Bayer 12 Packed	12
	Mono 10/12、Bayer 10/12、YUV422Packed、YUV 422 (YUYV) Packed	16
	RGB 8、BGR 8	24

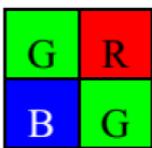
With different ADC bit depths and pixel formats, the device's max. frame rate may differ .

The larger the device's ADC bit depth value, the better the device's image quality, the lower the device's frame rate will be.

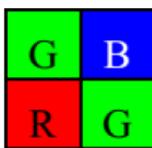


The ADC bit depth function may differ by device models.

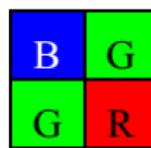
The default output data format of mono device is Mono 8. The default output data format of color device is Bayer 8, and it can be converted into RGB format via pixel interpolation algorithm. Bayer GR, Bayer GB, Bayer BG, Bayer RG and Bayer RBGG patterns are shown below.



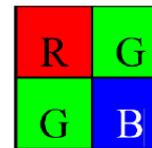
Bayer GR Pixel Pattern



Bayer GB Pixel Pattern



Bayer BG Pixel Pattern



Bayer RG Pixel Pattern

## Pixel Format

In Bayer pixel format, some color devices support Gamma function, LUT, contrast ratio, super palette control, and sharpness function after you enable Super Bayer Enable. Go to Image Format Control → Super Bayer Enable, and enable it according to actual demands.

Super Bayer Enable



For different models of device, the super Bayer function may be different, please refer to the actual one you got.

## Image Compression Mode

Without affecting image quality, this function allows the camera to compress data before transmitting to the external devices, and lower the usage of bandwidth, which belongs to lossless compression

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

You can select Compression as High Bandwidth Mode according to actual demands. Compression only compresses the image data, and does not increase the frame rate.

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

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

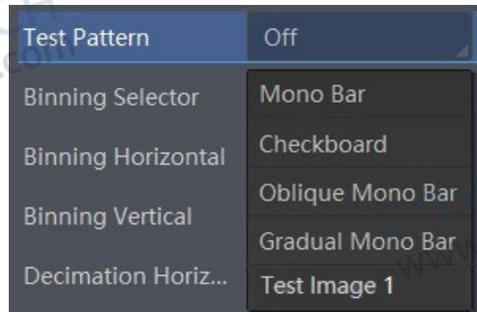


The function of the image compression is related with camera models, firmware and pixel format, and the actual product you purchased should prevail.

## Test Pattern

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



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, Test Image 1.



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



Fig:Mono Bar

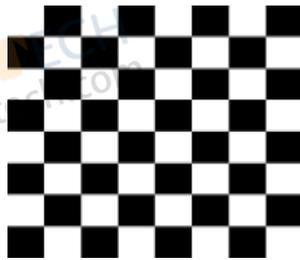


Fig:Checkboard

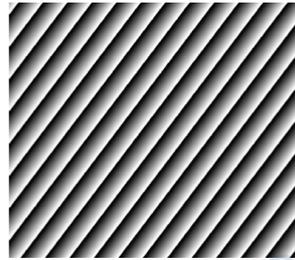


Fig:Oblique Mono Bar



Fig:Gradual Mono Bar

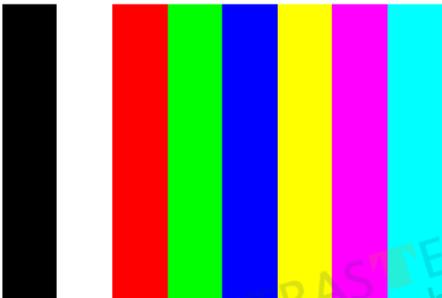


Fig:Vertical Color Bar



Fig:Horizontal Color Bar

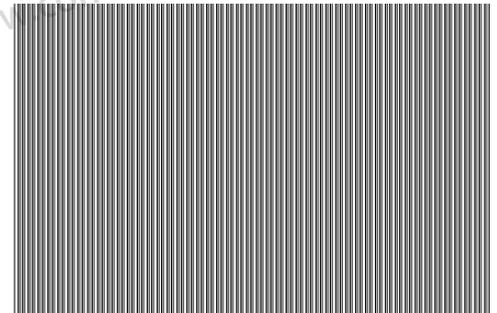


Fig:Test Image 1

## 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.

For a color device, it merges the pixel values of adjacent pixels of the same color horizontally, as shown below.



Binning Horizontal 2



Binning Vertical 2

If the horizontal binning coefficient and the vertical binning coefficient of the color device are both configured to 2, the device merges the 4 adjacent sub-pixels of the same color according to the corresponding position, and outputs the merged pixel value as a sub-pixel, as shown below.



Binning Horizontal 2 and Binning Vertical 2

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

Binning Selector	Region 0
Binning Horizontal	2
Binning Vertical	2



The binning related functions may differ by device models.

The device also supports binning mode function if the binning is  $2 \times 2$  and above. The binning mode defines how pixels are combined if the binning is  $2 \times 2$  and above. Click Binning Mode, and select Sum or Average according to actual demands.

- Sum: The values of the affected pixels are summed. This improves the signal-to-noise ratio, but also increases the device's response to light.
- Average: The values of the affected pixels are averaged. This greatly improves the signal-to-noise ratio without affecting the device's response to light.

Both binning modes (Sum and Average) reduce the amount of image data to be transferred.



Configuring binning mode is supported when the device is acquiring images.

## Decimation

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

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

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

Decimation Horizontal	1
Decimation Vertical	1



The decimation function may differ by camera models.

## Exposure Time

The exposure time mode may differ by camera models.

Exposure can be controlled by both Timed and Trigger Width under Exposure Mode.

- When Timed is selected for the Exposure Mode parameter, the exposure time is controlled by the Exposure Auto and Exposure Time parameters.
- When Trigger Width is selected for the Exposure Mode parameter, the exposure time and the duration of the level signal remain the same, and the Exposure Auto and Exposure Time parameters are invalid.



When On is selected for the Trigger Mode parameter, Line 0 or Line 2 is selected for the Trigger Source parameter, and Level High or Level Low is selected for the Trigger Activation parameter, Trigger Width can be selected for the Exposure Mode parameter.

The device offers 3 types of exposure time modes, including Ultrashort mode, Standard mode, and Bulb mode.

### Standard Mode

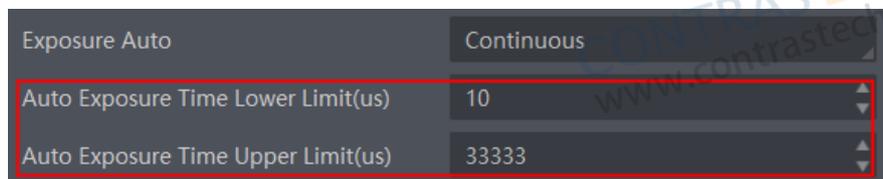
Under the standard exposure time mode, the camera supports 3 types of exposure methods: Off, Once and Continuous. Click Acquisition Control > Exposure Auto, and select Exposure Auto according to actual demands. The exposure method and principle are shown below.

Exposure Method	Parameter	Principle
Off	Acquisition Control > Exposure Auto	The camera exposes 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.



Exposure adjustments have an effect on camera brightness, see the Brightness chapter for details.

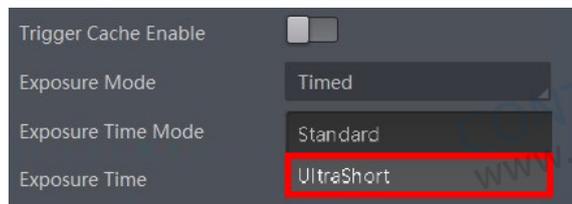
When the Exposure Auto is set as Off, you can enter Exposure Time manually. When the Exposure Auto is set as Once or Continuous, the exposure time should be within the range of Auto Exposure Time Lower Limit and Auto Exposure Time Upper Limit.



### UltraShort Mode

In Ultra Short Exposure mode, the camera exposes for a very small amount of time, which can only be adjusted manually, i.e. according to the value set by the user in the Exposure Time ( $\mu$ s) parameter. Due to the small exposure time, it needs to be used with a light source.

Since the camera defaults to the Standard exposure mode, to set the Exposure Time Mode to UltraShort, the parameter Exposure Time Mode should be set to UltraShort, UltraShort to UltraShort, and Standard to Standard, which is the camera's default mode. As shown below.



- If UltraShort exposure mode is supported, the Exposure Time Mode parameter can be set via the drop-down, UltraShort is UltraShort exposure mode, Standard is Standard mode, and the camera defaults to Standard mode.
- If UltraShort exposure mode is not supported, there is no Exposure Time Mode parameter and the camera defaults to Standard mode.



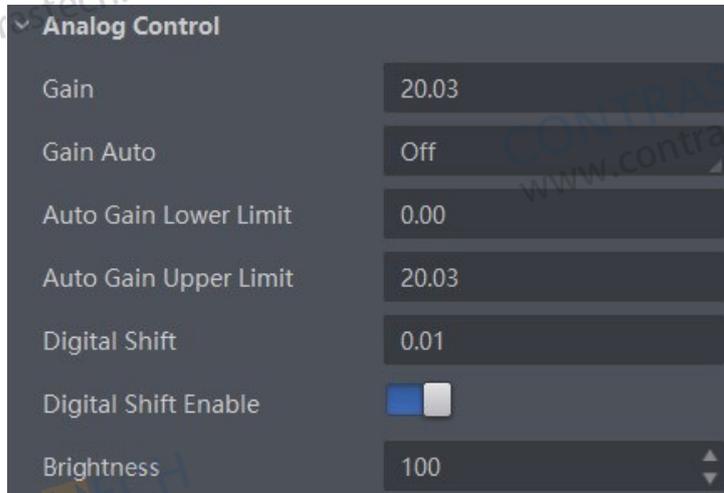
- If the camera does not support ultra-short exposure modes, the Exposure Time Mode parameter is not present in the properties.
- Whether the camera supports ultra-short exposure modes depends on the camera model and firmware program.

## Brightness

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

You should enable Once or Continuous exposure mode, or Once or Continuous gain mode first before setting brightness. Click Analog Control > Brightness, and set Brightness according to actual demand, and its range is from 0 to 255.

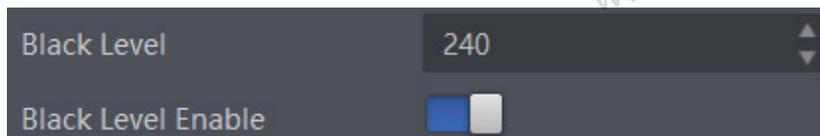
After setting brightness, the camera will automatically adjust exposure time to let image brightness reach target one. Under Once or Continuous exposure mode, or Once or Continuous gain, the higher the brightness value, the brighter the image will be.



## 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.



The black level function may differ by camera models.

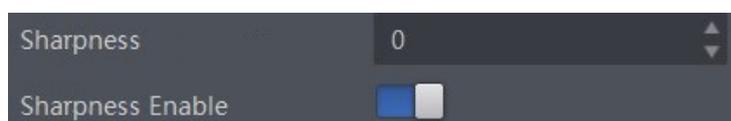
## Sharpness

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



- The sharpness function may differ by device models.
- The device supports sharpness function only in Mono and YUV formats.
- Regarding the color device in Bayer pixel format, you need to enable Super Bayer Enable first before using sharpness function.

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.



## Contrast Ratio

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

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

	<ul style="list-style-type: none"> <li>● The contrast ratio function may differ by device models.</li> <li>● Make sure that the live view is enabled, and Gamma correction and LUT function is disabled before using the contrast ratio function.</li> <li>● Regarding the color device in Bayer pixel format, you need to enable Super Bayer Enable first before using contrast ratio function.</li> <li>● The range of Contrast Ratio is from 0 to 100.</li> </ul>
--	--

## White Balance

White balance is only available for color cameras.

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

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

The camera supports 3 types of white balance modes: Off, Once and Continuous.

White Balance Mode	Parameter	Principle
Off		You need to set the R, G, B value manually, between 1 and 4095. 1024 means ratio is 1.0
Once	Analog Control > Balance White Auto	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.

Balance White Auto parameter defaults to Continuous, and AWB Color Temperature Mode is Narrow. If the color effect of the image is still not good after performing automatic white balance in this color temperature mode, you can set the AWB Color Temperature Mode parameter to Wide and then perform automatic white balance correction.

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.

	<ul style="list-style-type: none"> <li>■ 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.</li> <li>■ If the light source and color temperature in environment change, you need to correct white balance again.</li> </ul>
--	---

## Sequencer Control and HDR

The device supports sequencer or HDR functions, which allow you to configure multiple groups of parameters to acquire images.



- The device cannot support sequencer and HDR functions at the same time.
- The sequencer or HDR function may differ by device models.

### Sequencer

If the device supports sequencer, you can configure multiple groups of parameters like exposure time, gain, etc.



You cannot configure parameters like trigger width, exposure time mode during sequencer.

Steps

1. Go to Sequencer Control, select Off as Sequencer Mode, and On as Sequencer Configuration Mode.
2. Set Sequencer Set Total Number to configure how many groups to join sequencer according to actual demands.



Up to 8 groups of parameters can be configured.

3. Set Sequencer Set Selector to select one group of parameters, and set Sequencer Feature Selector to configure specific parameters.



You should go to the corresponding parameters to set their detailed parameters.

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



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

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

### HDR

If the device supports sequencer, you can configure multiple groups of parameters like exposure time, gain, etc.



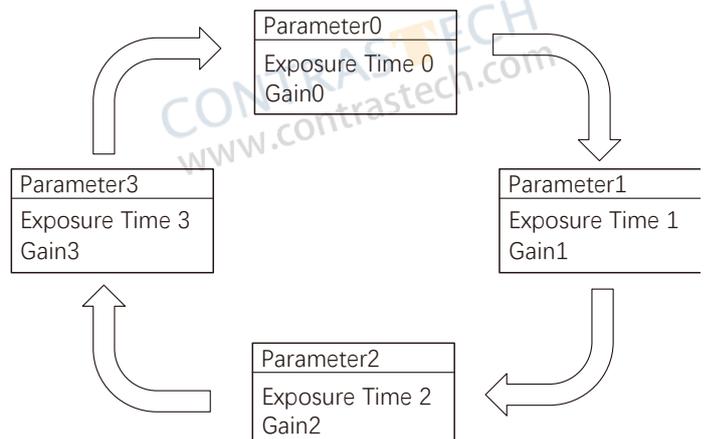
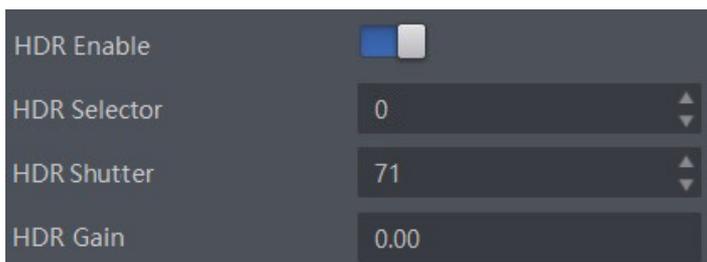
- The HDR function may differ by device models.
- The device supports HDR (High Dynamic Range) function that the device acquires images based on customized settings, and each with its own exposure time and gain.

Steps

1. Go to Acquisition Control → HDR Enable, and enable HDR Enable.
2. Select 0, 1, 2 or 3 as HDR Selector according to actual demands.
3. Set corresponding HDR Shutter and HDR Gain.



Up to 4 HDR groups can be configured.



## Gain



The gain function may differ by device models.

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

### ■ Analog Gain



- The analog gain parameter name may differ by device of different models or firmware. The analog gain parameter name can be Preamp Gain or Gain which have different settings method.
- When the analog gain parameter is Preamp Gain, you can set it manually only.

#### Preamp Gain

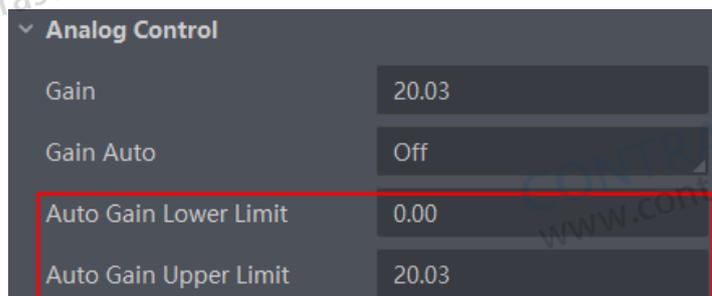
Go to Analog Control → Preamp Gain, and set Preamp Gain according to actual demands.

#### Gain

The device supports 3 types of gain mode, including Off, Once and Continuous. Click Analog Control → Gain Auto, and select Gain Auto according to actual demands.

Gain Mode	Parameter	Principle
Off		The camera adjusts gain according to the value configured by user in Gain.
Once	Analog Control > Gain Auto	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 gain mode is set as Once or Continuous, the gain should be within the range of Auto Gain Lower Limit (dB) and Auto Gain Upper Limit (dB).



- When increasing gain, the image noise will increase too, which will influence image quality. If you want to increase image brightness, it is recommended to increase the device's exposure time first. If the exposure time reaches its upper limit, and at this point, you can increase gain.
- Some models of the device do not support Once or Continuous gain mode. You can enter Gain (dB) directly.

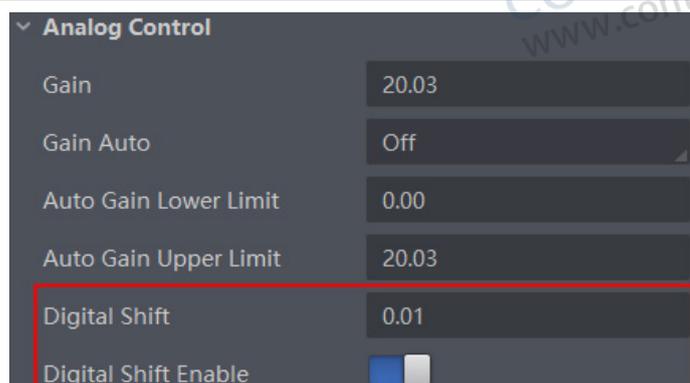
### ■ Digital Gain

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

Click Analog Control, enable Digital Shift Enable, and enter Digital Shift according to actual demands.



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



## Digital Noise Reduction

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

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

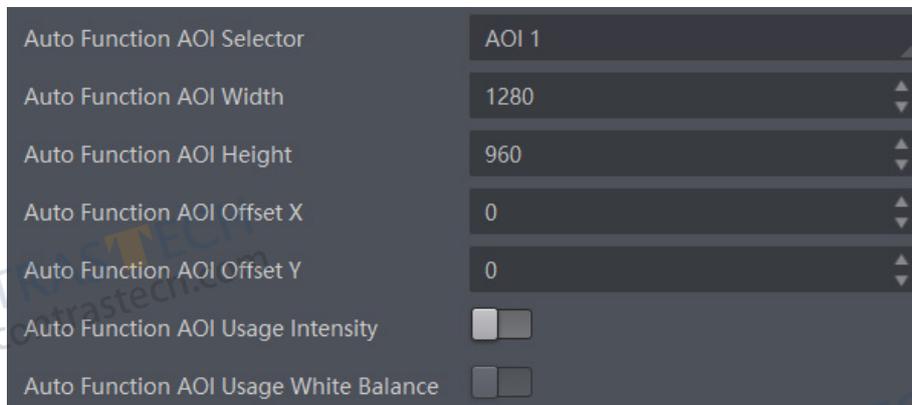
Denoise Strength refers to the intensity of the digital noise reduction, you can increase it to have a better effect. Noise Correct refers to the noise horizontal correction value, and it is used to adjust the noise curve.



This function may differ by camera models.

## AOI

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



The AOI 1 function needs to be used in the camera's Auto Exposure Time Mode, and the AOI 2 function needs to be used in the camera's Auto White Balance Mode.

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.

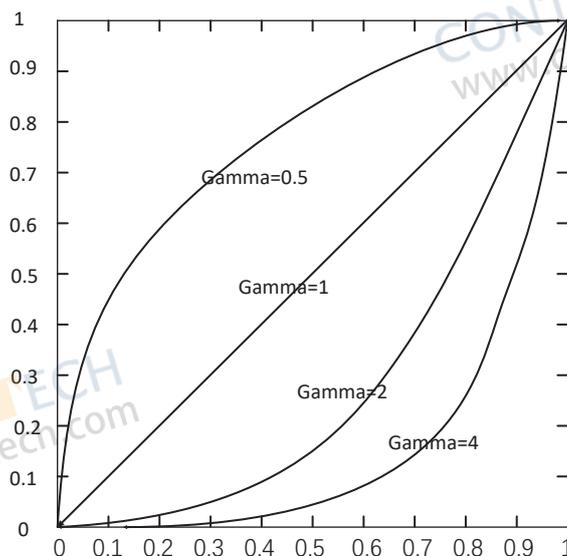
## Gamma Correction

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.

 Gamma correction is not supported under Bayer format for color cameras.

Gamma Curve

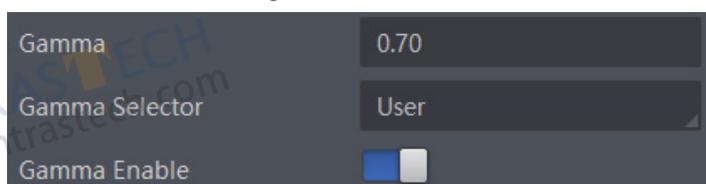


There are 2 types of Gamma correction, including User mode and sRGB mode.

User is a user-defined mode, which can set the value of Gamma; sRGB is a standard protocol mode.

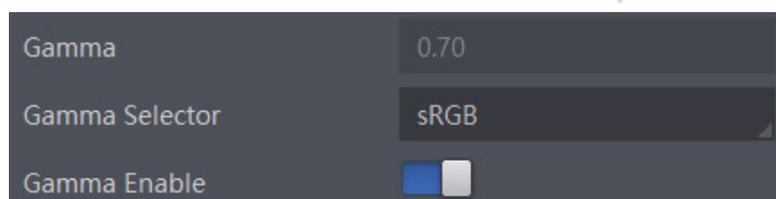
■ You can set User mode as shown below.

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



■ You can set sRGB mode as shown below.

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



## Color Adjustment

Color adjustment function allows you to select six color areas (red, green, blue, cyan, magenta, and yellow) in the image to set customized hue and saturation value.

Steps:

1. Click Analog Control and enable Color Adjustment Enable.
2. Select Color Adjustment Selector, and set corresponding Color Adjustment Hue and Color Adjustment Saturation according to actual demands.



This function may differ by camera models.

## Hue

The hue is the reference hue when the color correction function is enabled in the non-mono format of the color camera, and the overall tendency of the colors in the image can be adjusted.

The hue is set by the Hue parameter under the Color Transformation Control property, and the range is 0 ~ 255.

After setting Hue, the camera will perform color correction according to the Hue value to make the image tone reach the target value. For example, when Hue is set to 128, the red in the image appears as real red; when Hue is 0, the hue is reversed 128 degrees counterclockwise, and red becomes blue; when Hue is 255, the hue rotates clockwise At 128 degrees, red becomes green.

Adjusting the hue shifts the colors of the image.

Steps:

1. Click Color Transformation Control, and enable Color Transformation Enable. Make sure the camera's pixel format is Bayer, YUV, RGB or BGR.
2. Enable Hue Enable, and enter Hue according to actual demands.



- Hue is only available for color cameras.
- Hue setting method may differ by camera models. For some models, go to Analog Control, enable Hue Enable, and enter Hue according to actual demands.

## Saturation

The saturation is the reference saturation when the color correction function is enabled in the non-mono format of the color camera. The brightness of the colors in the image can be adjusted to make the image look fuller, more colorful, and closer to the real thing.

The smaller the set value, the darker the image will look; the larger the set value, the fuller and brighter the image will look.

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

Steps:

1. Click Color Transformation Control, and enable Color Transformation Enable. Make sure the camera's pixel format is Bayer, YUV, RGB or BGR.
2. Enable Saturation Enable, and enter Saturation according to actual demands.

Saturation

128

Saturation Enable



- Saturation is only available for color cameras.
- Saturation setting method may differ by camera models. For some models, go to Analog Control, enable Saturation Enable, and enter Saturation according to actual demands.

## Super Palette Control

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

- Steps
1. Go to Super Palette Control, and enable Super Palette Enable.
  2. Select Super Palette Selector.
  3. Set corresponding Super Palette Hue and Super Palette Saturation according to actual demands.



- The function of super palette control may differ by device models.
- Regarding the color device in Bayer pixel format, you need to enable Super Bayer Enable first before using super palette control function.

## Sensor Mode

The device provides two types of sensor mode, including high full well capacity and high sensitivity.

- High Full Well Mode: It greatly improves the overall brightness of images and is applicable to low-light environment.
- High Sensitivity: It improves the image's sensitivity.



The sensor mode function may differ by device models.

## WDR Mode

The WDR function makes the device have a stable imaging ability in a changing environment between brightness and darkness. Click Acquisition Control > WDR Mode, and select On as WDR Mode to enable the function or Off to disable it. Set WDR Level according to actual demands if the WDR Mode is On.



The range of WDR level is between 0 to 100. The larger the value, and the larger the wide dynamic range. It is recommended to set it as 71.

## Shading Correction



The specific shading correction types that devices support and configuration methods may differ by device models.

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

### ■ LSC Correction

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

Steps:

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



LSC correction should be executed in full resolution. If you are only interested in a certain region of the image, you can set a Region of Interest (ROI) instead.

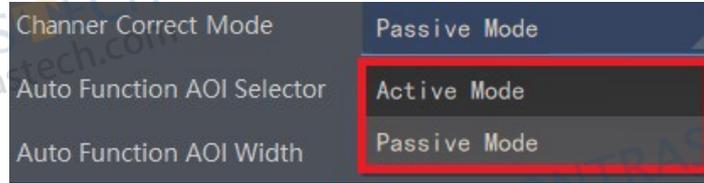
### ■ Other Corrections

Other corrections include FPNC correction and PRNUC correction. Go to Shading Correction, and enable NUC Enable. The FPNC Enable and PRNUC Enable will be automatically enabled or disabled according to the device's condition.

## Channel Correct Mode

The channel correction function allows you to adjust the image's uniformity, and you can set channel correct mode as shown below. Go to Analog Control → Channel Correct Mode, and select Channel Correct Mode according to actual demands.

- Active Mode adjusts channel difference in accordance with actual images in real time.
- Noise Correct adjusts channel difference in accordance with configured parameters in real time.



The channel correct mode function may differ by device models.

## Cooling Fan

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

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.

Fan Open Threshold 30



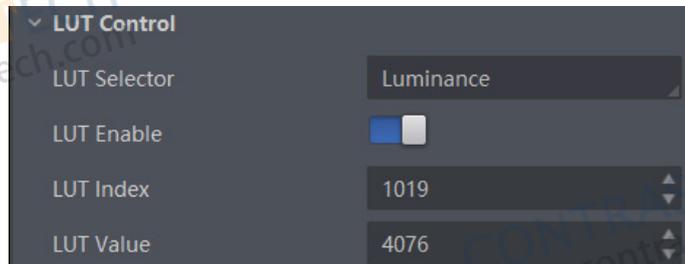
- The cooling fan may differ by device models.
- The temperature unit here is Celsius degree.

## 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.



- You cannot use Gamma correction function and LUT function at the same time.
- The parameter of LUT Save may differ by device models. If the device has no LUT Save, the settings you configured will be saved in the device in real time.
- For different models of device, the LUT Index and LUT Value range may differ, please refer to the actual one you got.
- Regarding the color device in Bayer pixel format, you need to enable Super Bayer Enable first before using LUT function.

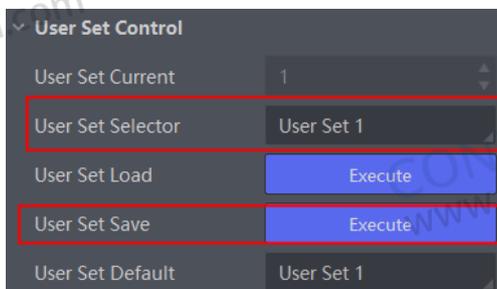
## Save and Load User Set

The camera supports 4 sets of parameters, including 1 default set and 3 user sets.

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

\_Save Parameters:

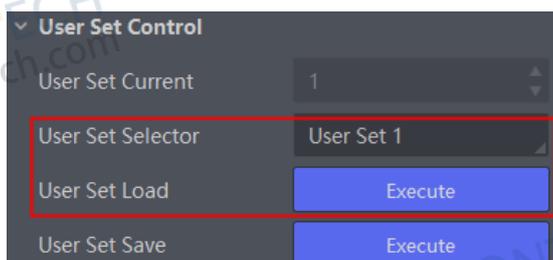
1. Click User Set Control, and select a user set in User Set Selector. Here we take selecting User Set 1 as an example.
2. Click Execute in User Set Save to save parameters.



\_Load Parameters:

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.

 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.

## CHAPTER 9 OTHER FUNCTIONS

### Device Control

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

Parameter	Read/Write	Description
Device Type	Read only	It is the device type.
Device Scan Type	Read only	It is the scan type of the sensor.
Device Vendor Name	Read only	It is the name of device manufacturer.
Device Model Name	Read only	It is the device model.
Device Manufacturer 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.
System of Chip Version	Read only	It is the chip system version of the device.
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. <ul style="list-style-type: none"> <li>● If User ID is empty, the client software displays the device model.</li> <li>● If you set it, the client software displays the User ID you set.</li> </ul>
Device Uptime(s)	Read only	It is the period of time when device is powered up.
Board Device Type	Read only	It is the device type.
Device Connection Selector	Read 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.
Device Reset	Write Only	Click Execute to reset the device.
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## Device Control

Parameter	Read/Write	Description
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.
Relative Humidity	Read only	It displays the device's internal relative humidity.
Device Fan Enable	Read & Write	It enables fan function.
TEC Enable	Read & Write	It enables TEC function.
TEC Temperature	Read & Write	It sets the target of TEC temperature in degrees Celsius (°C).
TEC Voltage	Read only	It is the TEC voltage.
Find Me	Read and write	The function of finding me is executed. Click Execute to find the currently operating device.
Device Max Throughput(Kbps)	Read only	It is max. bandwidth of the data that can be streamed out of the device.
Device PJ Number	Read only	It is the device's project number.
HB Abnormal Monitor	Read only	It monitors image stream condition.
HB Version	Read only	It is the version of the image compression mode.



The specific device control parameters may differ by camera models.

## Transport Layer Control

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

Parameter	Read/Write	Description
Paylode Size	Read only	It is the camera's load size.
GenCP Version Major	Read only	It is the major version in GenCP version.
GenCP Version Minor	Read only	It is the minor version in GenCP 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 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.
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 Stream Channel Selector	Read only	It selects the stream channel to control.
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## Transport Layer Control

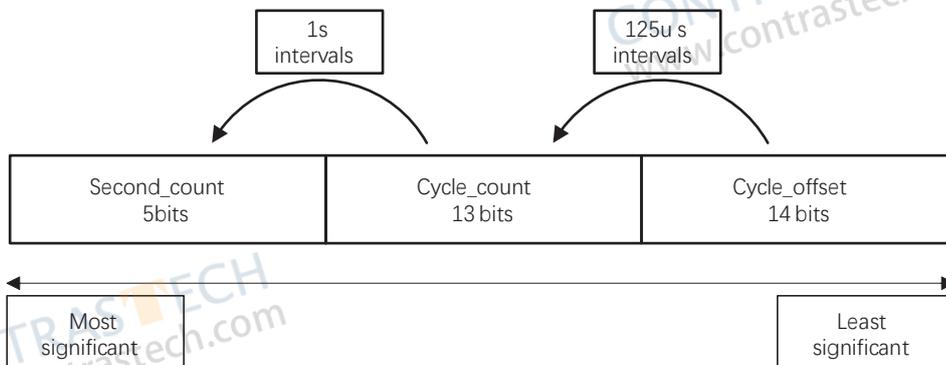
Parameter	Read/Write	Description
GEV SCP Interface Index	Read only	It is the Index of network interface to be used.
GEV SCP Host Port	Read and write	It is the host port of the channel
GEV SCP Direction	Read only	It transmits or receives the channel.
GEV SCPS Fire Test Packet	Read only	It sends a test packet.
GEV SCPS Do Not Fragment	Read and write	The state of this feature is copied into the "do not fragment" bit of the IP header of each stream packet.
GEV SCPS Big Endian	Read only	It is the Endianness of multi-byte pixel data for this stream.
GEV SCPS Packet Size(B)	Read and write	It specifies the stream packet size (in bytes) to send on this channel.
GEV SCPD	Read and write	It indicates the delay (in timestamp counter units) to insert between each packet for this stream channel.
GEV SCDA	Read and write	It indicates the destination IP address for this stream channel.
GEV SCSP	Read only	It indicates the source UDP port address for this stream channel.
GEV MCP Host Port	Read and write	It controls the port to which the device must send messages. Setting this value to 0 closes the message channel.
GEV MCDA	Read and write	It controls the destination IP address for the message channel.
GEV MCTT (ms)	Read and write	It provides the transmission timeout value in milliseconds.
GEV MCRC	Read and write	It controls the number of retransmissions allowed when a message channel message times out.
GEV MCSP	Read only	It indicates the source port for the message channel.
Gev IEEE 1588	Read and write	It enables the IEEE 1588 Precision Time Protocol to control the timestamp register.
Gev IEEE 1588 Status	Read only	The status of the IEEE 1588 Precision Time Protocol.
Gev GVSP Extended ID Mode	Read and write	It enables the extended ID mode.

## Embedded Information

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. Each category of embedded information has its unique data format.

Information Type	Byte	Data Format Description
Timestamp	4	4 bytes are used to transfer the timestamp information.
Gain	4	4 bytes are used to transfer the gain information. Each low 8 bits of the 4 valid data are combined to transfer the gain information. Value Range: 0 to 1023. Note: High bits will be complemented with 0 automatically.
Exposure	4	4 bytes are combined to show the exposure time, and the unit is $\mu$ s.
Brightness Info	4	4 bytes are used to transfer the brightness information. Value Range: 0 to 4095. Note: High bits will be complemented with 0 automatically.
White Balance	8	R/G/B occupies 2 bytes each. Value Range: 0 to 4095.
Frame Counter	4	Value Range: 0 to $2^{32}-1$
Ext Trigger Count	4	Value Range: 0 to $2^{32}-1$
Line Input Output	4	4 bytes are used to transfer the line input and output information.
Width	4	Value Range: 0 to $2^{32}-1$
Height	4	Value Range: 0 to $2^{32}-1$
Offset X	4	Value Range: 0 to $2^{32}-1$
Offset Y	4	Value Range: 0 to $2^{32}-1$
Pixel Format	4	Value Range: 0 to $2^{32}-1$
ROI Position	8	The column coordinate occupies 2 bytes, and the row coordinate occupies 2 bytes. The column coordinate information comes first. The length and width occupy 2 bytes respectively, and the length information comes first.



- Color cameras have the white balance only.
- Embedded information types, including width, height, offset X, offset Y and pixel format, are for cameras that support the chunk data function only.

## Embedded Information in Image

There are two ways to embed information into the image, including watermark function and Chunk function.

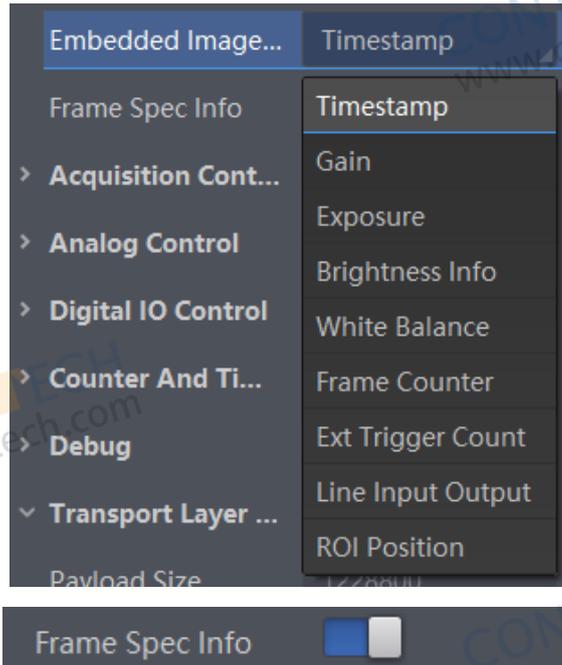


- Watermark function is not available if the device enables image compression mode.
- The Chunk function may differ by device models.
- The device uses Chunk function in priority if it supports both watermark and Chunk function.

### Watermark Settings

#### Steps

1. Click Image Format Control > Embedded Image Info Selector, and select Embedded Image Info Selector according to actual demands.
2. Enable Frame Spec Info to add watermark into images.



3. (Optional) Repeat steps above to add multiple watermarks.
4. Click  on the control toolbar of the client software to view specific watermark information.



The watermark is embedded into the starting position of the first line of image data. If the ROI is small and the first line of image data is insufficient to embed information, the information will be embedded into the second line of image data.

### Chunk Settings

#### Steps

1. Click Chunk Data Control > Chunk Mode Active, and Chunk Mode Active.
2. Select Chunk Selector according to actual demands.
3. Enable Chunk Enable to embed information into the image.
4. (Optional) Repeat steps above to add multiple Chunk information types.
5. Click  on the control toolbar of the client software to view specific information.

## Action Command

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

**i** 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.

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

4. Enable Scheduled.
5. Click connect icon 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.

**i**

- 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.

**i** 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.

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

9. Click Start Sending.

## File Access Control

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. Click  to open the File Access interface.



2. Select a User Set (User Set 1, User Set 2, or User Set 3) or DPC from the drop-down list.
3. Click Import or Export to import or export the camera's feature configuration or DPC data according to actual demands.

**i**

- The file access control function may differ by camera models.
- Importing and exporting the camera's feature configuration or DPC data among the same model cameras are supported.
- DPC represents the bad pixel data corrected by the camera.

## Multicast

The multicast function allows you to access the same camera via multiple PCs, The same camera can be connected to only one iDatum 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, and it has 3 modes as follows.

Modes	Description
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.

When the multicast function is enabled, the camera icon on the iDatum 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 iDatum 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.

### ■ Enable Multicast (Available)

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

1. Right click the available camera, and click Multicast Settings.
2. Select Role
  - \_The camera in the available state can start the multicast function in two roles: control and receiving mode and control mode.
3. Enter the IP Address
  - \_If the IP address is invalid, the system will prompt "Please check if the IP address is valid".
  - \_The multicast IP address should be a class D IP address.
4. Enter the Port
  - \_The valid value of the multicast port number is 0~65535, and the port number used should be an unused port number.
5. Click OK.

### ■ Enable Multicast (Connected )

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

1. Right click the connected camera, and click Multicast Settings.
2. Enable the multicast function, and edit the IP Address and Port.
3. Click OK.

## Event Control

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.
3. Right click the connected camera, and click Event Monitor.
4. View the specific event information in the event monitor interface.

	The event control function may differ by camera models.
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## Transfer Control

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

	The specific parameters of transfer control may differ by device models.
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### ■ User Controlled Transfer Control

The parameters of user controlled transfer control are shown below.

Parameter	Read/Write	Description
Transfer Control Selector	Read & Write	It selects the transfer mode. <ul style="list-style-type: none"> <li>● Basic: In this mode, the device sends images to the client software directly after acquiring images.</li> <li>● User Controlled: In this mode, the device saves images in its internal cache first, and then sends to the client software after acquiring images.</li> </ul>
Transfer Passive Enable	Read & Write	The transfer passive node will be displayed if it is enabled. Note: <ul style="list-style-type: none"> <li>● You should select User Controlled as Transfer Control Selector first.</li> <li>● Make sure that the device's Trigger Mode is On.</li> </ul>
Transfer Operation Mode	Read & Write	It is the transfer operation mode: <ul style="list-style-type: none"> <li>● Single Block: Click Execute in Transfer Strat to let the device transfer one image each time.</li> <li>● Multi Block: Click Execute in Transfer Strat to let the device transfer multiple images in cache.</li> </ul>
Transfer Queue Max Block Count	Read Only	It displays the max. image quantity that the device's memory can save before the compression.
Transfer Queue Current Block Count	Read Only	It displays current image quantity saved by the memory.
Transfer Start	Read and write	Click Execute to let the device transfer images.

### ■ Basic Transfer Control

The parameters of basic transfer control are shown below.

Parameter	Read/Write	Description
Transfer Selector	Read & Write	It selects the transfer source.
Transfer Control Selector	Read & Write	It selects the transfer mode.
Transfer Queue Max Block Count	Read Only	It displays the max. image quantity that the device's memory can save before the compression.
Transfer Queue Current Block Count	Read Only	It displays current image quantity saved by the memory.
Transfer Queue Over Flow Count	Read & Write	It is the image quantity discarded by FPGA.
Transfer Queue Mode	Read and write	It is the operating mode of memory queue.

## 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	
	Relative Humidity	
	Device Fan Enable	
	TEC Enable	
	TEC Temperature	
	TEC Voltage	
	Find Me	
Device Max Throughput(Kbps)		
Device PJ Number		
HB Abnormal Monitor		
HB Version		

## Camera Parameter Index

Attribute	Parameter	Section
Image Format Control	Width Max	Section Resolution and ROI
	Height Max	
	Region Selector	
	Region Destination	
	Width	
	Height	
	Offset X	
	Offset Y	
	Reverse X	Section Image Reverse
	Reverse Y	
	ADC Bit Depth	Section Pixel Format
	Pixel Format	
	Super Bayer Enable	
	Pixel Size	Section Image Compression Mode
	Image Compression Mode	
	High Bandwidth Mode	Section Test Pattern
	Test Pattern Generator Selector	
	Test Pattern	Section Binning
	Binning Mode	
	Binning Selector	
	Binning Horizontal	
	Binning Vertical	Section Decimation
	Decimation Horizontal	
	Decimation Vertical	Section Embedded Information in Image
	Embedded Image Info Selector	
	Frame Spec Info	

## Camera Parameter Index

Attribute	Parameter	Section
Acquisition Control	Acquisition Mode	Section Frame Rate
	Acquisition Start	
	Acquisition Stop	
	Acquisition Burst Frame Count	
	Acquisition Frame Rate(Fps)	
	Acquisition Frame Rate Control Enable	
	Resulting Frame Rate(Fps)	
	Reference Frame Rate	
	Overlap Mode	Section Non-Overlap Exposure and Overlap Exposure
	Trigger Selector	Section External Trigger Mode
	Trigger Mode	
	Trigger Software	
	Trigger Source	
	Trigger Activation	
	Trigger Delay( $\mu$ s)	
	Trigger Cache Enable	
	Sensor Shutter Mode	Section Rolling Shutter
	Exposure Time Mode	Section Exposure Time Mode
	Exposure Mode	
	Exposure Time( $\mu$ s)	
	Exposure Auto	
	Auto Exposure Time Lower Limit( $\mu$ s)	
	Auto Exposure Time Upper Limit( $\mu$ s)	
	WDR Mode	Section Set WDR Mode
	WDR Level	
	HDR Enable	Section HDR
	HDR Selector	
	HDR Shutter( $\mu$ s)	
	HDR Gain	
	Full Frame Transmission	Section Full Frame Transmission

## Camera Parameter Index

Attribute	Parameter	Section
Analog Control	Preamp Gain	Section Gain
	Gain(dB)	
	Gain Auto	
	Auto Gain Lower Limit(dB)	
	Auto Gain Upper Limit(dB)	
	Digital Shift	
	Digital Shift Enable	Section Sensor Mode
	Sensor Mode	Section Brightness
	Brightness	Section Black Level
	Black Level	
	Black Level Enable	Section White Balance
	Balance White Auto	
	AWB Color Temperature Mode	
	Balance Ratio Selector	
	Balance Ratio	Section Gamma Correction
	Gamma	
	Gamma Selector	
	Gamma Enable	Section Sharpness
	Sharpness	
	Sharpness Enable	Section Digital Noise Reduction
	Digital Noise Reduction Mode	
	Denoise Strength	
	Noise Correct	Section Channel Correct Mode
	Channel Correct Mode	Section Cooling Fan
	Fan Open Threshold	Section Contrast Ratio
	Contrast Ratio	
	Contrast Ratio Enable	Section AOI
	Auto Function AOI Selector	
	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		

## Camera Parameter Index

Attribute	Parameter	Section	
Color Transformation Control	CCM Enable	Section Color Transformation Control	
	Color Transformation Selector		
	Color Transformation Enable		
	Color Transformation Value Selector		
	Color Transformation Value		
	Color Transformation Control	Hue	Section Hue
		Hue Enable	Section Saturation
		Saturation	
		Saturation Enable	
Super Palette Control	Super Palette Enable	Section Super Palette Control	
	Super Palette Selector		
	Super Palette Hue		
	Super Palette Saturation		
LUT Control	LUT Selector	Section LUT	
	LUT Enable		
	LUT Index		
	LUT Value		
	LUT Save		
Shading Correction	Shading Selector	Section Shading Correction	
	Activate Shading		
	NUC Enable		
	FPNC Enable		
	PRNUC Enable		
	LSC Enable		
Digital IO Control	Line Selector	Section I/O Output	
	Line Mode		
	Line Inverter		
	Line Status		
	Line Status All		
	Line Debouncer Time( $\mu$ s)		
	Line Source		
	Strobe Enable		
	Strobe Line Duration( $\mu$ s)		
	Strobe Line Delay( $\mu$ s)		
	Strobe Line Pre Delay( $\mu$ s)		

## Camera Parameter Index

Attribute	Parameter	Section
Action Control	Action Unconditional Mode	Section Action Command
	Action Device Key	
	Action Queue Size	
	Action Selector	
	Action Group Mask	
	Action Group Key	
Counter And Timer Control	Counter Selector	Section 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 Excute	
	File Open Mode	
	File Operation Status	
	File Operation Result	
	File Size(B)	
Sequencer Control	Sequencer Mode	Section Sequencer
	Sequencer Configuration Mode	
	Sequencer Feature Selector	
	Sequencer Feature Enable	
	Sequencer Restart	
	Sequencer Set Total Number	
	Sequencer Set Selector	
	Sequencer Set Active	
	Sequencer Set Load	
	Sequencer Set Save	
Event Control	Event Selector	Section Event Control
	Event Notification	
Chunk Data Control	Chunk Mode Active	Section Chunk Settings
	Chunk Selector	
	Chunk Enable	

## Camera Parameter Index

Attribute	Parameter	Section
Transport Layer Control	Payload Size(B)	Section Transport Layer Control
	GEV Version Major	
	GEV Version Minor	
	GEV Device Mode Is Big Endian	
	GEV Device Mode Character Set	
	GEV Interface Selector	
	GEV MAC Address	
	GEV Supported Option Selector	
	GEV Supported Option	
	GEV Current IP Configuration LLA	
	GEV Current IP Configuration DHCP	
	GEV Current IP Configuration Persistent IP	
	GEV PAUSE Frame Reception	
	GEV Current IP Address	
	GEV Current Subnet Mask	
	GEV Current Default Gateway	
	GEV First URL	
	GEV Second URL	
	GEV Number Of Interfaces	
	GEV Persistent IP Address	
	GEV Persistent Subnet Mask	
	GEV Persistent Default Gateway	
	GEV Link Speed	
	GEV Message Channel Count	
	GEV Stream Channel Count	
	GEV Heartbeat Timeout(ms)	
	GEV Heartbeat Disable	
	GEV Timestamp Tick Frequency(Hz)	
	Timestamp Control Latch	
	Timestamp Control Reset	
	Timestamp Control Latch Reset	
	Timestamp Value	
	GEV CCP	
	GEV MCP Host Port	
GEV MCDA		
GEV MCTT(ms)		
GEV MCRC		
GEV MCSP		
GEV Stream Channel Selector		
GEV SCP Interface Index		

## Camera Parameter Index

Attribute	Parameter	Section
Transport Layer Control	GEV SCP Host Port	Section Transport Layer Control
	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 IEEE 1588 Slave Only	
	GEV IEEE 1588 Status	
Gev GVSP Extended ID Mode		
Transfer Control	Transfer Control Selector	Section Transfer Control
	Transfer Passive Enable	
	Transfer Operation Mode	
	Transfer Start	
	Transfer Selector	
	Transfer Control Selector	
	Transfer Queue Max Block Count	
	Transfer Queue Current Block Count	
	Transfer Queue Over Flow Count	
Transfer Queue Mode		
User Set Control	User Set Current	Section Save and Load User Set
	User Set Selector	
	User Set Load	
	User Set Save Status	
	User Set Save	
	User Set Default	



The specific parameter s may differ by camera models.

# Trouble Shooting

**Trouble:**

■ **No camera found when running the iDatum**

- Possible Reason1: Camera is not started up normally
- Solution1: Check camera power wiring (observe the indicator)
- Possible Reason2: Network cable connection error
- Solution2: Check network connection

■ **Camera connection error**

- Possible Reason1: Camera and client software are not in the same network segment
- Solution1: Edit its IP address
- Possible Reason2: The camera has been connected by another program
- Solution2: Reconnect after disconnecting the camera from other programs

■ **Live view is black**

- Possible Reason1: Aperture is closed
- Solution1: Open the aperture
- Possible Reason2: Camera exception occurs
- Solution2: Reboot the camera.

■ **Live view is normal, but the camera cannot be triggered.**

- Possible Reason1: Trigger mode is not enabled
- Solution1: Check whether the camera trigger mode and related trigger signal input are normal in the current environment.
- Possible Reason2: Incorrect wiring
- Solution2: Check whether the wiring is correct under corresponding triggering mode.

■ **The gigabit Ethernet becomes the fast Ethernet.**

- Possible Reason: The network cable is damaged.
- Solution : Check whether the network cable is damaged.

■ **Camera is disconnected during operation?**

- Possible Reason1: Use the adapter to connect the device.
- Solution1: The device manufactured by our company has high requirements for data transmission, and the quality of adapters on the market is not very good, which cannot guarantee the effective transmission of data. It is not recommended to use adapters to connect the device.
- Possible Reason2: Many devices are connected to a switch, resulting in insufficient bandwidth.
- Solution2: The device needs a GigE data transmission environment, and each device needs to be guaranteed a GigE transmission environment. If multiple devices are used together, it is recommended to use PCIE independent GigE NIC or a vision controller with multiple connectors.
- Possible Reason3: Insufficient power supply causes the device to disconnect.
- Solution3: It is recommended to use DC power supply. Refer to the device's datasheet for the power supply range.

## CHAPTER 10 TECHNICAL SUPPORT

If you need advice about your camera or if you need assistance troubleshooting a problem with your camera, it's highly recommended to describe your issue in details and contact us via E-mail at [support@contrasttech.com](mailto:support@contrasttech.com)

It would be helpful if you can fill-in the following table and send to us before you contact our technical support team.

Camera Model:		Camera's SN:	
Describe the issue in as much detail as possible:			
If known, what's the cause of the issue?			
How often did/does the issue occur?			
How severe is the issue?			
Parameter set	Please connect the camera directly to PC and use iDatum to make note of the parameter when the issue occurred.		

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