微图视觉
Vision Datum

LEO Series
USB3.0 Area Scan Camera
User Manual

V2.2.12, Dec. 2022

Preface

Purpose

This Manual is a basic description of LEO series USB3.0 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.

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.visiondatum.com/en/service/005001.html

Technical Support

For technical support, e-mail: support@visiondatum.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

- USB3.0 interface supports theoretical 5Gbps bandwidth. USB interface also for power supply;
- 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 USB3 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:

Different models of cameras have different appearances, which are distinguished according to the type of lens interface.
The Industrial camera contains 6pin port provides I/O interface function, USB3.0 interface provides power supply and has camera working status indicator light.
Use M2 / M3 specification locking screw holes to fix the camera.

Camera Housing and Base Mounting Hole Size(mm):

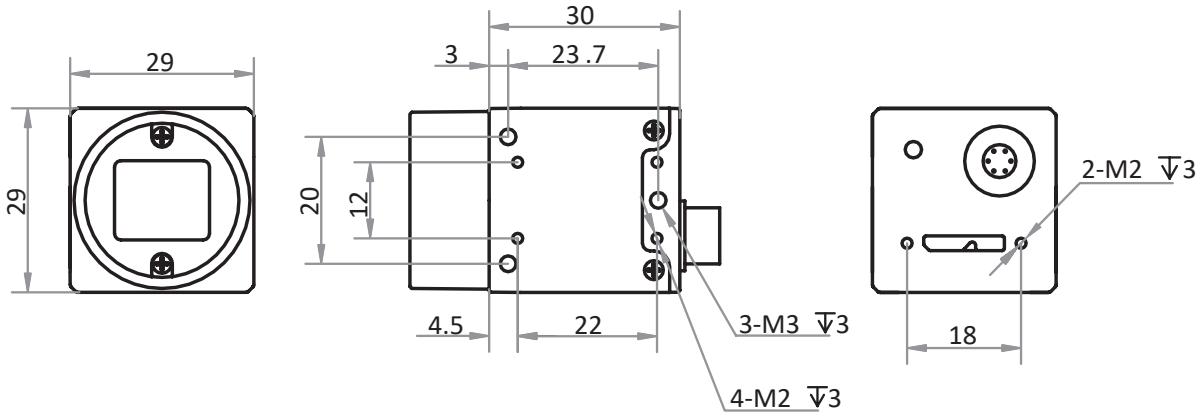

Fig. 1-1: 29 mm×29 mm×30 mm Mechanical Dimensions (in mm) of the USB3.0 camera with the USB interface on the bottom.

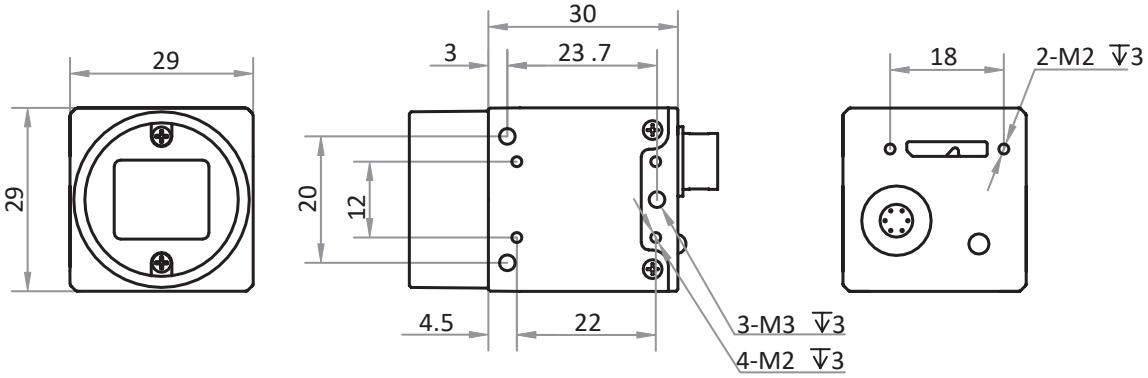

Fig. 1-2: 29 mm×29 mm×30 mm Mechanical Dimensions (in mm) of the USB3.0 camera with the USB interface at the top.

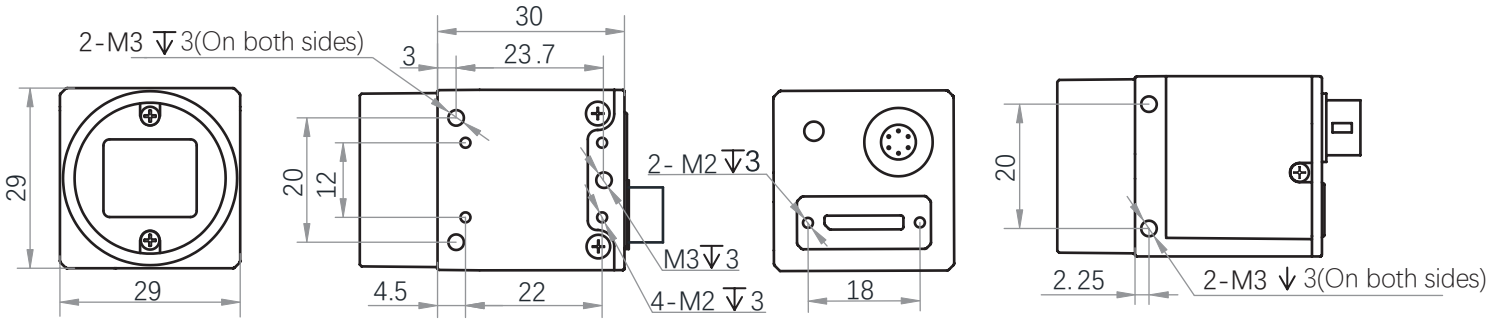

Fig. 1-3: 29 mm×29 mm×30 mm Mechanical Dimensions (in mm) of the USB3.0 camera with 4 sides for flexible mounting.

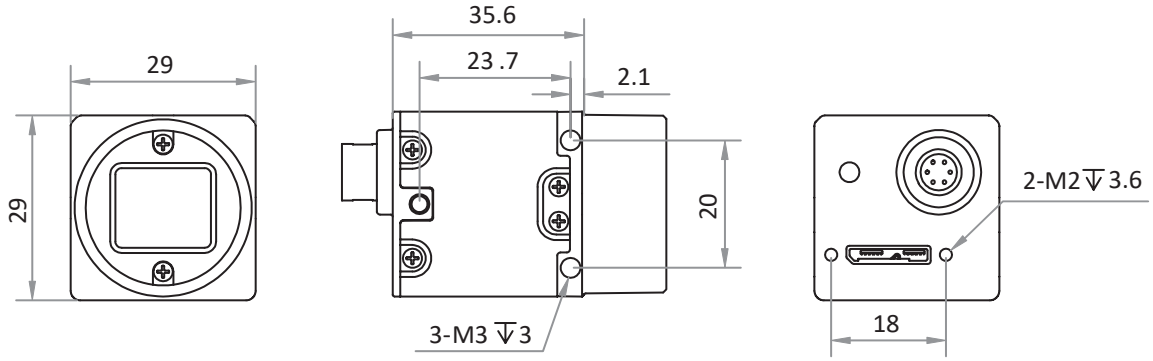

Fig. 1-4: 29 mm×29 mm×30 mm Mechanical Dimensions (in mm) of the USB3.0 camera with the USB interface at the bottom.

Mechanical Dimensions

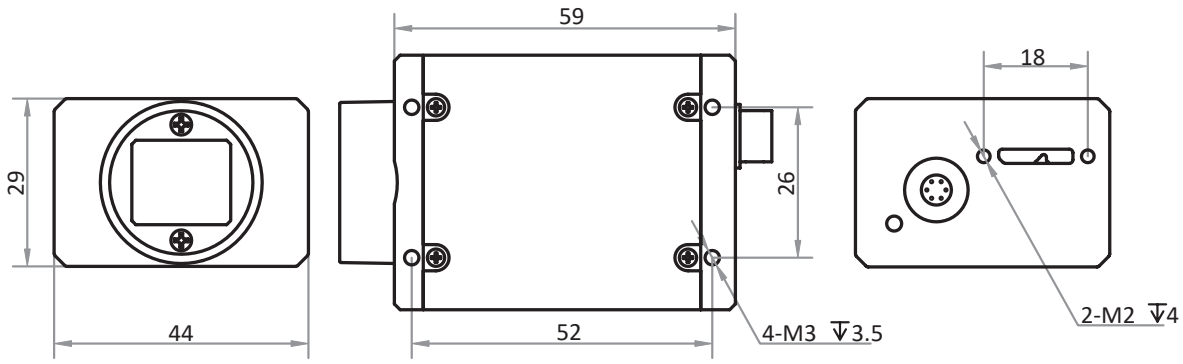

Fig. 1-5: 29 mm×44 mm×59 mm Mechanical Dimensions (in mm) of the USB3.0 camera.

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CHAPTER 2

POWER AND I/O IENTERFACE DEFINITION

I/O Connection Definition and Assignments

The camera has a 6-pin power and I/O interface that provides power, and input/output signal.. Read the followings to get pin definitions.

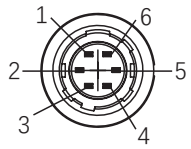


Table 2-1
6-pin I/O Interface Description

Pin	Signal	I/O Signal Source	Description
1	DC_PWR	-	Camera power supply
2	OPTO_IN	Line 0+	Opto-isolated input
3	GPIO	Line 2	Can be configured as input or output
4	OPTO_OUT	Line 1+	Opto-isolated output
5	OPTO_GND	Line 0/1-	Opto-isolated signal ground
6	GND	Line 2-	Camera power supply ground

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.visiondatum.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.

Check Driver

After connecting the camera, the PC will automatically install VisionDatum USB3 Vision Cameras driver. You can view that camera driver has been successfully installed in the Windows device manager by right-clicking on camera driver.

After the installation is successful, it is recommended to open the iDatum client to connect to the camera, check the effect of camera connection and image preview, confirm that the environment is normal, and then start the secondary development based on the SDK.

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 USB3.0 Area Scan Camera
- It refers to the lens that matches with lens mount of the camera.
- The computer must be equipped with appropriate operating system
- Micro USB3.0 (type B) cable

Steps:

- Mount lens that matches with lens mount of the camera
- Connect the camera to the computer and power
- Use Micro USB3.0 (type B) cable to connect the camera to the computer.
- Power Supply

- Direct power supply: Use the 6-pin power and I/O cable to connect the camera to a power adapter.
- USB power supply: Use the USB3.0 cable to connect the camera to the PC or other devices via USB3.0 interface.

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.

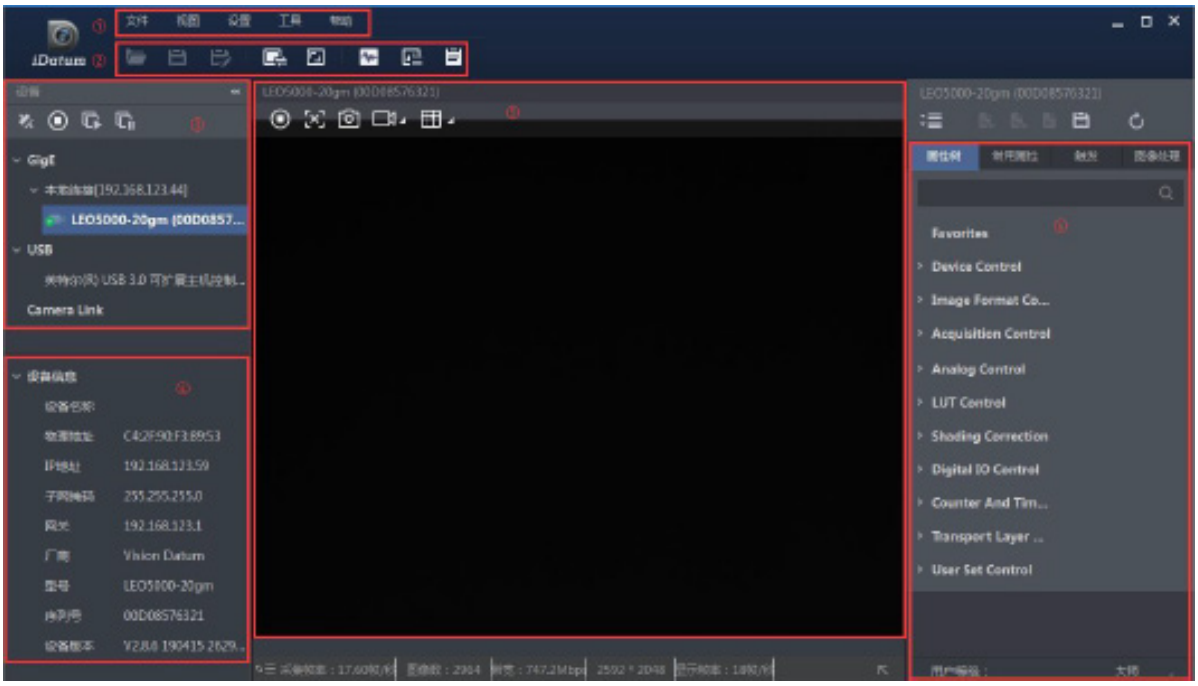
4、Click ">" in the camera's feature panel to unfold the specific camera parameters, and set them according to actual demands.Please see the table below for the introduction of each attribute classification.

Attribute	Description
Device Control	You can view the device information, edit its name, reset the device, etc.
Image Format Control	You can view and set the device's resolution, image reverse function, pixel format, region of interest, test pattern, etc.
Acquisition Control	You can view and set the device's acquisition mode, frame rate, trigger mode, exposure time, etc.
Analog Control	You can view and set the device's gain, black level, Gamma correction, sharpness, etc.
LUT Control	You can view the Look-Up Table (LUT), and set its index and value.
Shading Correction	You can set shading correction to correct shade.
Digital IO Control	You can set the different input and output signals.
Counter And Timer Control	You can view and set the counter related parameters.
Transport Layer Control	You can view and set the parameters of the device's transport layer.
Stream Control	You can view the size of payload, data head, and data end.
User Set Control	You can save or load the device's parameters.

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

Main interface

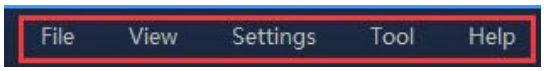
For specific main window of the client software, please refer to the actual one you got.



Software Operation

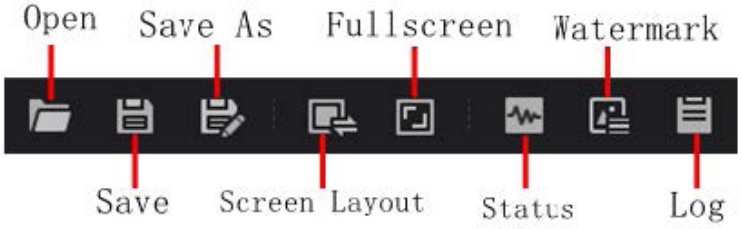
Menu Bar

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

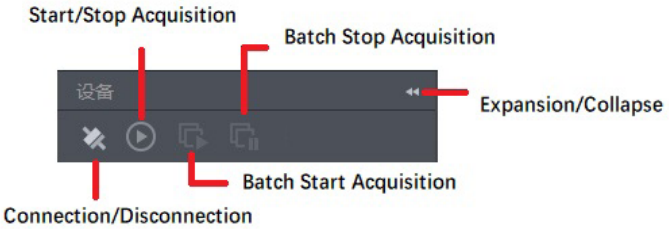


Control Toolbar

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.

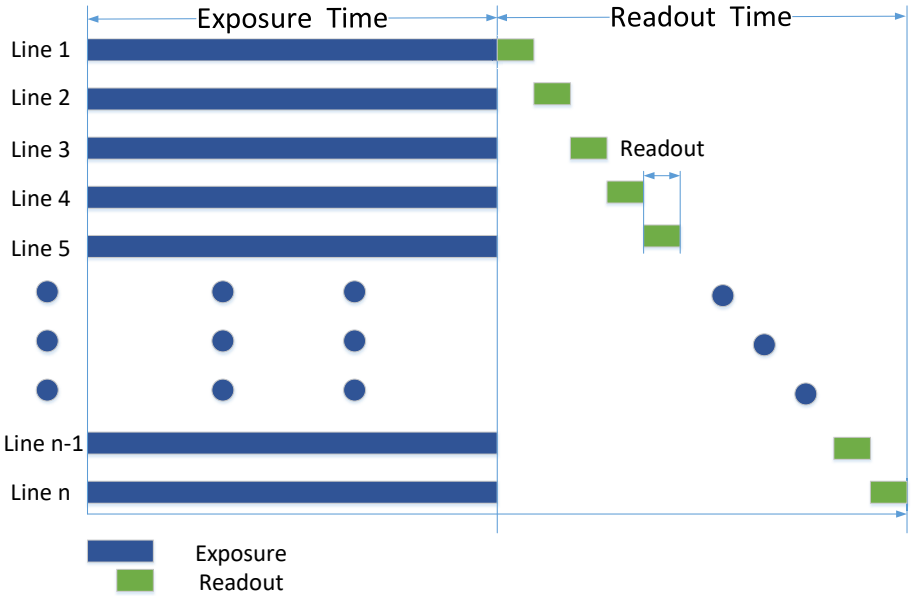
■ Expansion/Collapse: This function can be used to expand or collapse the Device List and Device Information which list on the left side of iDatum, and the default state is expansion. In the"Collapse"state, the iDatum left side only display the searched cameras.

CHAPTER 4 CAMERA FEATURES

Global Shutter and Rolling Shutter

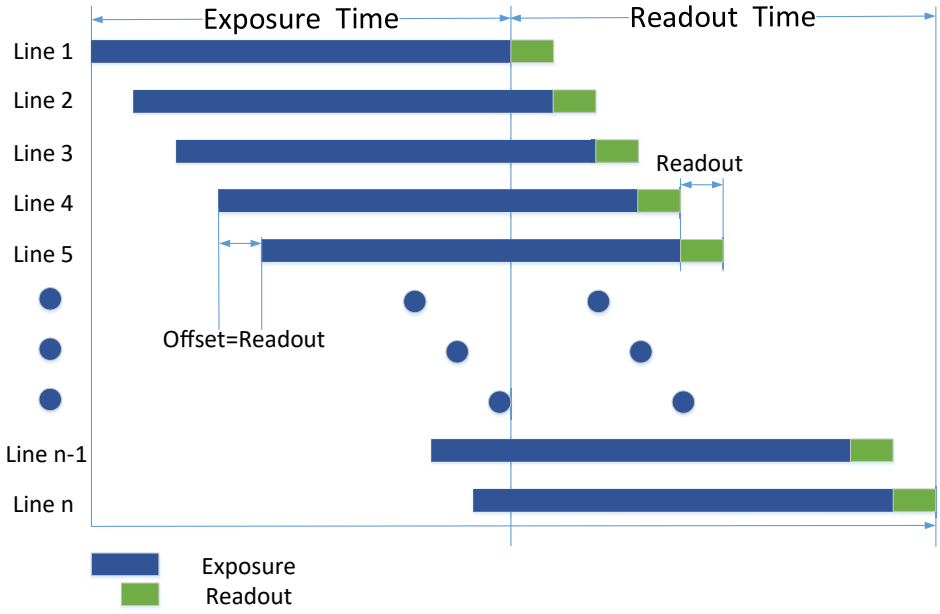
Global Shutter

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

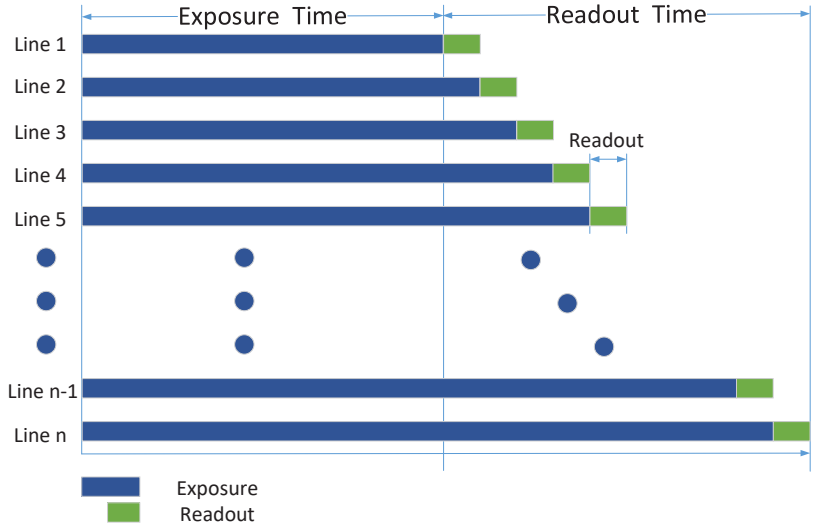
For cameras that support rolling shutter: as soon as the exposure ends, and the data readout starts simultaneously. After the whole action, the rest of rows start to expose and read out one by one. All pixels expose at the same time, then readout at different time, as shown below.



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 .

i	● 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.

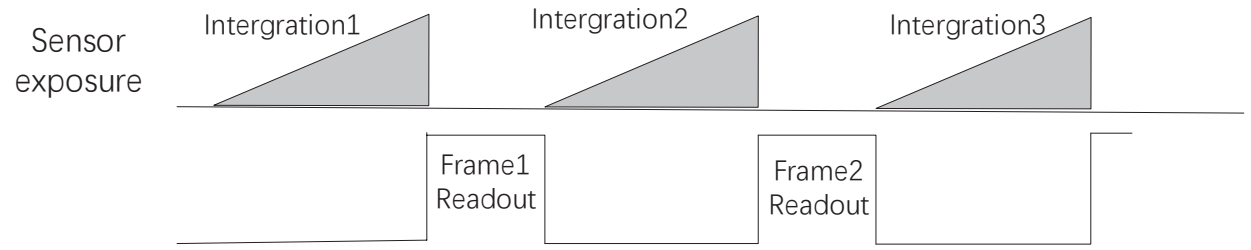
Non-Overlap Exposure and Overlap Exposure

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.

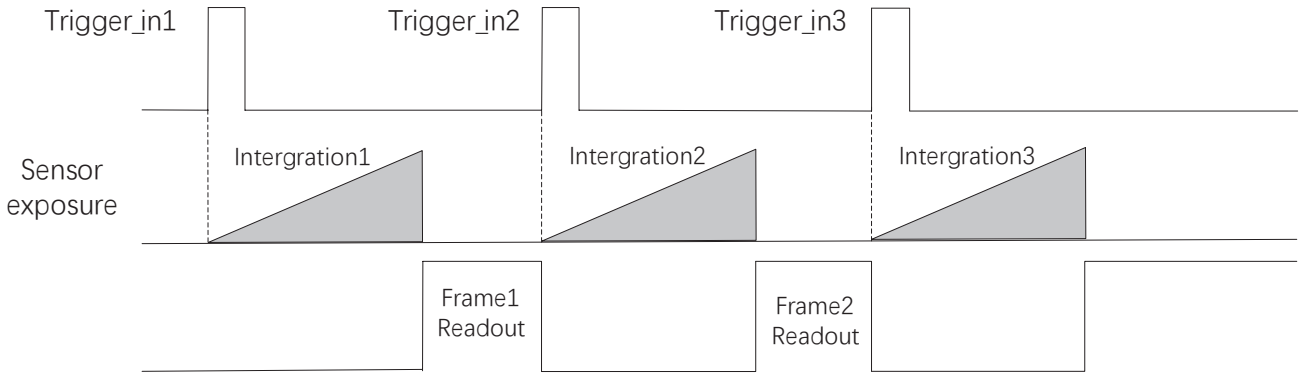
The products mentioned in this manual use overlap exposure to process image data.

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.



Internal Trigger Non-Overlap Exposure



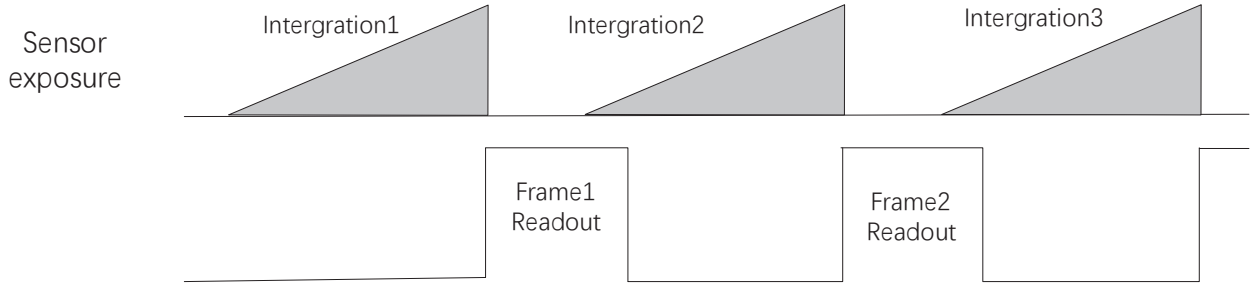
External Trigger Non-Overlap Exposure

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

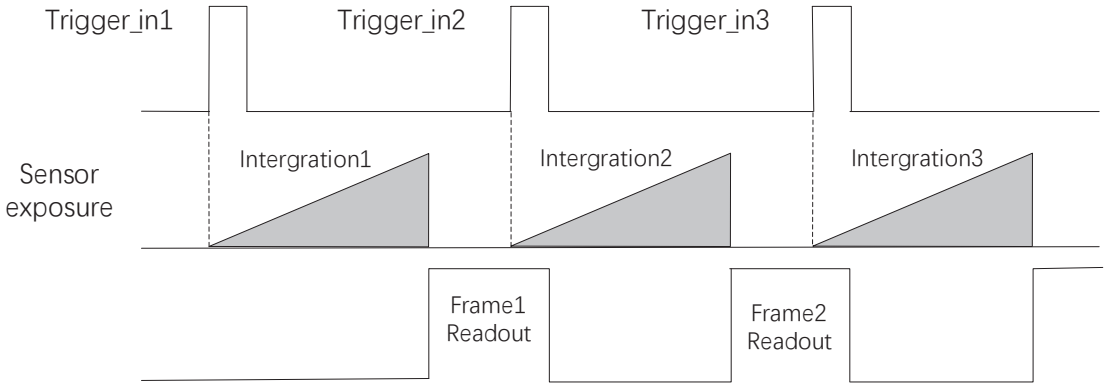
Non-Overlap Exposure and Overlap Exposure

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.



Internal Trigger Overlap Exposure



External Trigger Overlap Exposure

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 4 factors determines the camera's frame rate in real-time.

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

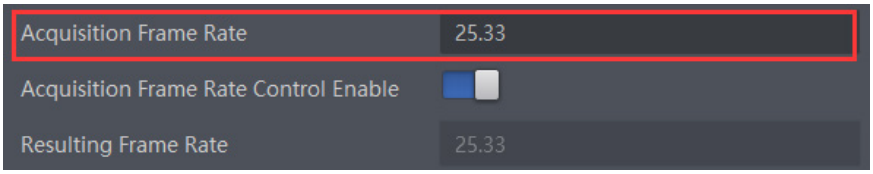
The camera can also manually control the real-time frame rate.

The specific steps are as follows:

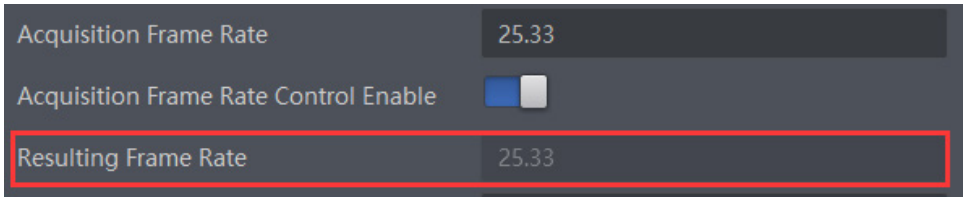
Click Acquisition Control > Acquisition Frame Rate, enter Acquisition Frame Rate according to actual demands, and enable Acquisition Frame Rate Control Enable.

_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 according to the configured frame rate.



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



Trigger Mode

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

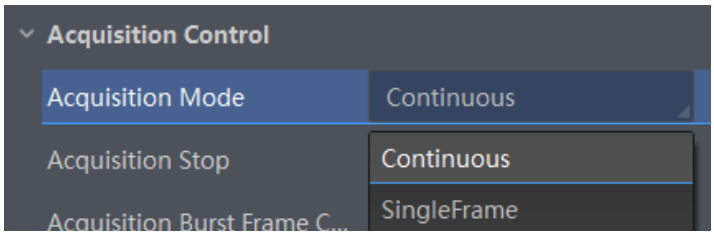
Internal trigger mode(acquisition modes), including SingleFrame mode and Continuous mode;external trigger mode, including software trigger, hardware trigger.

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 4 types of external trigger sources, including software trigger, hardware trigger, counter 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 USB3.0 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.
Free trigger		Anyway	Use software trigger, hardware trigger or counter trigger to send signals to the camera to acquire images.

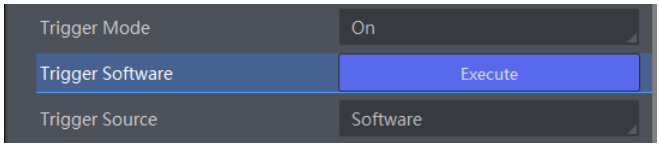
These 4 external trigger sources are valid only when the Trigger Mode is On

■ Software Trigger

For the camera support software trigger mode, when user set software trigger, the client software can send commands to camera to acquires and transfer images via USB3.0.

1.Click Acquisition Control > Trigger Mode, and select On as Trigger Mode.

2.Select Software as Trigger Source, and click Execute in Trigger Software to send trigger commands.



Trigger Mode

■ Hardware Trigger

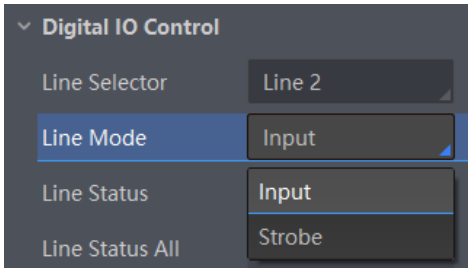
If set“Hardware”as“Trigger Source”can switched to hardware external trigger mode.

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

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

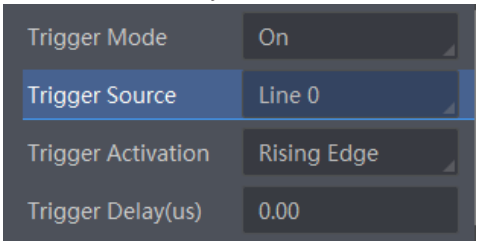
The setting as input signal is as shown below:

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



3.Click Acquisition Control, select On as Trigger Mode, select Line 2 as Trigger Source.

The command to trigger the photo is given to the camera by the external device.



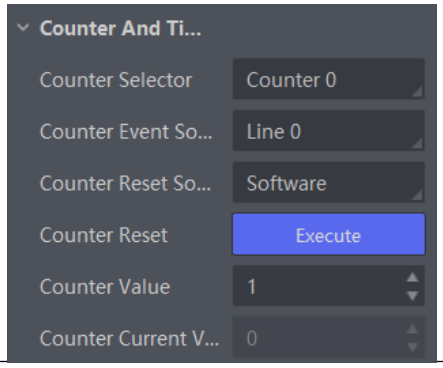
■ Counter Trigger

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.



Trigger Mode

■ 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 Related Parameters

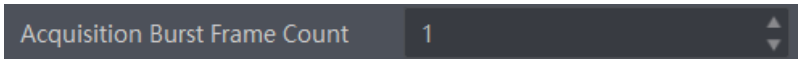
Under external trigger mode, you can set burst frame count, trigger delay, trigger cache enable, trigger activation and trigger debouncer. Different trigger sources can set various trigger parameters, and their relation is shown below.

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

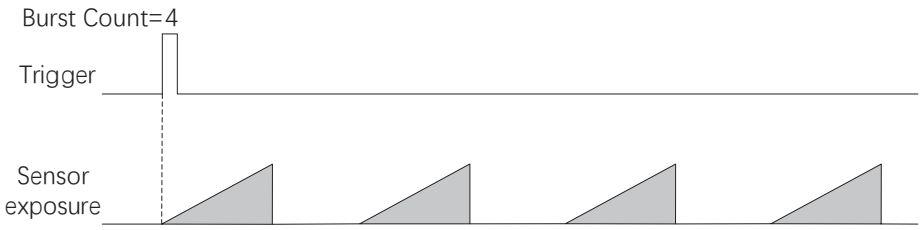
■ Burst Frame Count

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.



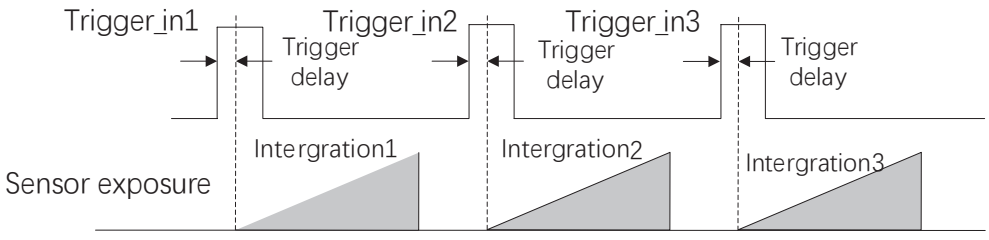
When Acquisition Burst Frame Count is 1, it is in single frame trigger mode. When Acquisition Burst Frame Count is larger than 1, it is in multi-frame trigger mode. If Acquisition Burst Frame Count is n and when inputting 1 trigger signal, the camera stops acquiring images after exposing n times and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



Rising Edge as Trigger Signal

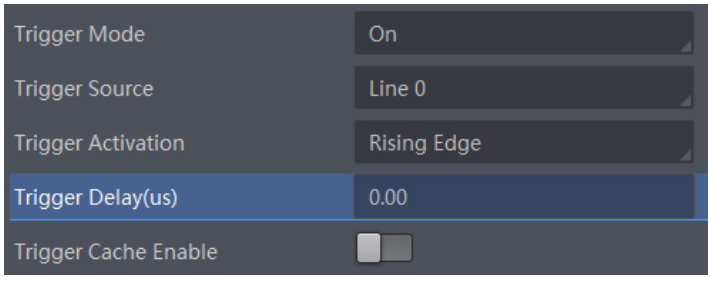
■ Trigger Delay

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



Rising Edge as Trigger Signal

You can enter Trigger Delay according to actual demands, and its range is from 0 μs to 16000000 μs.

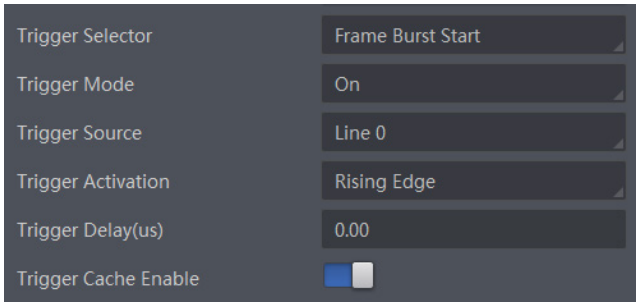


Trigger Mode

■ Trigger Cache Enable

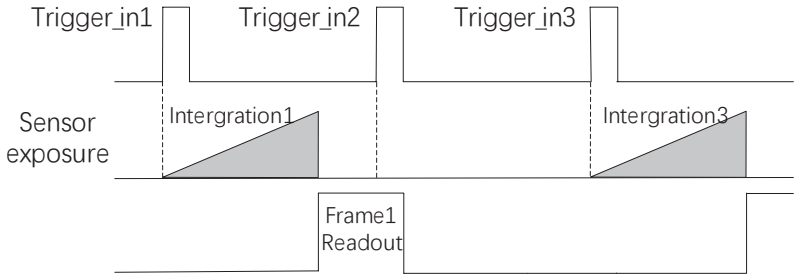
The camera has the function of Trigger Cache Enable. During the triggering process, if the camera receives new trigger signal, it will save and process the signal if you enable this function. Trigger cache enable can save up to 2 trigger signals.

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.

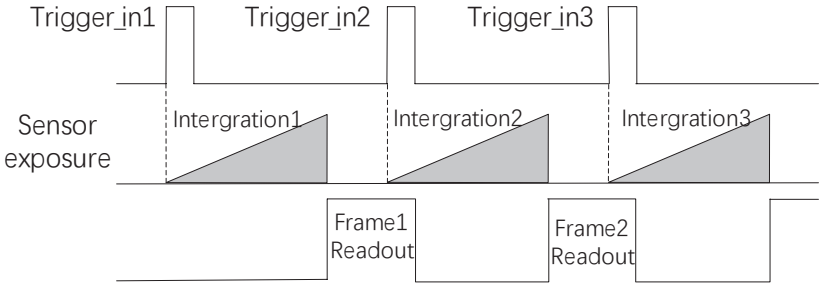
- Disable Trigger Cache Enable: the 2nd trigger signal will be filtered without processing.



Rising Edge as Trigger Signal

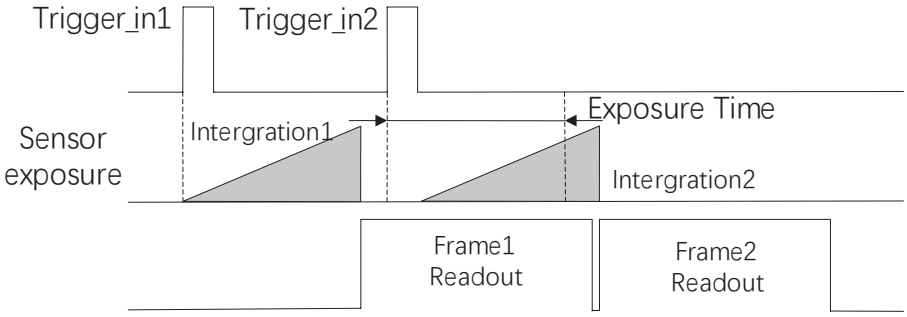
- Enable Trigger Cache Enable: the 2nd trigger signal will be saved.

_ 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.



Rising Edge as Trigger Signal

_ 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.



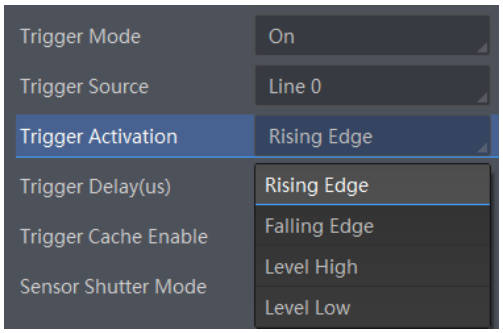
Rising Edge as Trigger Signal

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.

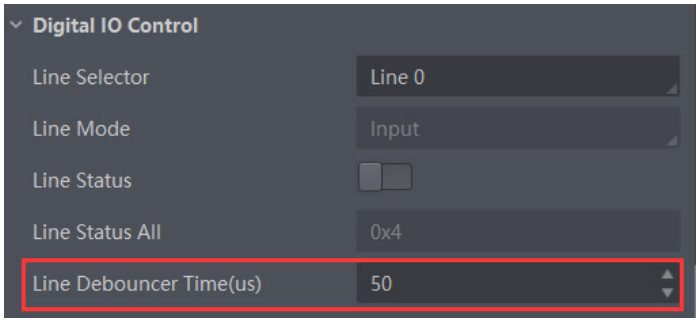
Trigger Activation	Parameter	Parameter Value	Principle
Rising Edge	Acquisition Control > Trigger Activation	Rising Edge	Rising Edge refers to the rising edge of the trigger signal is valid, that is camera exposure and acquisition at the beginning of the rising edge of the trigger signal.
Falling Edge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



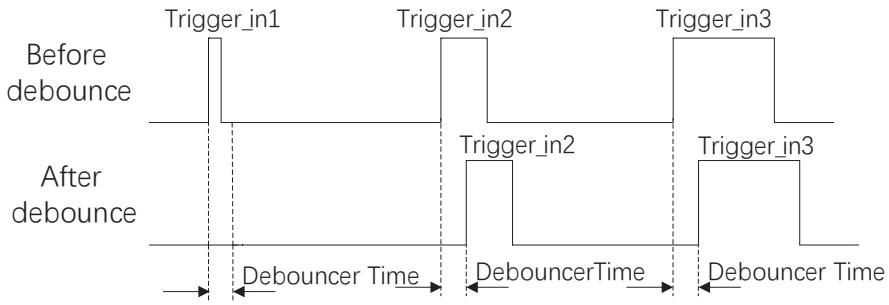
■ Trigger Debouncer

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 μs to 1000000 μs.



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



Rising Edge as Trigger Signal

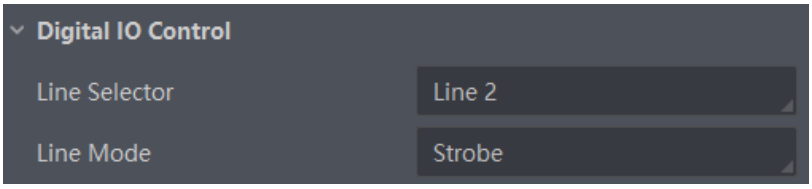
CHAPTER 6 I/O OUTPUT

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 7 I/O Electrical Characteristics and Wiring.

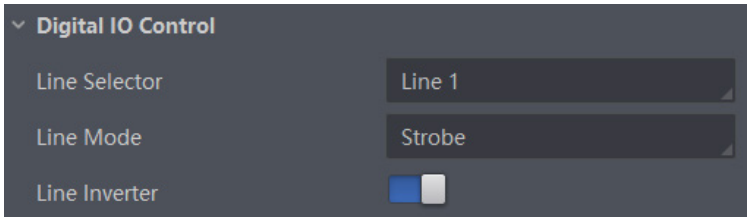
Set Output Signal

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.

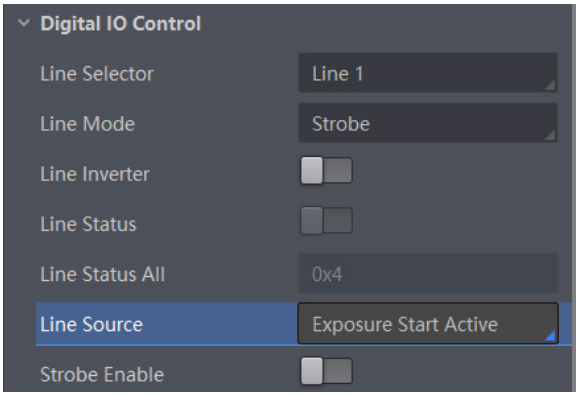
Click Digital IO Control > Line Selector, select line for Line Selector, and enable Line Inverter. The Line Inverter parameter is disabled by default.



■ 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.

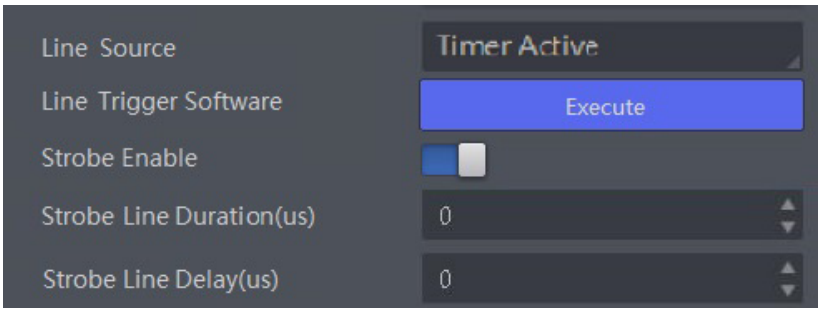


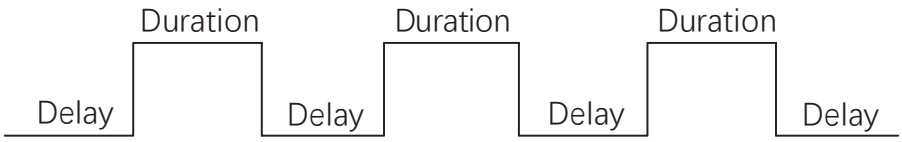
Set Output Signal

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.





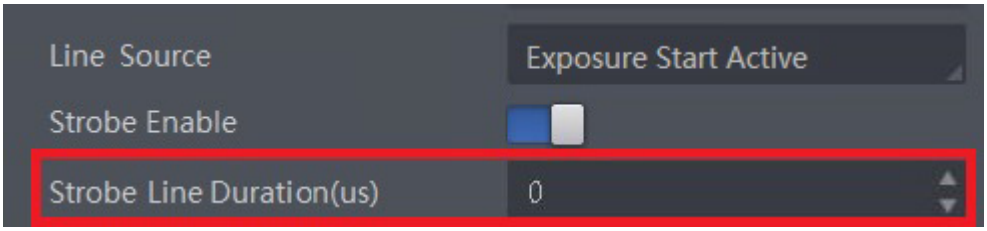
Regarding strobe signal, you can also set its duration, delay and pre delay.

■ 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.

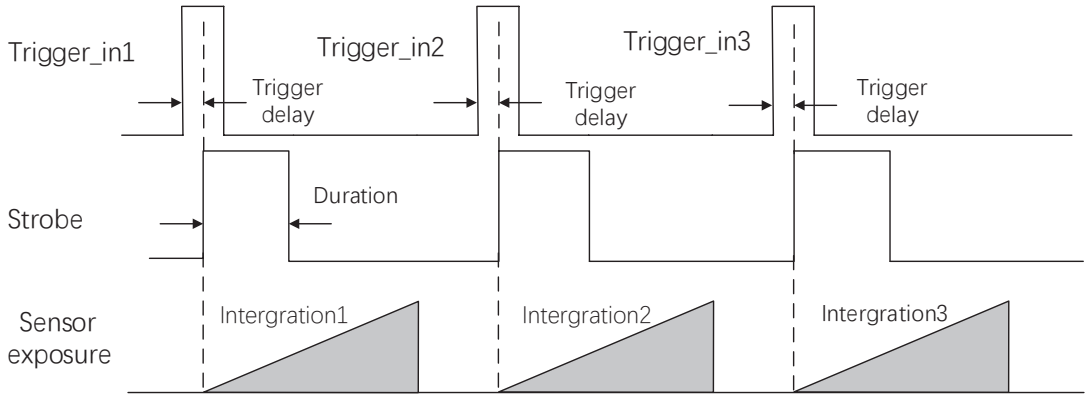
Set Output Signal

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.

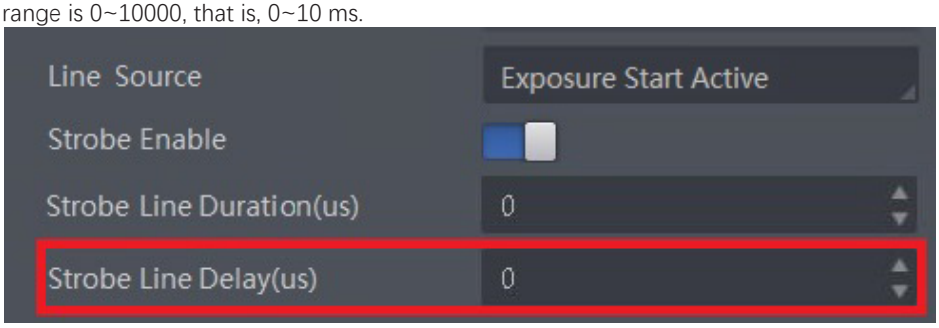


Strobe Line Delay

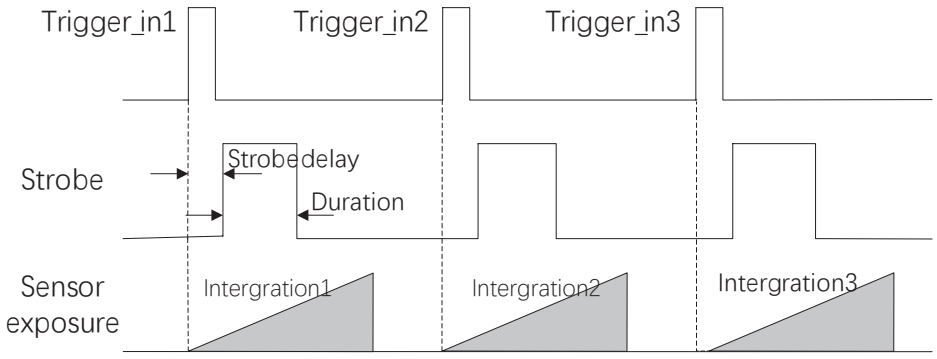
The camera supports setting strobe line delay to meet actual demands. When exposure starts, the strobe output doesn't take effect immediately. Instead, the strobe output will delay according to the strobe line delay setting.

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

The unit is μs 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.

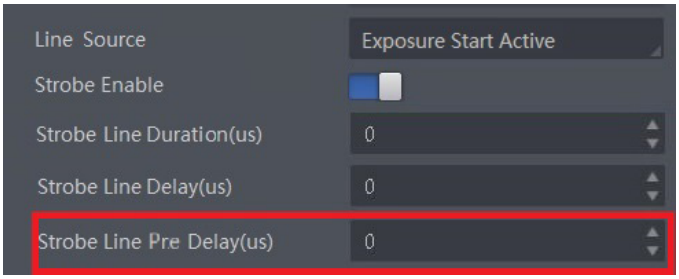


Set Output Signal

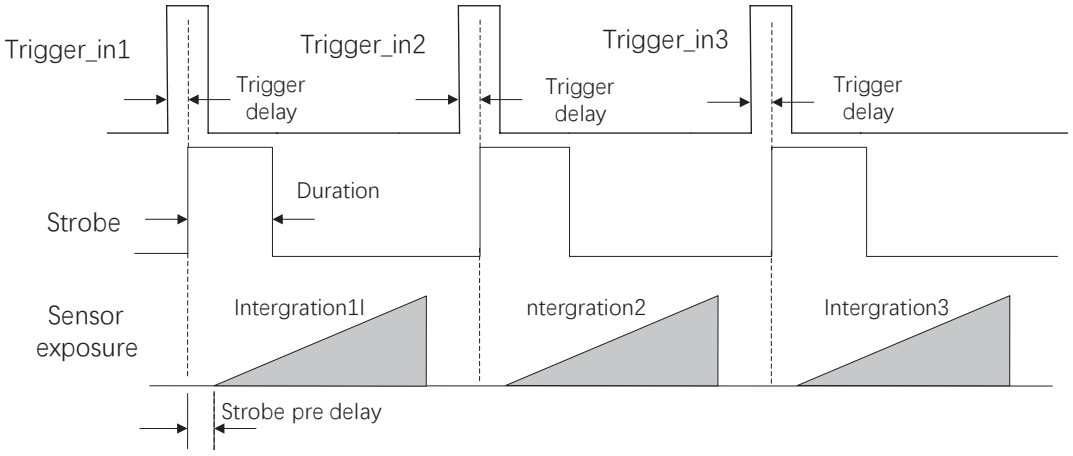
■ Strobe Line Pre Delay

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 μs 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.



7

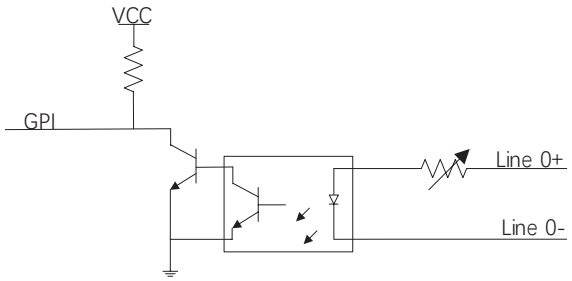
CHAPTER 7 I/O ELECTRICAL FEATURE AND WIRING

I/O Electrical Feature

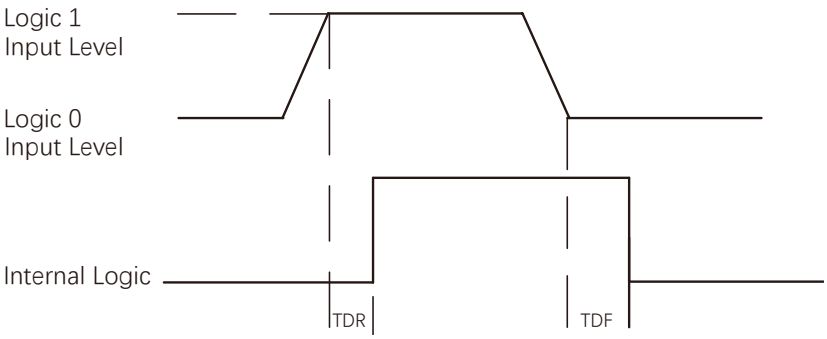
■ Line 0 Opto-isolated Input Circuit

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	VALUE
Input Logic Level Low	VL	0 ~ 1 VDC
Input Logic Level High	VH	1.5 ~ 24 VDC
Input Rising Delay	TDR	1.8 ~ 4.6 μs
Input Falling Delay	TDF	16.8 ~ 22 μs

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

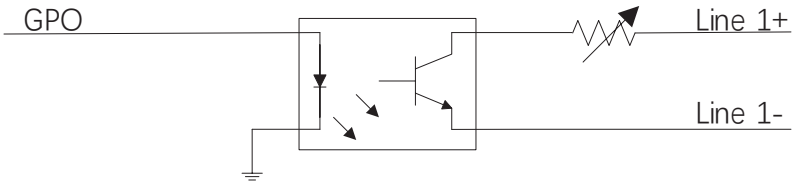
■ The breakdown voltage is 30 VDC, and keep voltage stable.

I/O Electrical Feature

Line 1 Opto-isolated Output Circuit

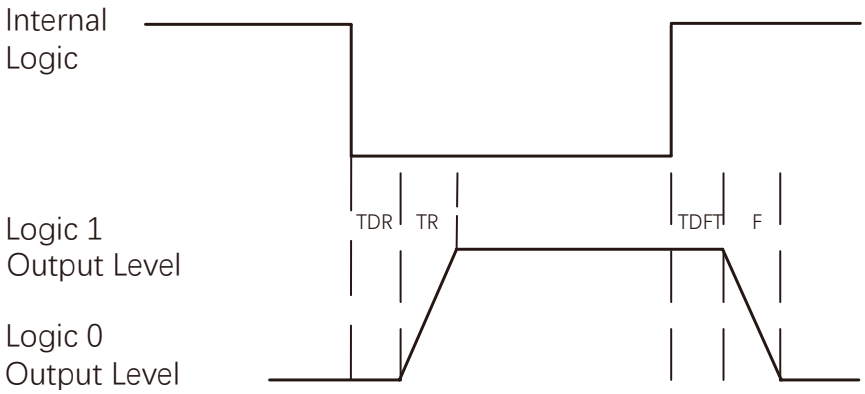
The Line 1 opto-isolated output circuit in camera I/O control is shown below.

The maximum output current of Line 1 is 25 mA.



Output Logic Level:

The maximum output current of Line 1 is 25 mA and output impedance is 40 Ω.



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

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

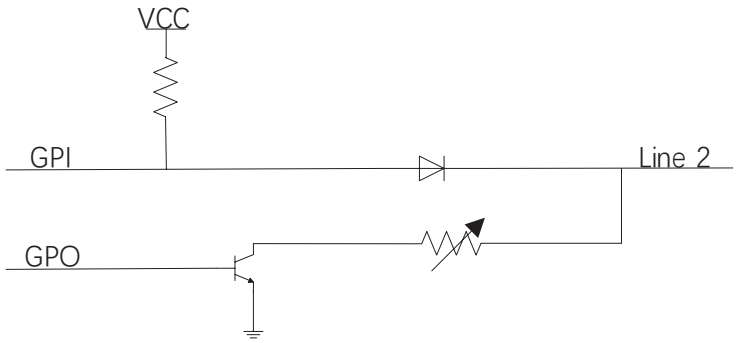
With different external voltage and resistance, the corresponding current and the parameter of output logic level low are shown below.

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

I/O Electrical Feature

Line 2 Bi-direction I/O Circuit

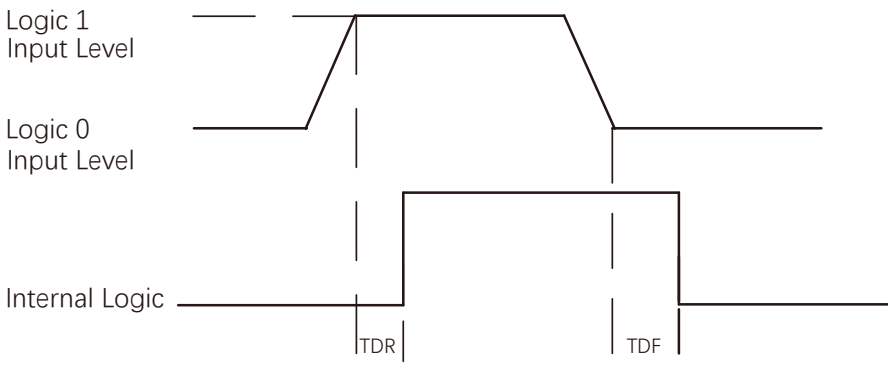
The Line 2 bi-direction I/O circuit in camera I/O control is shown below. The Line 2 can be configured as input signal or as output signal.



Line 2 Configured as Input

With the condition of 100 Ω 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	Value
Input Logic Level Low	VL	0 ~ 0.5 VDC
Input Logic Level High	VH	1.5 ~ 24 VDC
Input Rising Time	TDR	< 1 μs
Input Falling Time	TDF	< 1 μs

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

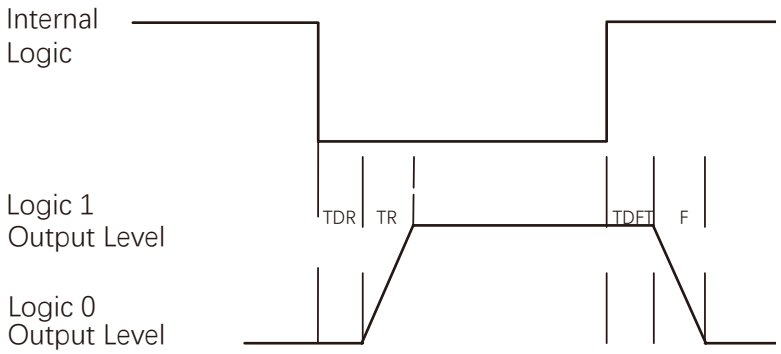
The maximum current is 25 mA and the output impedance is 40 Ω.

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

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

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

Output Logic Level:



Electrical Feature of Line 2 Output:

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

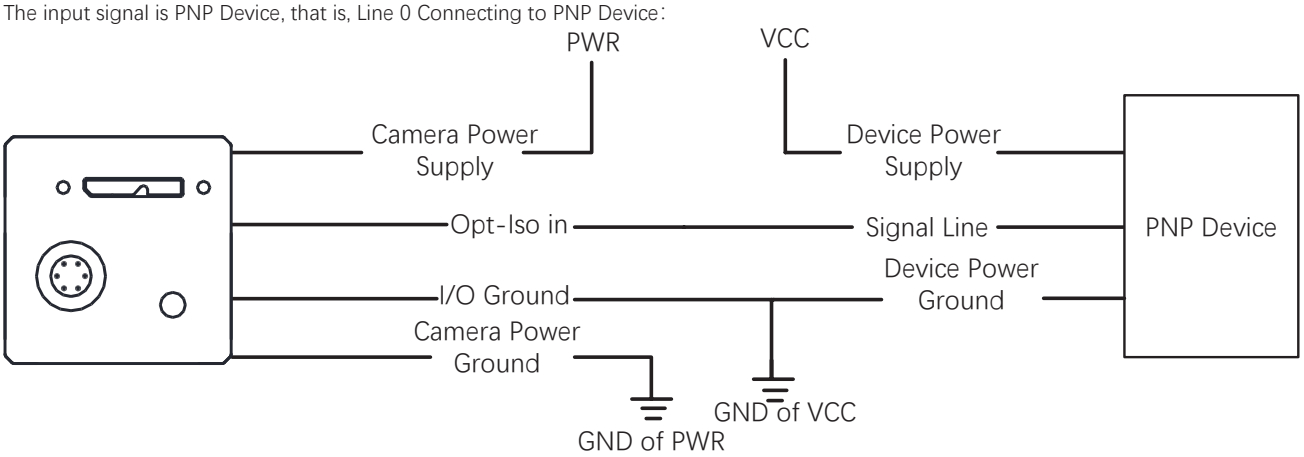
I/O Wiring

The camera has different appearance with varied models. Here mainly introduces how to wire the I/O part of the camera. 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 in Chapter 2.

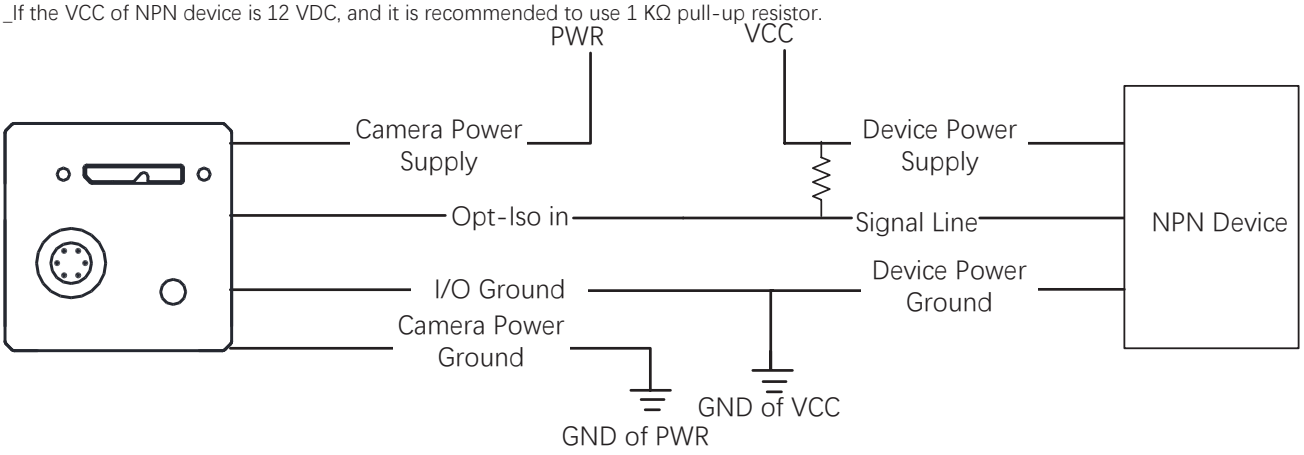
Line 0 Wiring

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

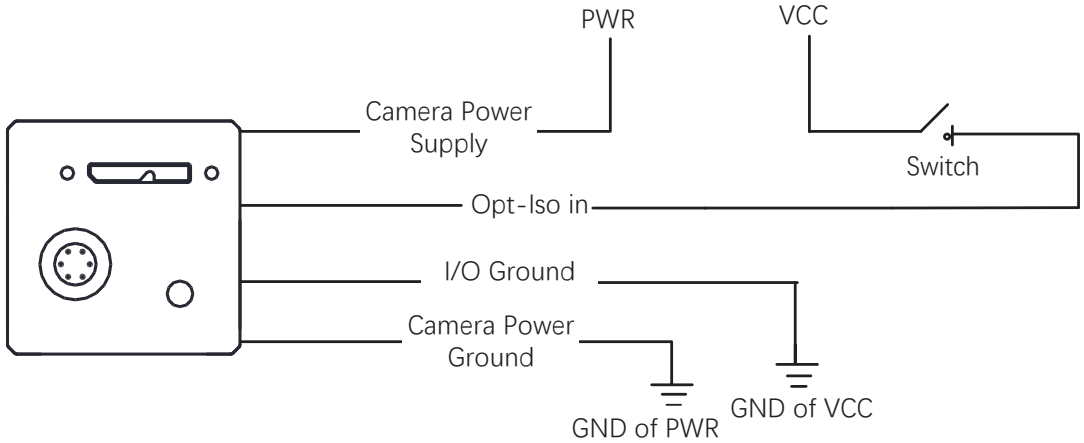
The input signal is PNP Device, that is, Line 0 Connecting to PNP Device:



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



The input signal is Switch, that is, Line 0 Connecting to a Switch:
If the VCC of switch is 24 VDC, and it is recommended to use 4.7 KΩ resistor to protect circuit.

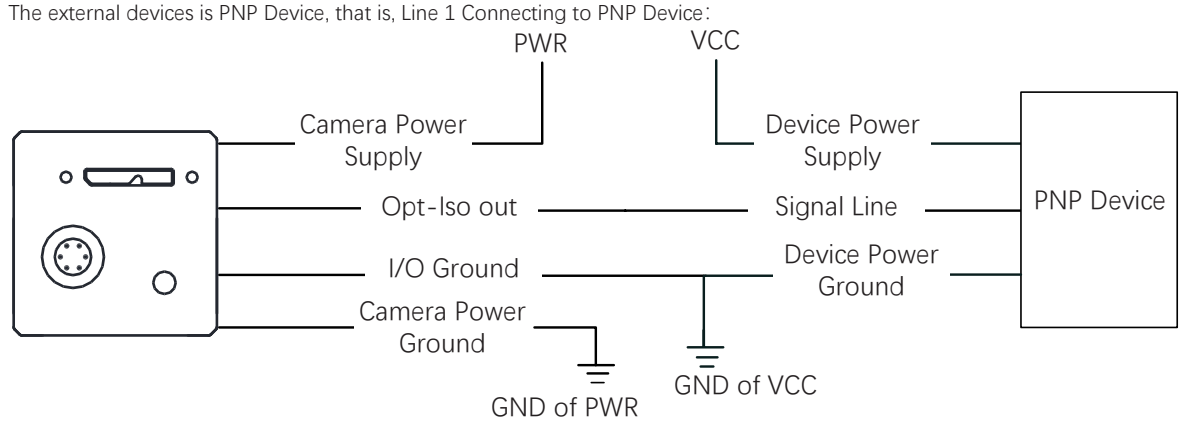


I/O Wiring

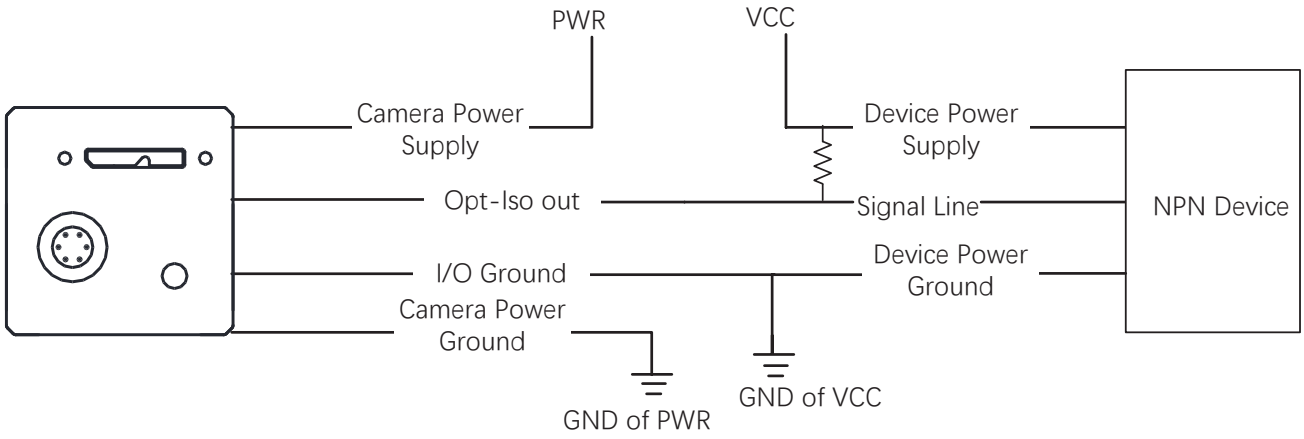
Line 1 Wiring

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



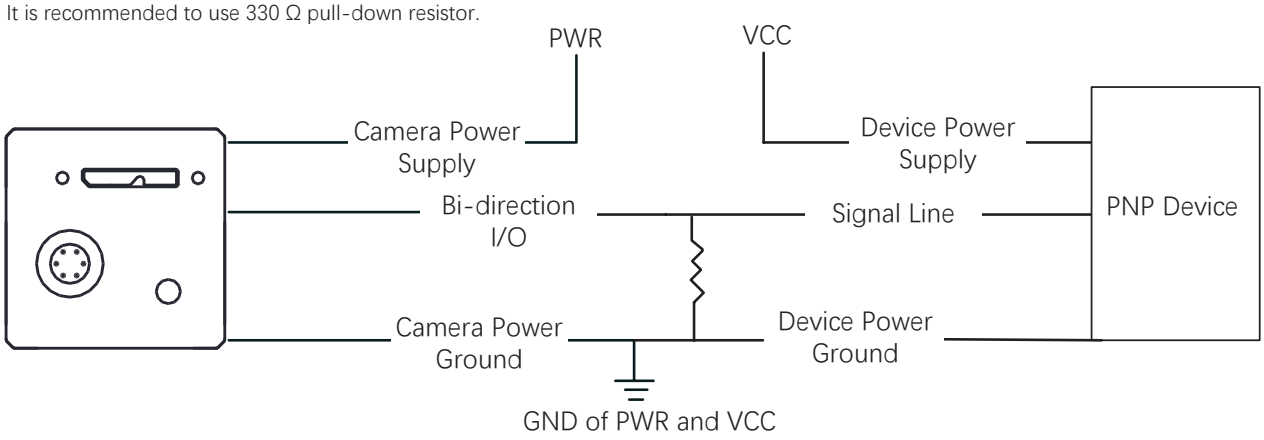
I/O Wiring

Line 2 Wiring

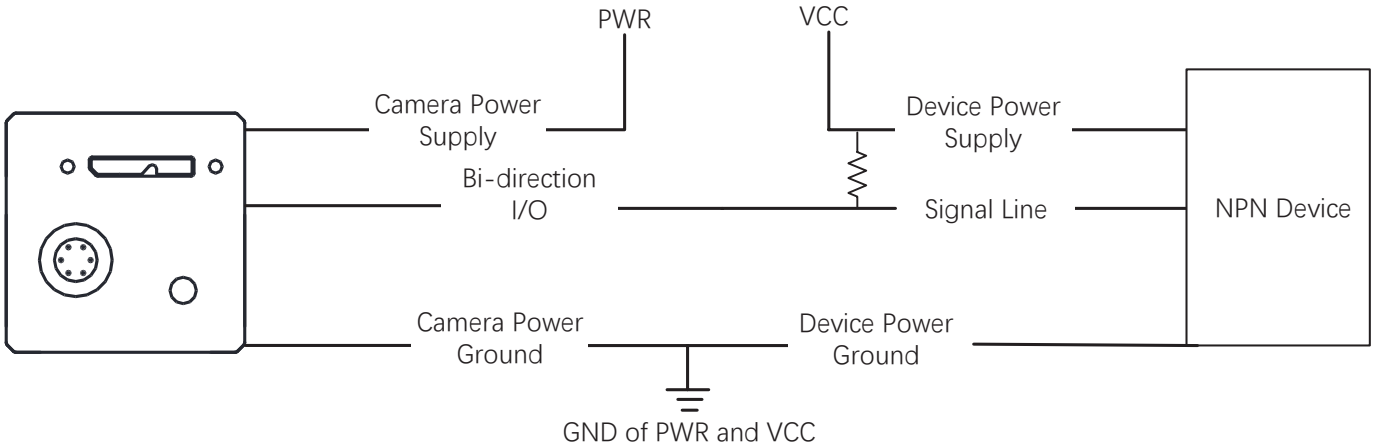
As bi-direction I/O Circuit, Line 2 can be used as both input signal and output signal.

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.

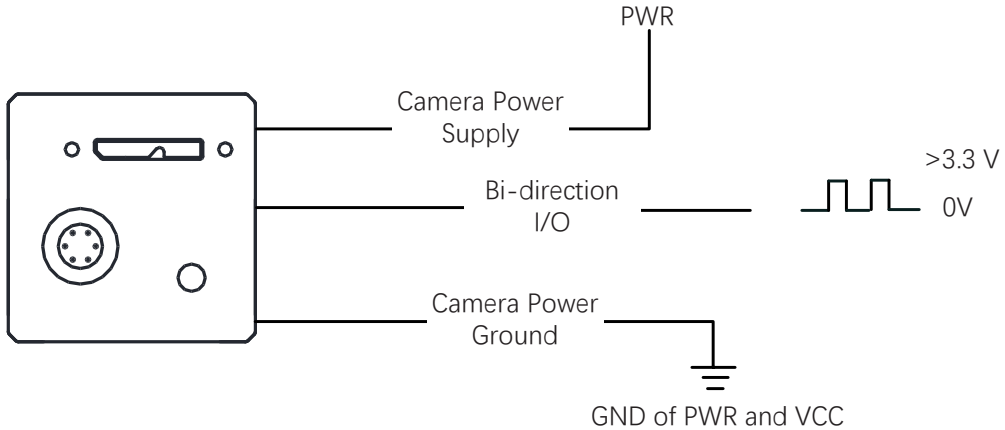
The input signal is PNP Device, that is, Line 2 Connecting to PNP Device as Input:
It is recommended to use 330 Ω pull-down resistor.



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



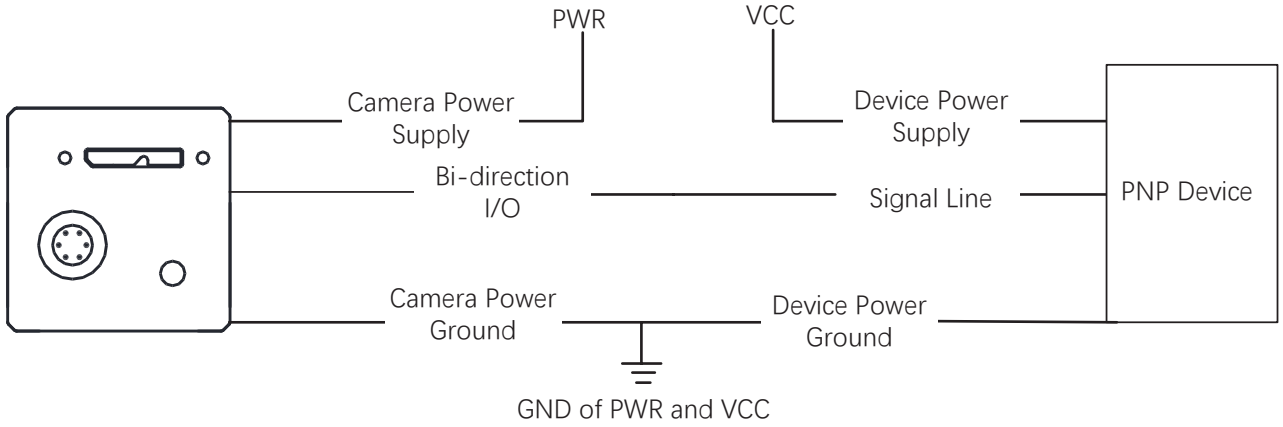
The input signal is Switch, that is, Line 2 Connecting to a Switch as Input:
The switch value can provide low electrical level to trigger line 2.



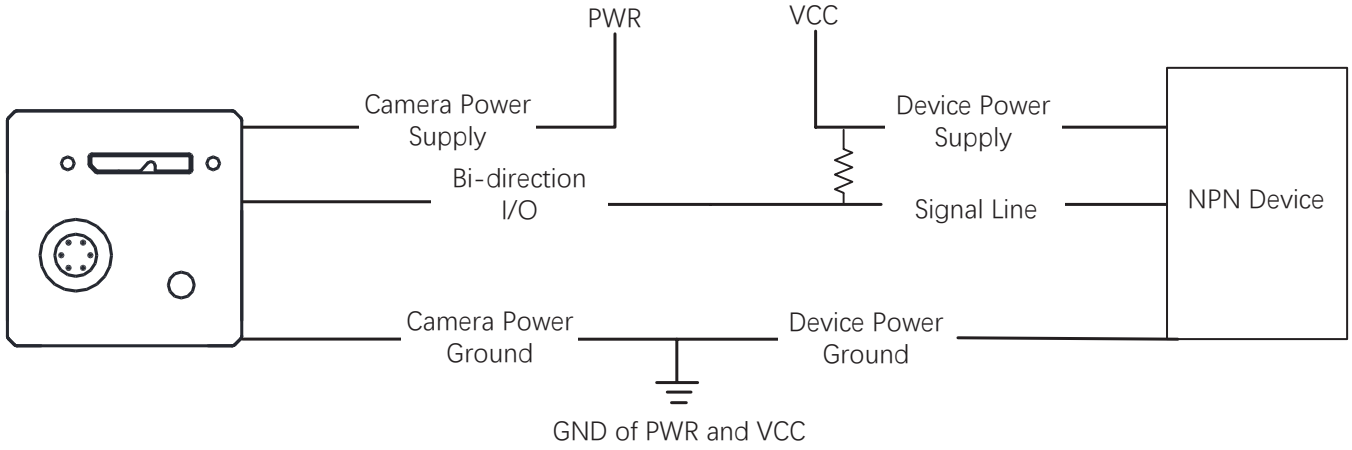
I/O Wiring

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

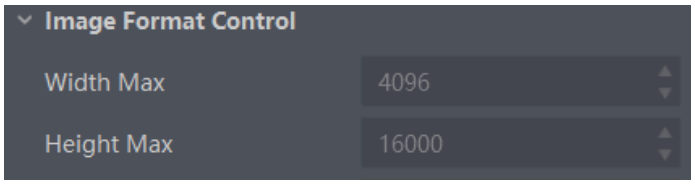


8

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.

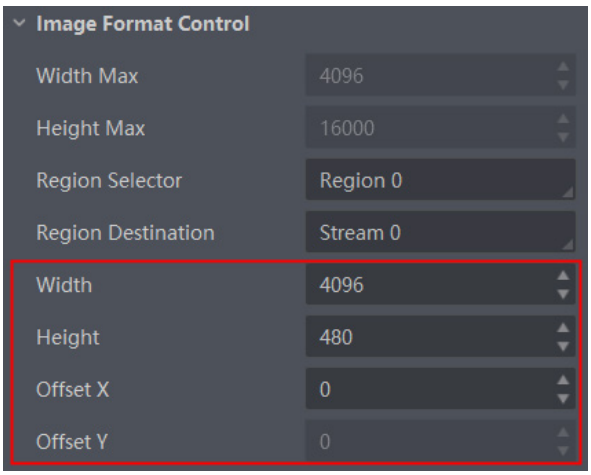


If you are only interested in a certain region of the image, you can set a Region of Interest (ROI) for the camera. Setting Region of Interest can reduce the bandwidth of the image being transmitted. Thus increasing the frame rate to some extent.

i	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.



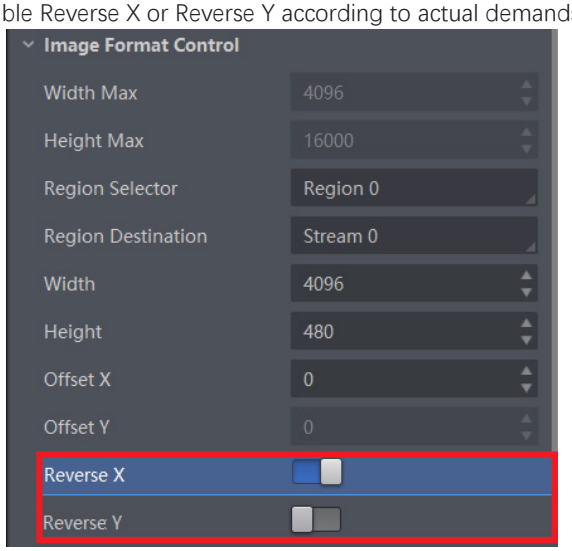
i	■ The Width value plus Offset X value should not be larger than Width Max parameter value, Height value plus Offset Y value should not be larger than Height Max parameter value. ■ The ROI function may differ by camera models.

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.

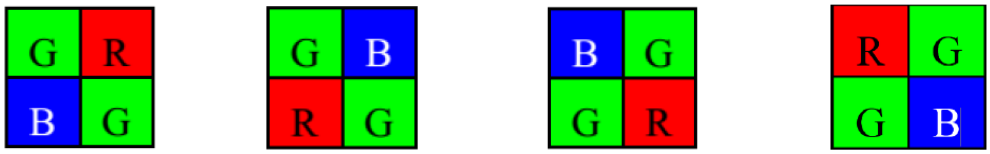
Pixel Format

The pixel format may differ by camera models.

Pixel Format	Pixel Size（Bits/Pixel）
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

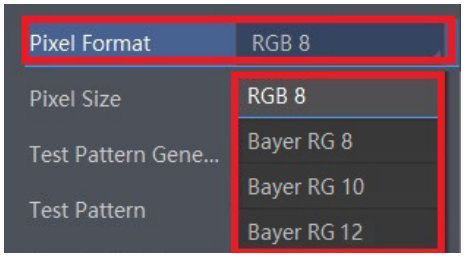
The original data of monochrome cameras is in Mono 8 format; the original data of color cameras is in Bayer 8 format. Among them, the color camera completes the conversion of the original data to RGB8 through the camera's internal pixel interpolation algorithm. The RGB format can be converted to YUV format through the algorithm, YUV Under the format, the value of Y component can be output as Mono 8 format.

Bayer GR, Bayer GB, Bayer BG, Bayer RG, etc. are shown in the figure below.



Bayer GR　Bayer GB　Bayer BG　Bayer RG

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



Super Bayer

In Bayer pixel format, the device supports 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.

i	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.

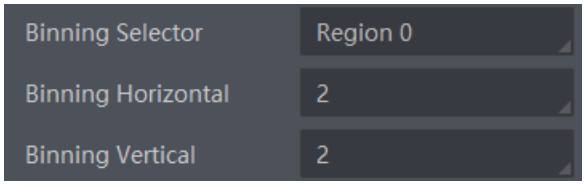
- HB abnormal monitor is used to monitor image stream condition. If the size of compressed image is larger than that of raw image under HB function, this parameter will increase. When this parameter increases rapidly, it is recommended to disable the image compression mode.
- HB version refers to the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

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

Binning

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

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



The device also supports binning mode function if the binning is 2 × 2 and above. The binning mode defines how pixels are combined if the binning is 2 × 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.

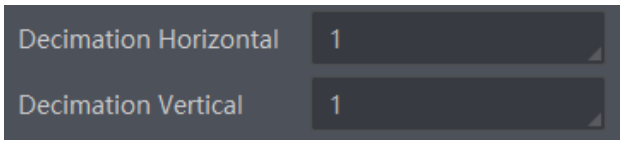
i	● Binning Horizontal is the image's width, and Binning Vertical is the image's height. ● The binning related functions may differ by device models. ● Configuring binning mode is supported when the device is acquiring images.

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.

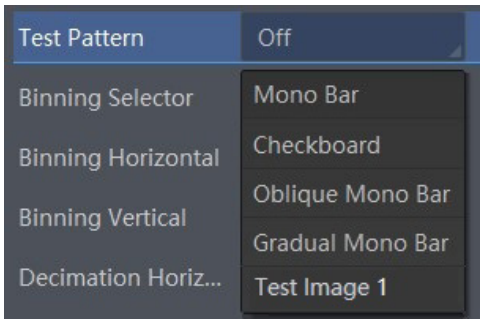


The decimation function may differ by camera models.

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

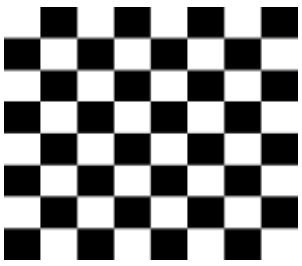


Fig:Checkboard

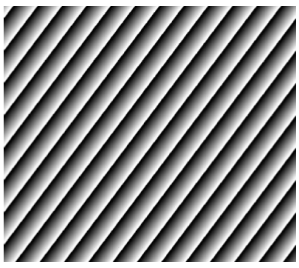


Fig:Oblique Mono Bar

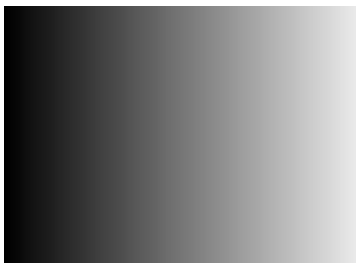


Fig:Gradual Mono Bar

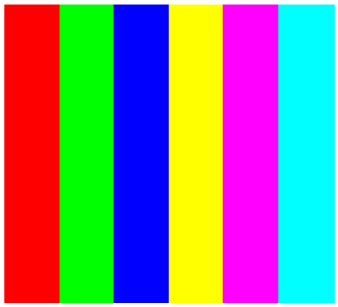


Fig:Vertical Color Bar

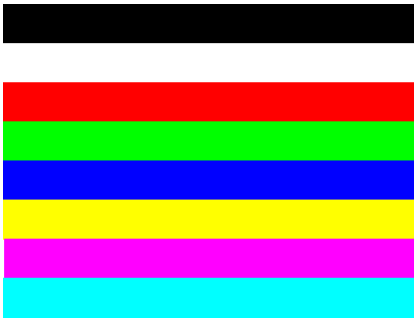


Fig:Horizontal Color Bar

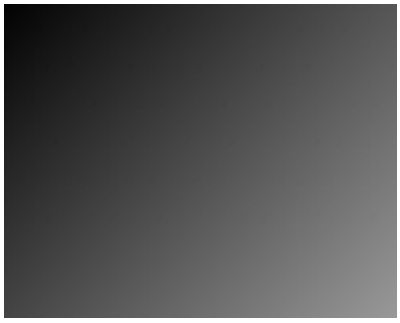


Fig:Test Image 1

Exposure Time Mode

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

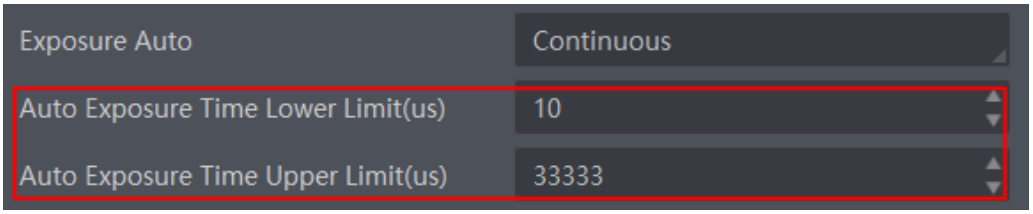
	● The exposure time mode may differ by device models. ● If the device you got does not support Ultrashort exposure time mode, and then there is no Exposure Time Mode parameter, and your device supports Standard exposure time mode only by default.

Exposure Auto

The device supports 3 types of exposure mode, including Off, Once and Continuous. Click Acquisition Control → Exposure Auto, and select Exposure Auto according to actual demands.

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

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



	● If the device is under Continuous exposure mode, once external trigger mode is enabled, the device will automatically switch to Off exposure mode. ● Some models of the device do not support Once or Continuous exposure mode. You can enter Exposure Time (μ s)directly.

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

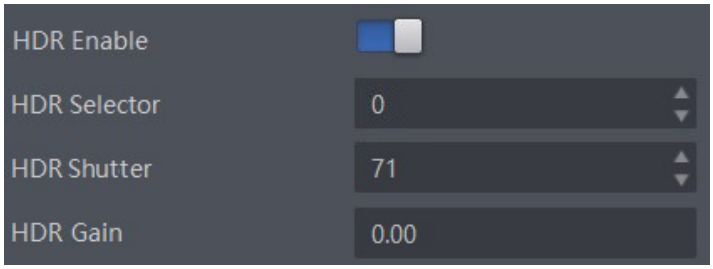
If the device supports sequencer, you can configure multiple groups of parameters like exposure time, gain, etc.

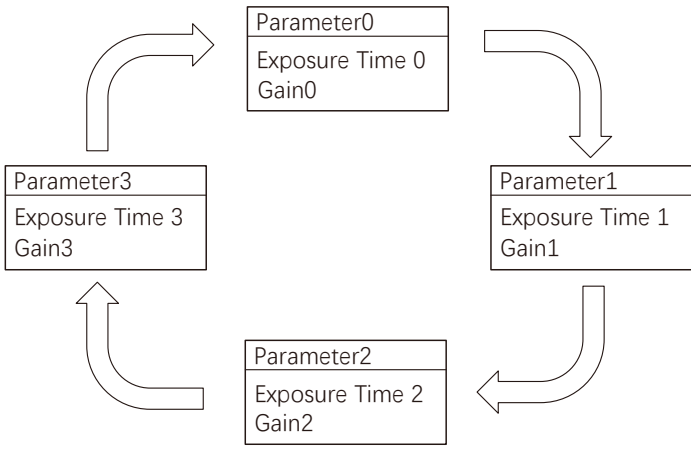
- The HDR function may differ by device models.
- The device supports HDR (High Dynamic Range) function that the device acquires images based on customized settings, and each with its own exposure time and gain.

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

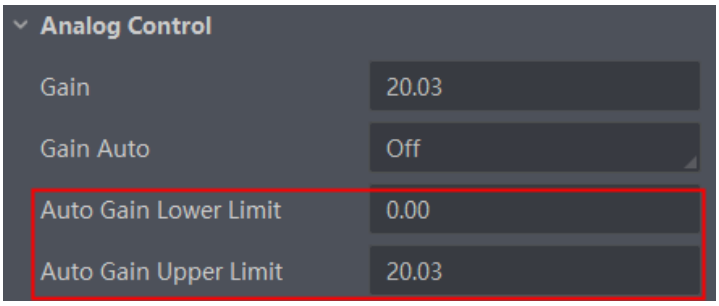
Go to Analog Control → Preamp Gain, and set Preamp Gain according to actual demands.

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

When the 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).

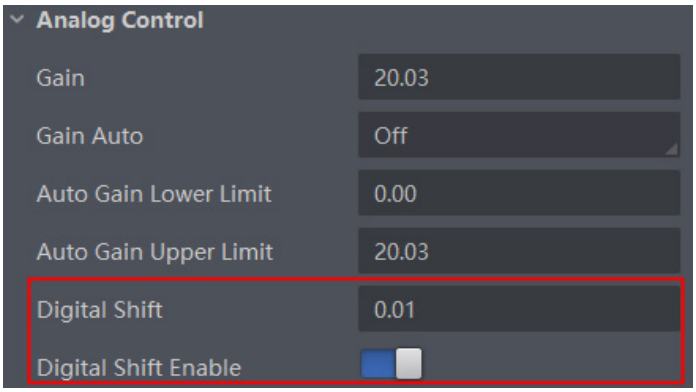


- When increasing gain, the image noise will increase too, which will influence image quality. If you want to increase image brightness, it is recommended to increase the device's exposure time first. If the exposure time reaches its upper limit, and at this point, you can increase gain.
- Some models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

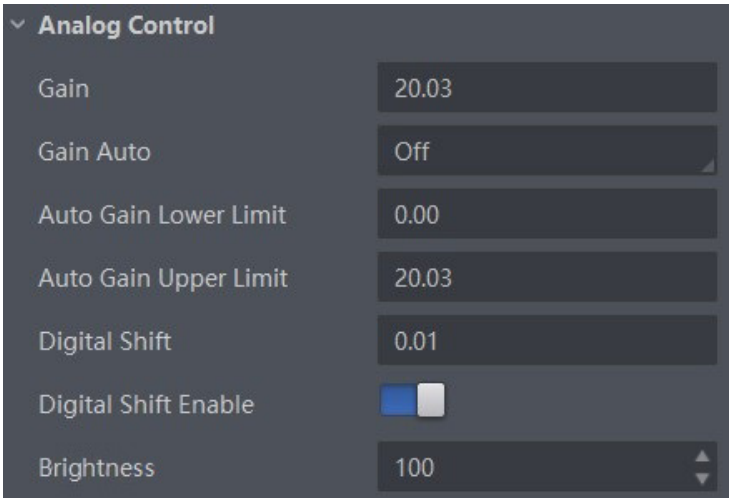


Brightness

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.

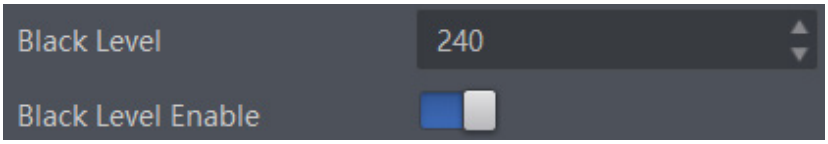
After setting brightness, the camera will automatically adjust exposure time to let image brightness reach target one. Under Once or Continuous exposure mode, or Once or Continuous gain, the higher the brightness value, the brighter the image will be.



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.



i	The black level function may differ by camera models.

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

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

Steps:

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

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.

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

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

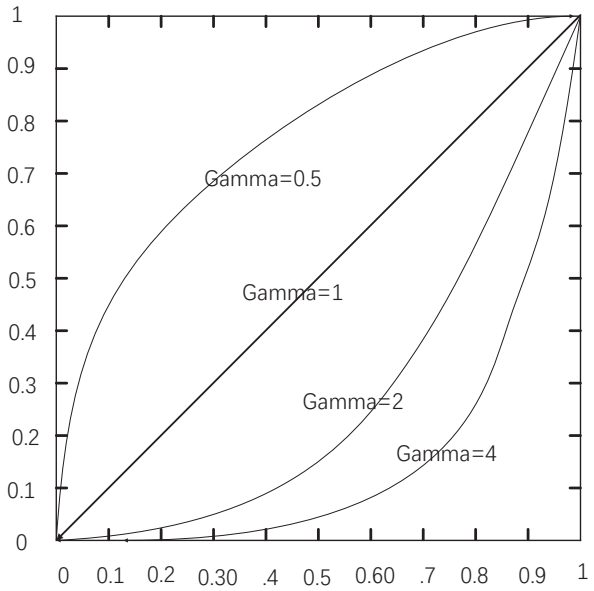
Gamma Correction

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.

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

Gamma Curve

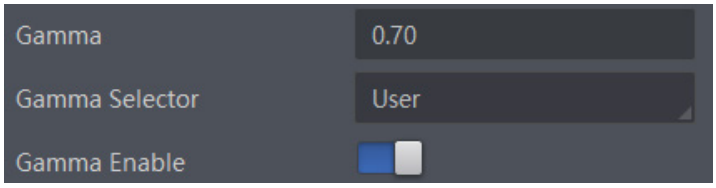


There are 2 types of Gamma correction, including User mode and sRGB mode.

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

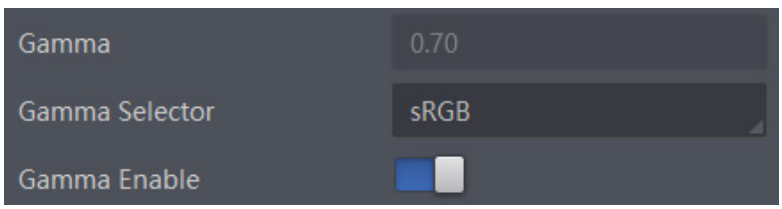
■ You can set User mode as shown below.

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.

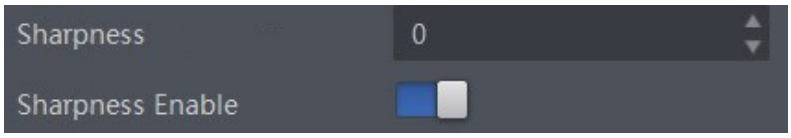


Sharpness

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

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

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.



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.

i	This function may differ by camera models.

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.

i	● The contrast ratio function may differ by device models. ● Make sure that the live view is enabled, and Gamma correction and LUT function is disabled before using the contrast ratio function. ● Regarding the color device in Bayer pixel format, you need to enable Super Bayer Enable first before using contrast ratio function. ● The range of Contrast Ratio is from 0 to 100.

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.

i	■ 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

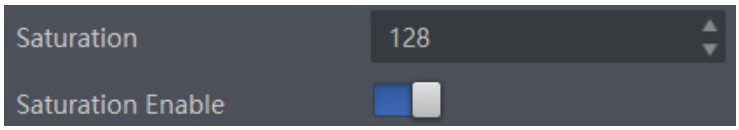
The saturation is the reference saturation when the color correction function is enabled in the non-mono format of the color camera. The brightness of the colors in the image can be adjusted to make the image look fuller, more colorful, and closer to the real thing.

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 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.

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.

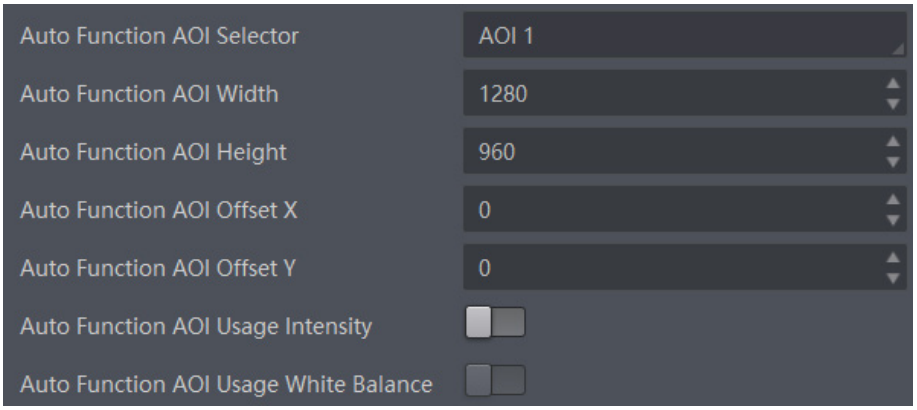
Steps:

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.

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:

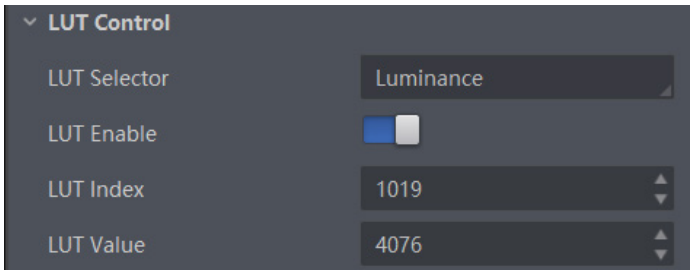
1. Click Analog Control > Auto Function AOI Selector, and select AOI 1 or AOI 2 Auto Function AOI Selector.
2. Enter Auto Function AOI Width, Auto Function AOI Height, Auto Function AOI Offset X, and Auto Function AOI Offset Y according to actual demands.
3. Enable Auto Function AOI Usage Intensity if 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.

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.

Color Transformation Control

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

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

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

	● The function of color transformation control is only available for color devices. ● Currently, RGB to RGB is available for Color Transformation Selector only.

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.

Shading Correction

i	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.

i	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.

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.
Device Serial Number	Read only	It is the device serial number.
Device User ID	Read and write	Device name and it is empty by default. You can set according to your preference. ● If User ID is empty, the client software displays the device model. ● If you set it, the client software displays the User ID you set.
Maximum Device Response Time	Read only	Maximum time until a device sends a response upon a received command,if it does not respond within the time, it is considered to be disconnected.
Device Manifest Table Address	Read only	The camera currently selects the ID of GenICam XML
Device SBRM Address	Read only	Address of the Technology Specific Bootstrap Register Map.
Device Timestamp	Read only	Current device time in ns.
Device Timestamp Latch	Read and write	Execute the Execute button to get the current timestamp of the device
Device Timestamp Increment	Read only	The maximum value of the device timestamp.
Device Protocol Endianess	Read only	Endianess of the protocol implementation.
Device Implementation Endianess	Read only	Endianess of the device implementation.
Device Uptime(s)	Read only	Time of Device boot.
Board Device Type	Read only	Device type
USB Speed Mode	Read only	The USB interface speed mode is divided into two modes: HighSpeed (when the camera is connected to the USB2.0 interface) and SuperSpeed (when the camera is connected to the USB3.0 interface).
Device Connection Status	Read only	Indicates the status of the specified Connection.
Device Link Throughput Limit Mode	Read and write	The transmission bandwidth can be controlled after opening
Device Link Throughput Limit(Bps)	Read and write	Transmission bandwidth control. If necessary, delay will be evenly inserted between the transmission layer data packets to control the bandwidth peak.
Device Link Current Throughput	Read only	The actual bandwidth of the device's current transmission.
Device Command Timeout	Read only	The device timeout time, if there is no response after the time, it is considered to be disconnected/command timeout count.
Device Sensor Throughput Limit	Read and write	It controls device flow, and can be set according to actual bandwidth to avoid image lose.

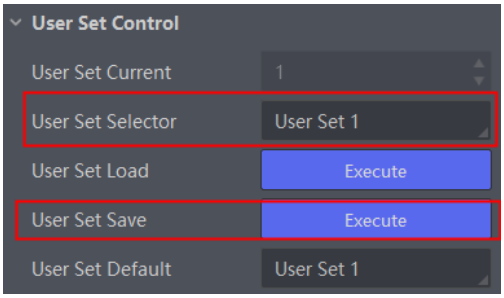
Device Control

Parameter	Read/Write	Description
Device Stream Channel Count	Read only	It is the quantity of device stream channel.
Device Reset	Read and write	Execute the Execute button to reset the device parameters.
Device Temperature Selector	Read and write	It selects device component temperature.
Device Temperature	Read only	It displays the real-time temperature of the device component you selected in Device Temperature Selector.
Find Me	Writable	Click Execute to let red indicator flash once, and find device.
Device Max Throughput(Kbps)	Read only	It is the maximum flow of device operation.
Device PJ Number	Read only	It is the device's project number.
HB Abnormal Monitor	Read only	It monitors image stream condition.
HB Version	Read only	It is the version of the image compression mode.

The specific device control parameters may differ by camera models.

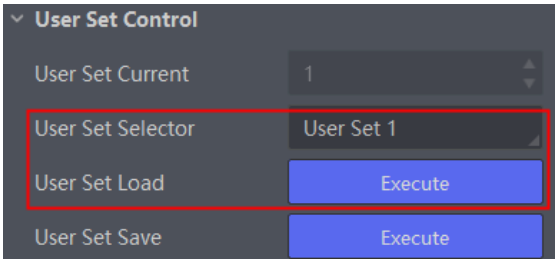
Save and Load User Set

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.

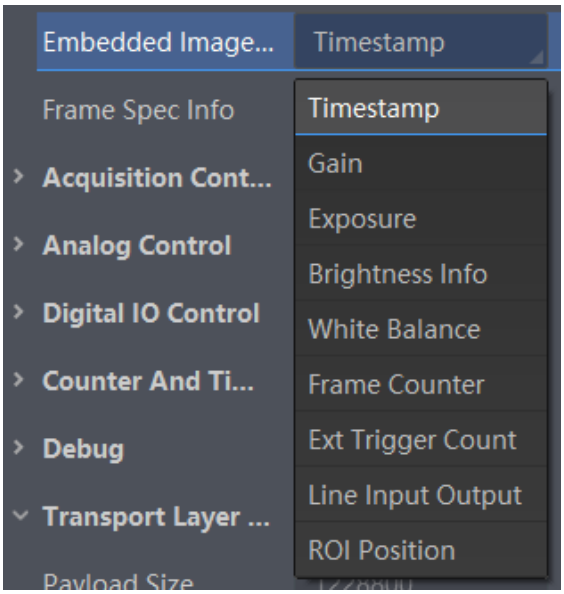


_Set User Default:
You can also set default parameter by selecting parameter from drop-down list of User Set Default.

Embedded Information

Steps:

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



2. When multiple information needs to be embedded, just repeat the above steps.

3. You can view related information through Embedded Information Tool in the iDatum shortcut toolbar, and the specific values will only be displayed after the camera starts previewing.

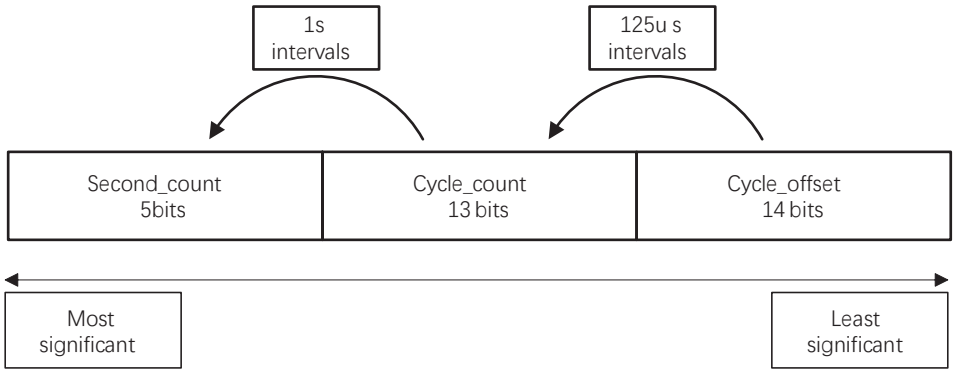
When the Embedded Information tool sets the image embedded information, it is not affected by ROI. If the ROI area is small and the first line of image is not enough to embed information, it will be embedded in the second line of image.

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 μs.
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.

Embedded Information



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

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(B)	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.
U3V Version Major	Read only	It is the major version in U3V version.
U3V Version Minor	Read only	It is the minor version in U3V version.
U3VCP SIRM Available	Read only	Set whether the device supports at least 1 device stream interface.
U3VCP EIRM Available	Read only	Set whether the device supports at least 1 device event interface.
U3VCP IIDC2 Available	Read only	Set whether the device supports IIDC2 register mapping
U3V Max Command Transfer Length	Read only	Maximum command transmission length supported by the device (in bytes)
U3V Max Acknowledge Transfer Length	Read only	The maximum response data transmission length supported by the device (in bytes)
U3V Number Of Stream Channels	Read only	The number of stream channels. If it is 0, stream channels are not supported.
U3V SIRM Address	Read only	Stream interface register map address
U3V SIRM Length	Read only	Length of each SIRM
U3V EIRM Address	Read only	It is the mapping address of EIRM.
U3V EIRM Length	Read only	It is the length of each EIRM.
U3V Current Speed	Read only	Current USB connection speed

U3V Protocol Control

You can go to Stream Control attribute to view the camera's USB transfer size, transfer count, the size of the Final1 and Final2.

Parameter	Read/Write	Description
U3V SI Payload Transfer Size	Read only	the size of regular payload bulk transfers.
U3V SI Payload Transfer Count	Read only	the number of regular payload data bulk transfers.
U3V SI Payload FinalTransfer1 Size	Read only	the size of the Final Transfer 1 payload bulk transfer.
U3V SI Payload FinalTransfer2 Size	Read only	the size of the Final Transfer 2 payload bulk transfer.

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.

i	The event control function may differ by camera models.

Transfer Control

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

i	The specific parameters of transfer control may differ by device models.

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. ● Basic: In this mode, the device sends images to the client software directly after acquiring images. ● User Controlled: In this mode, the device saves images in its internal cache first, and then sends to the client software after acquiring images.
Transfer Passive Enable	Read & Write	The transfer passive node will be displayed if it is enabled. Note: ● You should select User Controlled as Transfer Control Selector first. ● Make sure that the device's Trigger Mode is On.
Transfer Operation Mode	Read & Write	It is the transfer operation mode: ● Single Block: Click Execute in Transfer Strat to let the device transfer one image each time. ● Multi Block: Click Execute in Transfer Strat to let the device transfer multiple images in cache.
Transfer Queue Max Block Count	Read Only	It displays the max. image quantity that the device's memory can save before the compression.
Transfer Queue Current Block Count	Read Only	It displays current image quantity saved by the memory.
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.

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.

Camera Parameter Index

Attribute	Parameter	Section
Device Control	Device Type	Device Control
	Device Scan Type	
	Device Vendor Name	
	Device Model Name	
	Device Manufacturer Info	
	Device Version	
	Device Firmware Version	
	Device Serial Number	
	Device User ID	
	Maximum Device Response Time	
	Device Manifest Table Address	
	Device SBRM Address	
	Device Timestamp	
	Device Timestamp Latch	
	Device Timestamp Increment	
	Device Protocol Endianess	
	Device Implementation Endianess	
	Device Uptime(s)	
	Board Device Type	
	USB Speed Mode	
	Device Connection Status	
	Device Link Throughput Limit Mode	
	Device Link Throughput Limit(Bps)	
	Device Link Current Throughput	
	Device Command Timeout	
	Device Sensor Throughput Limit	
	Device Command Timeout	
	Device Stream Channel Count	
	Device Reset	

Camera Parameter Index

Attribute	Parameter	Section
Device Control	Device Temperature Selector	Device Control
	Device Temperature	
	Find Me	
	Device Max Throughput(Kbps)	
	Device PJ Number	
	HB Abnormal Monitor	
	HB Version	
Image Format Control	Width Max	Resolution and ROI
	Height Max	
	Region Selector	
	Width	
	Height	
	Offset X	
	Offset Y	
	Reverse X	Image Reverse
	Reverse Y	
	Pixel Format	Pixel Format
	Pixel Size	
	ADC Bit Depth	
	Super Bayer Enable	Super Bayer
	Image Compression Mode	Image High Bandwidth Mode
	High Bandwidth Mode	
	Test Pattern Generator Selector	Test Pattern
	Test Pattern	
	Binning Selector	Binning
	Binning Horizontal	
	Binning Vertical	
	Binning Mode	
	Decimation Horizontal	Decimation
	Decimation Vertical	
	Embedded Image Info Selector	Embedded Information in Image
	Frame Spec Info	
Acquisition Control	Acqusition Mode	Frame Rate
	Acquisition Start	
	Acqusition Stop	
	Acquisition Burst Frame Count	
	Acqusition Frame Rate	
	Acqusition Frame Rate Control Enable	
	Resulting Frame Rate	
	Overlap Mode	Overlap Mode

Camera Parameter Index

Attribute	Parameter	Section
Acquisition Control	Trigger Selector	Trigger Source
	Trigger Mode	
	Trigger Software	
	Trigger Source	
	Trigger Activation	
	Trigger Delay（μs）	External Trigger Mode
	Trigger Cache Enable	
	Sensor Shutter Mode	Global Shutter and Rolling Shutter
	Exposure Mode	Exposure Time Mode
	Exposure Time Mode	
	Exposure Time（μs）	
	Exposure Auto	
	Auto Exposure Time Lower Limit （μs）	
	Auto Exposure Time Upper Limit （μs）	
	HDR Enable	HDR
	HDR Selector	
	HDR Shutter(us)	
	HDR Gain	
Analog Control	Preamp Gain	Analog Gain
	Gain(dB)	
	Gain Auto	
	Auto Gain Lower Limit	
	Auto Gain Upper Limit	
	Digital Shift	Digital Gain
	Digital Shift Enable	
	Brightness	Brightness
	Black Level	Black Level
	Black Level Enable	
	Balance White Auto	
	AWB Color Temperature Mode	White Balance
	Balance Ratio Selector	
	Balance Ratio	
	Gamma	Gamma
	Gamma Selector	
	Gamma Enable	
	Sharpness	Sharpness
	Sharpness Enable	
	Digital Noise Reduction Mode	Digital Noise Reduction
	Denoise Strength	
	Noise Correct	

Camera Parameter Index

Attribute	Parameter	Section
Analog Control	Contrast Ratio	Contrast Ratio
	Contrast Ratio Enable	
	Auto Function AOI Selector	AOI
	Auto Function AOI Width	
	Auto Function AOI Height	
	Auto Function AOI Offset X	
	Auto Function AOI Offset Y	
	Auto Function AOI Usage Intensity	
	Auto Function AOI Usage White Balance	
Color Transformation Control	Color Transformation Selector	Color Transformation Control
	Color Transformation Enable	
	Color Transformation Value Selector	
	Color Transformation Value	
	Hue	Hue
	Hue Enable	
	Saturation	Saturation
	Saturation Enable	
Super Palette Control	Super Palette Enable	Super Palette Control
	Super Palette Selector	
	Super Palette Hue	
	Super Palette Saturation	
LUT Control	LUT Selector	LUT
	LUT Enable	
	LUT Index	
	LUT Value	
	LUT Save	
Shading Correction	Shading Selector	Shading Correction
	Activate Shading	
	NUC Enable	
	FPNC Enable	
	PRNUC Enable	
	LSC Enable	
Digital IO Control	Line Selector	I/O Output
	Line Mode	
	Line Inverter	
	Line Status	
	Line Status All	
	Line Debouncer Time（μs）	
	Line Source	
	Strobe Enable	

Camera Parameter Index

Attribute	Parameter	Section
Digital IO Control	Strobe Line Duration（μs）	I/O Output
	Strobe Line Delay（μs）	
	Strobe Line Pre Delay（μs）	
Counter And Timer Control	Counter Selector	Counter Trigger
	Counter Event Source	
	Counter Reset Source	
	Counter Reset	
	Counter Value	
	Counter Current Value	
Sequencer Control	Sequencer Mode	Sequencer Control and HDR
	Sequencer Configuration Mode	
	Sequencer Feature Selector	
	Sequencer Set Total Number	
	Sequencer Set Selector	
	Sequencer Set Load	
	Sequencer Set Save	
	Sequencer Set Active	
	Sequencer Restart	
Event Control	Event Selector	Event Control
	Event Notification	
Transport Layer Control	Payload Size	Transport Layer Control
	GenCP Version Major	
	GenCP Version Minor	
	U3V Version Major	
	U3V Version Minor	
Transport Layer Control	U3VCP SIRM Available	Transport Layer Control
	U3VCP EIRM Available	
	U3VCP IIDC2 Available	
	U3V Max Command Transfer Length	
	U3V Max Acknowledge Transfer Length	
	U3V Number Of Stream Channels	
	U3V SIRM Address	
	U3V SIRM Length	
	U3V EIRM Address	
	U3V EIRM Length	
	U3V Current Speed	
Stream Control	U3V SI Payload Transfer Size	U3V protocol control
	U3V SI Payload Transfer Count	
	U3V SI Payload FinalTransfer1 Size	
	U3V SI Payload FinalTransfer2 Size	

Camera Parameter Index

Attribute	Parameter	Section
Transfer Control	Transfer Control Selector	Transfer Control
	Transfer Passive Enable	
	Transfer Operation Mode	
	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	Save and Load User Set
	User Set Selector	
	User Set Load	
	User Set Save	
	User Set Default	

Trouble Shooting

Trouble:

■ No camera found when running the iDatum

Possible Reason1: Camera is not started up normally
Solution1: Check camera power wiring and check driver installation.Reinstall iDatum or USB3.0 driver.
Possible Reason2: USB cable connection error
Solution2: Observe the LED indicator and check cable connection.

■ Camera connection error

Possible Reason1: The software is not installed correctly, and the USB3.0 driver is not installed successfully
Solution1: Check driver installation.Reinstall iDatum or USB3.0 driver.
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.

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@visiondatum.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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