Hangzhou Hikrobot Technology Co., Ltd.

XoFLink Area Scan Camera

User Manual

HIKROBOT

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Symbol Conventions

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

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

Available Model

This manual is applicable to the XoFLink area scan camera.

Contact Information

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Contents

Chapter 1 Safety Instruction

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

1.1 Safety Claim

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

1.2 Safety Instruction

⚠**Caution**:

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

- It is strictly forbidden to wire, maintain, and disassemble the device is powered on. Otherwise, there is a danger of electric shock.
- If the device emits smoke, odor or noise, please turn off the power and unplug the power cord immediately, and contact the dealer or service center in time.
- It is strictly forbidden to touch any terminal of the device when operating it. Otherwise, there is a danger of electric shock.
- It is strictly forbidden for non-professional technicians to detect signals during device operation; otherwise, it may cause personal injury or device damage.
- It is strictly forbidden to maintain the device is powered on, otherwise there is a danger of electric shock.
- Avoid aiming the lens at strong light (such as lighting, sunlight, or laser beams, etc.); otherwise, the image sensor will be damaged.
- If it is necessary to clean the device, use a damp paper towel or a soft clean cloth to moisten a little pure water, gently wipe off the dust, and do not use alcohol-based corrosive solutions. Make sure to power off the device and unplug the power socket when cleaning.
- Keep clean of the device's image acquisition window. It is recommended to use cleaning water to wipe off the dust.
- If the device does not work properly, please contact your dealer or the nearest service center. Never attempt to disassemble the device yourself (we shall not assume any responsibility for problems caused by unauthorized repair or maintenance).
- Caution: If the device has battery, risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.
- Please dispose of the device in strict accordance with the relevant national or regional regulations and standards to avoid environmental pollution and property damage.

Note:

- Check whether the device's package is in good condition, whether there is damage, intrusion, moisture, deformation, etc. before unpacking.
- Check the surface of the device and accessories for damage, rust, bumps, etc. when unpacking.
- Check whether the quantity and information of the device and accessories are complete after unpacking.
- Store and transport the device according to the storage and transport conditions of the device, and the storage temperature and humidity should meet the requirements.
- It is strictly prohibited to transport the device in combination with items that may affect or damage the device.
- Quality requirements for installation and maintenance personnel:
  - Qualification certificate or working experience in weak current system installation and maintenance, and relevant working experience and qualifications. Besides, the personnel must possess the following knowledge and operation skills.
  - The basic knowledge and operation skills of low voltage wiring and low voltage electronic circuit connection.
  - The ability to comprehend the contents of this manual.

- Please read the manual and safety instructions carefully before installing the device.
- Please install the device strictly according to the installation method in this manual.
- The case of the device may be overheated, and it needs to be powered off for half an hour before it can be touched.
- The device should not be placed with exposed flame sources, such as lighted candles.
- It is recommended to block the fiber port of the device and cables to avoid dust.

1.3 Electromagnetic Interference Prevention

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

Chapter 2 Cleaning Instruction

2.1 Device and Lens Cleaning

Four ways are available to clean the device and lens when they have dust or stains. Refer to the following table for different devices and their supported cleaning methods.

Table 2-1 Device and Cleaning Method

Device / Cleaning Method	Camera	Lens
Rubber Dust Air Blower	Support	Support
Mirror Brush Cleaning	Not Support	Support
Contact Cleaning	Support	Support
Lens Cleaning Paper	Not Support	Support

2.1.1 Rubber Dust Air Blower

You can use a rubber dusk air blower to clean the dust on the surface of the device filter and lens. The specific operation steps are as follows:

Steps

1. Blow the rubber dusk air blower downward several times to blow out the dust inside.
2. Hold the device or lens and tilt it down so that the air blower port and the device lens are at an angle of 45 degrees.
3. Blow to clean the dust on the surface of the device filter and lens.

Figure 2-1 Cleaning by Rubber Dust Air Blower

Note

- Do not go too far into the device's lens mount and avoid direct contact with the dust glass when cleaning.
- It is strictly forbidden to blow the lens directly from the mouth, and avoid spattering saliva particles onto the glass surface, causing serious secondary pollution.

2.1.2 Mirror Brush Cleaning

If the dust on the surface of the lens cannot be cleaned by rubber dusk air blower, use a mirror brush to gently remove the dust on the surface of the lens.

Note

Do not touch the bristles directly with your hands.

2.1.3 Contact Cleaning

For the stubborn stains on device filter or lens surface, such as finger marks, liquid stains, etc., it is recommended to use a fat-free cotton swab or dust-free cloth with high purity alcohol to wipe clean. Take the fat-free cotton swab as an example, the specific operation steps are as follows:

Steps

1. Take a clean fat-free cotton swab, and dip it in proper amount of alcohol or cleaning liquid.

Note

Do not touch the head of the cotton swab by fingers.

2. Tilt the fat-free cotton swab about 60 degrees, resist the device filter or lens surface, clean from left to right, turn cotton swab over one side, and clean again from right to left.
3. Take another fat-free cotton swab that is not stained with alcohol or cleaning liquid and swipe the device filter or lens to absorb the remaining alcohol or cleaning liquid.
4. Check whether there is still a stain. If the stain changes position, repeat steps above, until the stain is cleaned.

Figure 2-2 Contact Cleaning

Note

If the stains on the lens cannot be wiped or clean, please clean by using lens cleaning paper. For specific operation steps, please refer to the next section.

2.1.4 Lens Cleaning Paper

For lens stains that cannot be cleaned by a fat-free cotton swab or dust-free cloth, use lens cleaning paper to clean them.

Before You Start

- Use lens paper purchased from a regular, professional photography store.
- Use freshly opened lens cleaning paper in a wet state.
- Make sure there is no hard dust on the lens.

Tear off the outer package of the lens cleaning paper, fold the pre-moistened paper to a suitable wiping state, and slowly spiral wipe it in the same direction from the center of the lens outward.

Figure 2-3 Cleaning by Lens Cleaning Paper

Note

- Do not use hard paper, paper towels, or napkins to clean the lens. These products contain scratching wood pulp, which will seriously damage delicate coating on the lens.
- Do not press the lens surface hard when cleaning it the lens cleaning paper. Otherwise, the fragile coating on the lens surface will be wiped off.

After completing the lens cleaning, no dust or water stains should be visible from all directions on the lens. If stains still exist, please contact us to return the device for cleaning.

2.2 Device Housing Cleaning

When cleaning the device, try to clean it in a closed room to avoid a large amount of dust in the environment. The specific operation steps are as follows:

Steps

1. Disconnect the device's power supply.
2. Take a soft lint-free cloth that will not cause static electricity during cleaning and soak it with a neutral detergent.
3. Wipe the device's housing with a soaked, lint-free cloth as appropriate.
4. Wait for the residual moisture to evaporate after wiping. When the moisture has completely evaporated, you can reconnect the device to the power supply.

Note

Do not use compressed air to accelerate evaporation.

After inspecting and confirming that the device lens and its housing are cleaned, install the device lens cap with the mount facing downwards, or store the lens properly.

Chapter 3 Overview

3.1 Introduction

The XoFLink area scan camera supports the XoFLink protocol. It adopts QSFP+ ports to transmit non-compressed images in real time. Parameters can be set via the MVS client software or SDK. The image acquisition process is realized via its matched 50 Gbps fiber port frame grabber and QSFP+ optical module.
The camera is applicable to PCB AOI, 3D applications, electronic semiconductor, motion capture, and other industries.

3.2 Key Feature

- Supports auto or manual adjustment of gain, exposure time, manual adjustment of LUT, and Gamma correction, etc.
- Supports the hardware trigger, software trigger, free run, etc.
- Supports data transmission through 50 Gbps fiber port and multiple Link transmission.
- Compatible with the XoFLink protocol, and supports secondary development.

Note

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

3.3 Operating Principle

The onboard block diagram of the device is shown below. After the image sensor receives the image data, it completes the image data processing through various built-in ISP image-processing algorithms, and finally completes the high-speed transmission of image data through the XoFLink protocol.

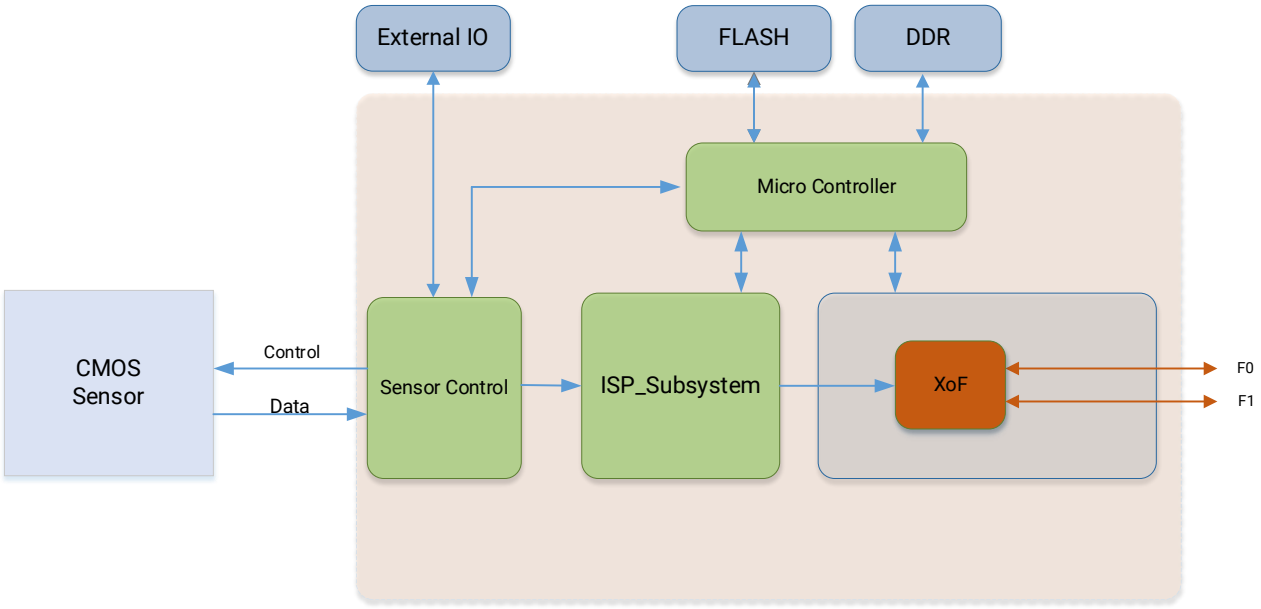


Figure 3-1 Operating Principle

Chapter 4 Device Hardware

4.1 Appearance

Refer to the figure below for device appearance and the table below for component description.

Note

- The device's appearance may differ by device models. The image below is for reference only. For specific appearance and dimension, please refer to the device's specification for details.
- The appearance is subject to change, and the actual device you purchased shall prevail.

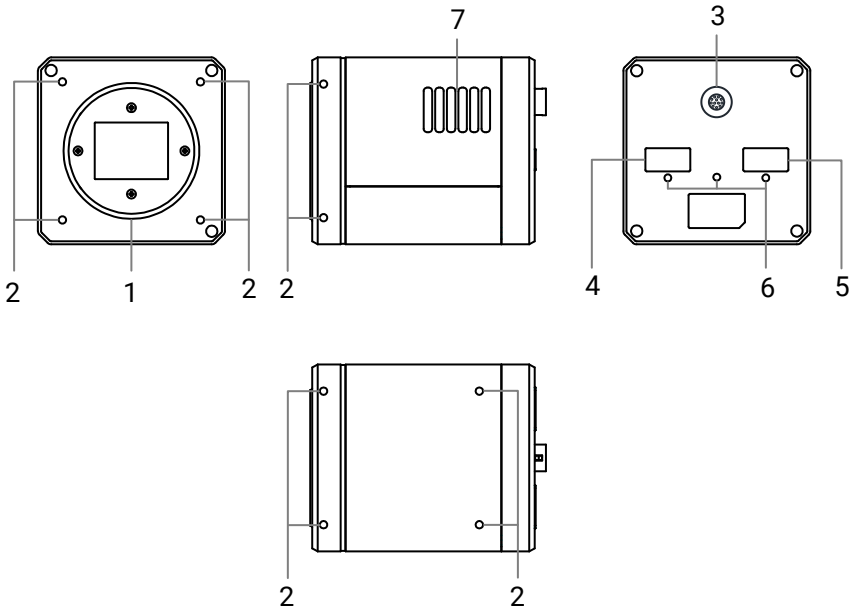


Figure 4-1 Appearance

Table 4-1 Component Description

No.	Component	Description
1	Lens Mount	It is used to install the lens. Refer to the device's specification for specific lens mount information.
2	Screw Hole	It is used to fix the device to the installation position. Refer to the device's specification for specific screw information.
3	Power and I/O Connector	It provides power supply, input/output signal and serial port function. Refer to section ***Power and I/O Connector*** for details.

No.	Component	Description
4	F0 Interface	It is the first XoFLink fiber port for transmitting data. The data interface is QSFP+ port.
5	F1 Interface	It is the second XoFLink fiber port for transmitting data. The data interface is QSFP+ port.
6	LED Indicator	The device has two kinds of indicators, including device LED indicator and fiber port LED indicator. Refer to section ***Indicator*** for details.
7	Cooling Fan	It is used to cool the device to ensure its normal operation.

4.2 Power and I/O Connector

The device has a 12-pin P10 connector serving as the power and I/O connector that provides power supply, input/output signal and serial port function, as shown below.

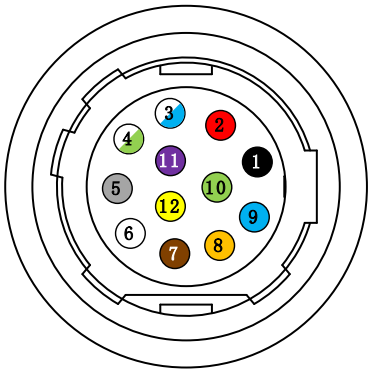


Figure 4-2 12-Pin P10 Connector

Note

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

Table 4-2 Pin Definitions of 12-Pin P10 Connector

No.	Color	Signal	I/O Signal Source	Description
1	Black	GND	Line 2-	Device power supply ground
2	Red	DC_PWR	--	Device power supply
3	White/Blue	DC_PWR	--	Device power supply

No.	Color	Signal	I/O Signal Source	Description
4	White/Green	OPT_IN-	Line 0-	Opto-isolated input signal ground
5	Gray	OPT_OUT-	Line 1-	Opto-isolated output signal ground
6	White	GND	--	Device power supply ground
7	Brown	GND	--	Device power supply ground
8	Orange	232_RXD	--	RS-232 receives
9	Blue	232_TXD	--	RS-232 transmits
10	Green	GPIO2	Line 2+	Input or output
11	Purple	OPT_OUT+	Line 1+	Opto-isolated output
12	Yellow	OPT_IN+	Line 0+	Opto-isolated input

4.3 Indicator

The device has two kinds of indicators, including device LED indicator and fiber port LED indicator. The device LED indicator indicates the device's operation status, and fiber port LED indicator indicates the connection status between the fiber patch cable and the device.

Table 4-3 Definitions of Indicator

No.	Status	Description of Indicator
1	Unlit	It stays unilluminated.
2	Solid	It stays illuminated.
3	Flashing rapidly	Its unlit interval is 0.2 sec.
4	Flashing slowly	Its unlit interval is 1 sec.
5	Flashing very rapidly	Its unlit interval is 0.08 sec.

4.3.1 Device LED Indicator

Refer to the table below for device LED indicator description.

Table 4-4 Device LED Indicator Description

No.	Indicator Color	Status	Device Status Description
1	Red	Solid	The device exception occurs.
2	Blue	Solid	The device is in an idle status.
3	Blue	Unlit	The device is not powered on.

No.	Indicator Color	Status	Device Status Description
4	Blue	Flashing rapidly	The device is acquiring images in continuous mode.
5	Blue	Flashing slowly	The device is acquiring images in trigger mode.
6	Red and blue	Flash alternatively	The device is updating firmware.

4.3.2 Fiber Port LED Indicator

Refer to the table below for fiber port LED indicator description.

Table 4-5 Fiber Port LED Indicator Description

No.	Indicator Color	Status	Device Status Description
1	Unlit		● The device is not powered on. ● The device is powered on but the XoFLink fiber patch cable is not connected the frame grabber and the device.
2	Green	Solid	The device is connected but no data transmission.
3	Green	Flashing very rapidly	The device is acquiring images in continuous mode.
4	Orange	Flashing slowly	The device is acquiring images in trigger mode.

4.4 Lens

4.4.1 Lens Mount

The device supports standard M58-mount lenses. The thread depth of M58-mount lens is not less than 5 mm.

4.4.2 Lens Selection

In order to meet the image acquisition needs of industrial cameras, our company provides a variety of lenses with high performance, high definition, low distortion rate and other features. You should consider following factors when selecting a lens:

- Lens mount: The device supports standard M58-mount lenses. When selecting lens, select lens with the same mount. When the mount of the device and the lens are

different, part of the lens mounts may be switched using the corresponding adapter ring.
- Flange focus length: The flange focus length of different lenses is varied. It is necessary to select the lens with the matched flange focus length when selecting the lens.
- Sensor size: Make sure that the target surface of the lens is larger than or equal to the size of the device's sensor size.
- Resolution: It represents the ability of the lens to record the details of an object. It is generally measured in the number of line pairs that can be distinguished per millimeter: line pairs/millimeter (lp/mm). The higher the resolution of the lens, the clearer the image. Make sure that the accuracy required by the system is less than the resolution of the lens when selecting the lens.
- Working distance: The distance from the first working surface of the lens to the measured object. Make sure that the working distance is greater than the minimum object distance of the lens when selecting a lens.
- Focal length: The distance from the center point of the lens to the clear image formed on the focal plane. The smaller the focal length value is, the larger the field of view of the image captured by the digital camera is. According to the focal length of the lens, the appropriate working distance can be set up, or the appropriate lens can be selected according to the requirements of the working distance.

Note

In order to better provide a suitable lens model, you can go to the official website of our company (***https://en.hikrobotics.com/***): **Products → Lens → Lens Selector** to enter your application parameters, and you will find a suitable lens model. If you have any problems, please contact our technical support.

4.5 Cable

4.5.1 Cable Selection

According to the cable performance, it can be divided into standard, flexible, high flexible and super flexible cables. You need to select cables according to different scenarios.
- Standard cable: It is applicable to static scenario only.
- Flexible cable: It can withstand 100,000 times of drag chain or bending movement.
- High flexible cable: It can withstand 5 million times of drag chain movement.
- Super flexible cable: It can withstand 10 million times of drag chain movement, 3 million times of bending movement or 5 million times of twisting movement.

4.5.2 Wiring Principle

Regarding the power and I/O cable and optical fiber patch cord, attention should be paid to the application requirements of scenarios such as high-frequency communication and high-frequency motion. In such scenarios, if the cables are arranged in an inappropriate

manner, various problems may be caused in use, such as cable skin wear, internal conductor breakage, and device packet loss. Based on the above situation, this section introduces the basic wiring principles and precautions of sports cables to help you install and use related products correctly and improve the overall healthy operating life of the system.

- The minimum bending radius of the chain rail during wiring should be controlled at more than 10 to 12 times the wire diameter (the larger the bending radius, the longer the cable movement life).
- Make sure that the cable does not spin in the chain rail, and the cable should be spread horizontally along the chain rail.
- If the cable is laid too tightly, the cable sheath and the chain rail will produce friction during the movement, which will cause the sheath to wear. Therefore, in the wiring process, the laying tension on the cable should be avoided.
- If the cable is fixed at the moving part of the chain rail, stress concentration will occur at the fixed position during the movement. Therefore, both ends of the cable can be fixed, but not at the middle moving section.
- Multiple cables may interfere with each other when moving in the chain rail. At this time, the chain rail with sufficient width should be selected to ensure that there is still a certain space after the cables are laid horizontally. The use of spacers is also an effective way to avoid interference. Note that there should also be at least 2 mm clearance between the spacer and the cable. Do not drain cables without spacers.
- Please keep the space factor occupied by the cable after laying within 30%, as shown below.

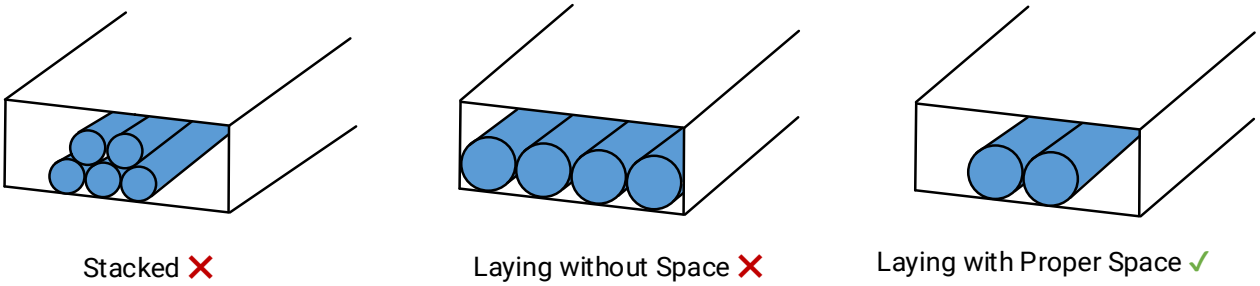


Figure 4-3 Cable Laying

- In the same chain rail, if there are cables with different thicknesses and diameters, the cables with small outer diameter are easily squeezed to the bottom by the cables with large outer diameter. In this case, use spacers for classification and isolation, as shown below.

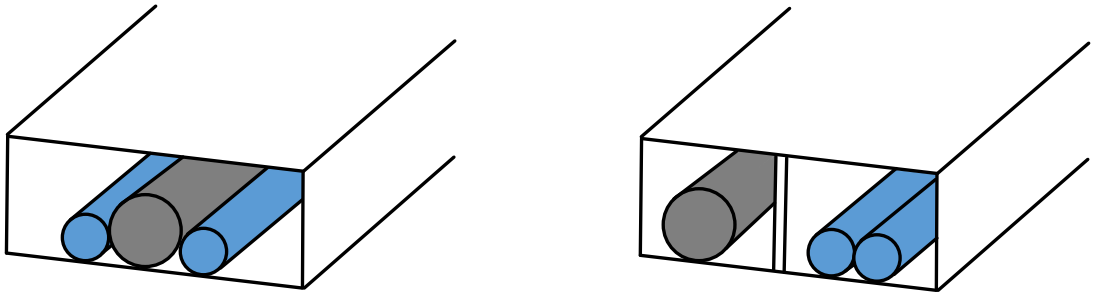


Figure 4-4 Isolated via Spacer

- If the wiring is in the same track as the hard object such as the air pipe, use a spacer to isolate it.
- If the chain rail is damaged, replace the chain rail and cable at the same time, because the damaged chain rail may aggravate the damage to the cable.
- Do not bend the cable vertically on the fixed point.

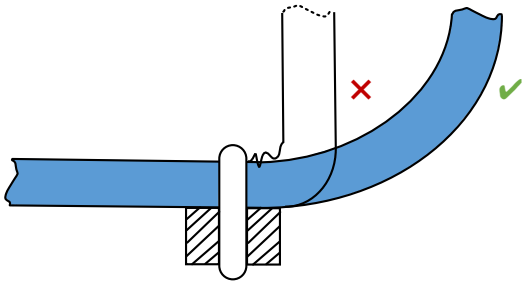


Figure 4-5 Vertically Bended Prohibited

- Make sure to reserve a suitable bending length for the cable.

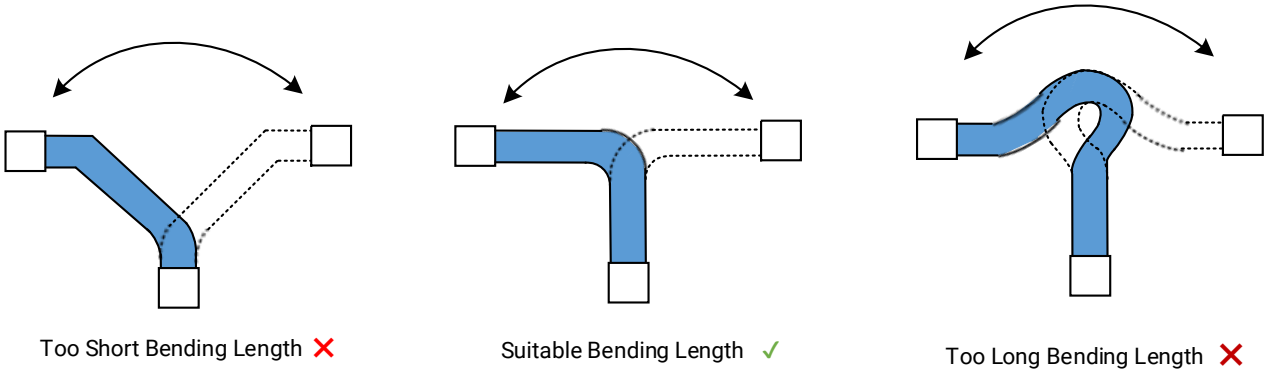


Figure 4-6 Suitable Bending Length

- Please keep a sufficient bending radius.

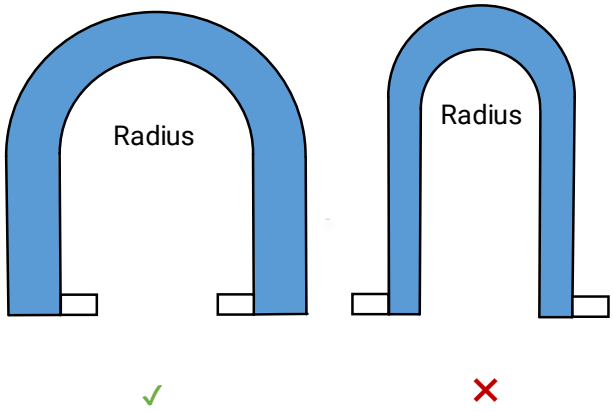


Figure 4-7 Sufficient Bending Radius

- When assembling the connector, please fix it on the connector net tail instead of the cable body.

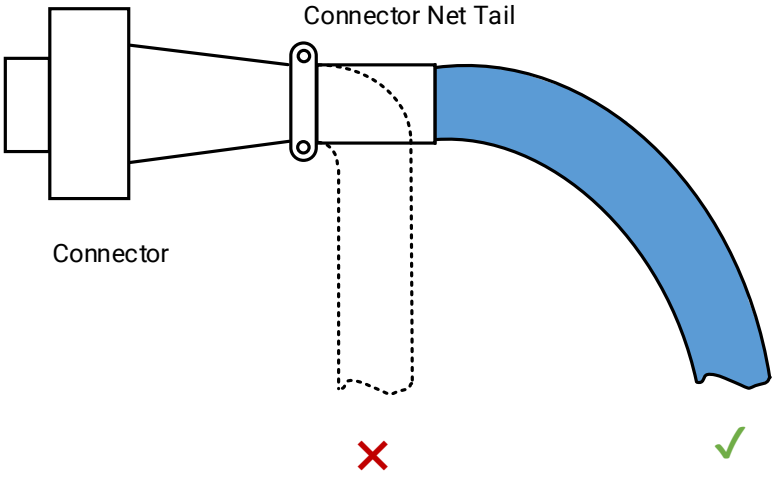


Figure 4-8 Assemble Connector

- Do not bind cables of different diameters together.

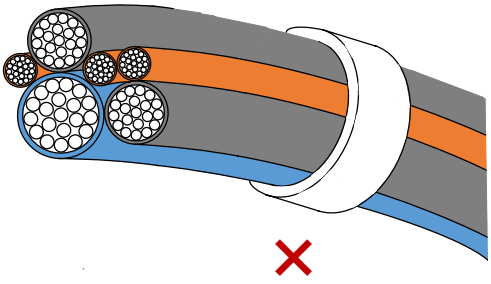


Figure 4-9 Improper Binding

Chapter 5 Power Supply and Heat Dissipation

5.1 Device Power Supply

The device provides only one way of power supply: external DC power supply.
Connect the external DC power supply to the I/O connector through the I/O cable to power the device. Refer to the device's label for the specific voltage range of power supply.

Note

- Using a DC power supply that exceeds the specified voltage range may cause damage or abnormal operation of the device.
- Inserting a connector that does not match the I/O connector may cause damage or abnormal operation of the device. Refer to section ***Power and I/O Connector*** for details.
- Do not short-circuit the power supply and ground.

You can use an industrial power supply to provide DC power supply for the device. When using it, please observe the following precautions:

- Before carrying out any installation or maintenance work, make sure that the power supply is disconnected from the AC power and that there is no risk of accidental reconnection due to human negligence or wiring issues.
- Do not install the power supply in a humid environment, near liquid, in high-temperature conditions, in direct sunlight, or near flame sources.
- The industrial power supply has exposed high-voltage terminals. Please install it in an enclosed case or cabinet to prevent accidental contact by personnel.
- Maintain sufficient insulation distance between the internal components of the power supply and the screws.
- Ensure that the cooling fan and holes for heat dissipation are unobstructed. If adjacent equipment generates heat, keep it at least 10 cm to 15 cm away from the power supply.
- Make sure the power supply is properly grounded before use.
- When using the power supply, do not exceed the upper limit of its output current and output power. Refer to the power supply's nameplate for specific parameters.
- Non-standard installations or using the power supply in high-temperature environments will increase the temperature of the internal components, potentially reducing output power.
- The power supply contains high-voltage circuits that pose a risk. If any abnormalities occur, disconnect the power first and have it inspected by a technician with professional electrical qualifications. Do not attempt to open the casing yourself.
- Avoid touching the power supply terminals within 5 minutes after the power has been cut off to prevent the risk of electric shock.

5.2 Heat Dissipation

The device contains photosensitive components, if the device's temperature rises, and it will have a certain impact on the quality of the acquired image. Based on the above situation, this section will introduce the temperature parameters and installation suggestions to achieve better heat dissipation effect and improve the image quality and reliability of the device.

5.2.1 Temperature Parameter

Working Temperature

The upper limit of the working environment temperature in the specification of device refers to the maximum ambient temperature that the device can meet without any additional heat dissipation measures. Running within the working temperature can meet the temperature requirements on the electronic components and ensure the reliable operation of the device.

The heat dissipation mode of the device is fan cooling, and the air inlet and outlet are shown in the first figure below. The monitoring point of the working environment temperature is 80 mm away from the air inlet as shown in the second figure below. In the space where the device and the temperature measuring point are located, there is no object in the middle and the temperature distribution is uniform.

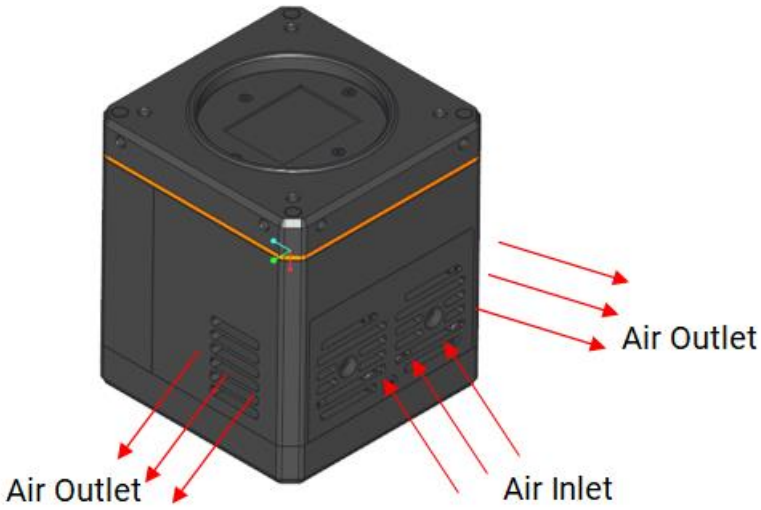


Figure 5-1 Air Inlet and Outlet of the Device

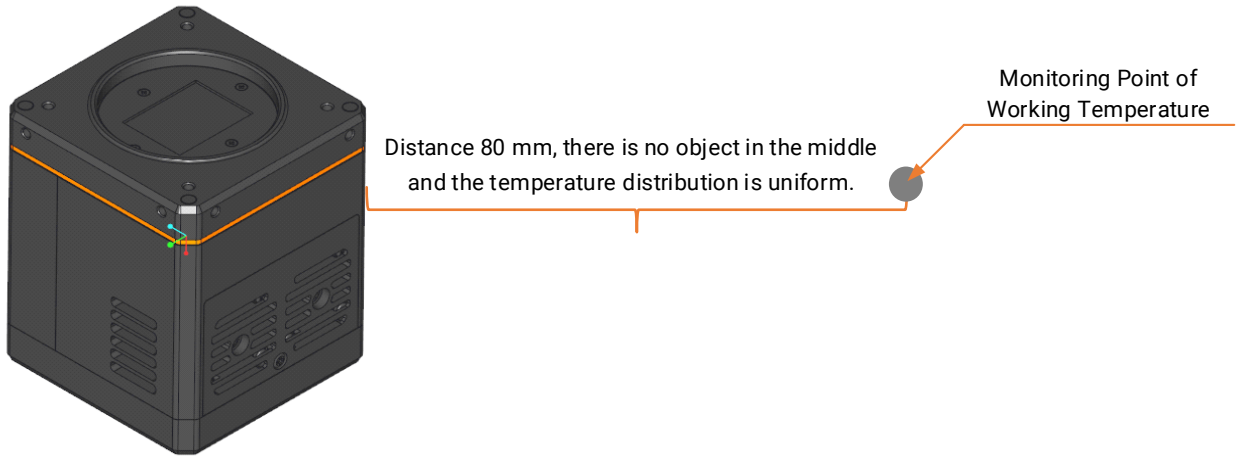


Figure 5-2 Monitoring Point of Working Temperature

Housing Temperature

Some components inside the device have done heat conduction measures to guide the heat to the housing to ensure that the temperature of the components meets the specification requirements, which also leads to a higher local temperature of the housing. Therefore, we often feel that the device's housing has a certain temperature, or feel hot, which is a normal phenomenon of device heat dissipation.

5.2.2 Heat Dissipation Measures

The temperature of the device's key components is a key factor affecting image quality, operation stability, and long-term reliability. Therefore, the correct installation is beneficial to the heat dissipation of the device, so as to obtain better image quality and reliability. This section will specify the requirements of the surrounding environment and installation parts.

Heat Dissipation via Cooling Fan

The device adopts cooling fans to realize heat dissipation. Thus, it is necessary to ensure that the device is installed in a well-ventilated environment, and avoid placing it in a closed environment that will affect the normal operation of the fan. The device should be installed away from the air inlet and outlet. As shown in the figure below, there should be no object within 100 mm around the air inlet and outlet of the device.

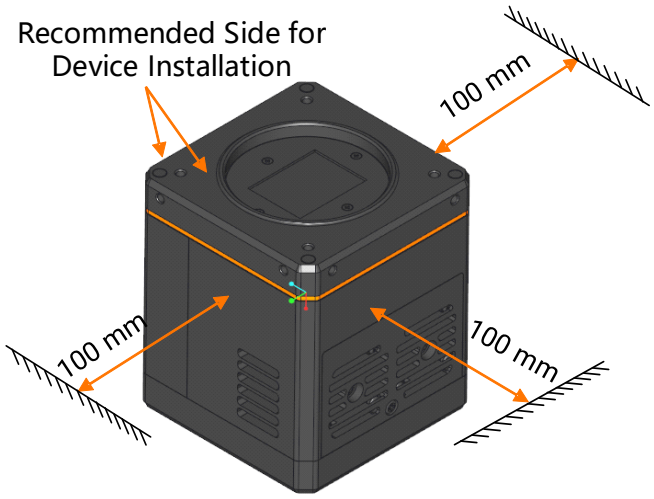


Figure 5-3 Surrounding Environment for Heat Dissipation

Heat Dissipation via Installation Part

Since most industrial cameras are fixed by the installation part, most of the heat can be guided to the metal mounting platform through the installation part during field installation, so as to dissipate the heat and greatly improve the heat dissipation efficiency of the device.

The heat discharged through the installation part depends on the heat conduction of the installation part itself and the installation method.

- **Installation Part Material**
  - Use materials with high heat conduction, such as aluminum and copper, which can quickly transfer heat away.
  - At the same time, it is best to fix the installation part on the mounting platform of metal material to conduct heat to the metal parts and dissipate it.
  - Minimize the use of materials with low heat conduction, such as plastic and rubber.
- **Installation Part Section**
  - Installation part with lower thickness is recommended.
  - Avoid using extended or bent installation parts.
- **Contact Area**
  - Surface contact should be used between the device, installation parts and the mounting platform, and the contact area between installation surfaces should be increased as much as possible to improve the heat dissipation of the device.
  - Avoid using point contact between the device, installation parts and the mounting platform.

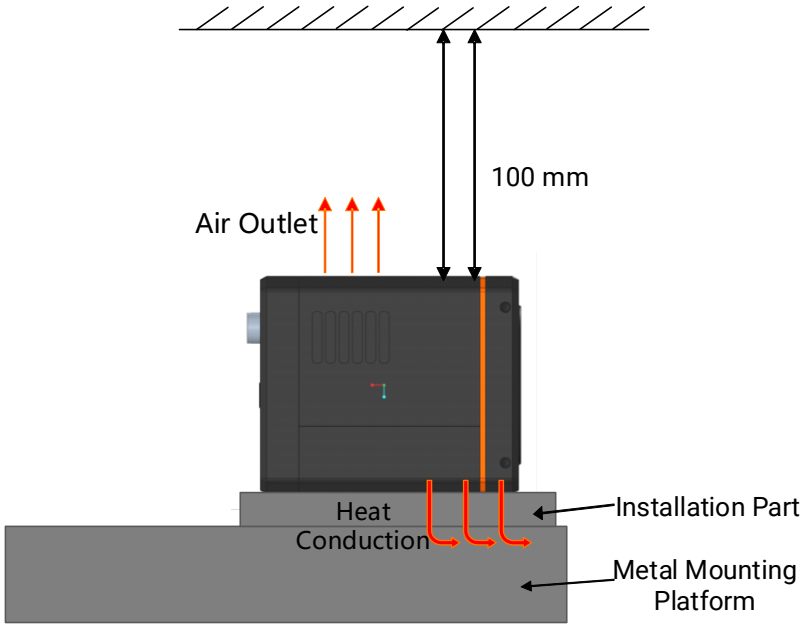


Figure 5-4 Heat Dissipation via Installation Part

If the installation part is made of plastic, rubber, or other materials with poor heat conduction, the application of ventilation equipment such as fans or air conditioners can increase the airflow over the device's surface. This reduces the ambient air temperature around the device, enhancing heat dissipation through convection and thereby reducing the temperature of housing. As a result, the image quality and reliability of the device are improved.

Chapter 6 Quick Start Guide

The overall workflow of using the device is shown below:

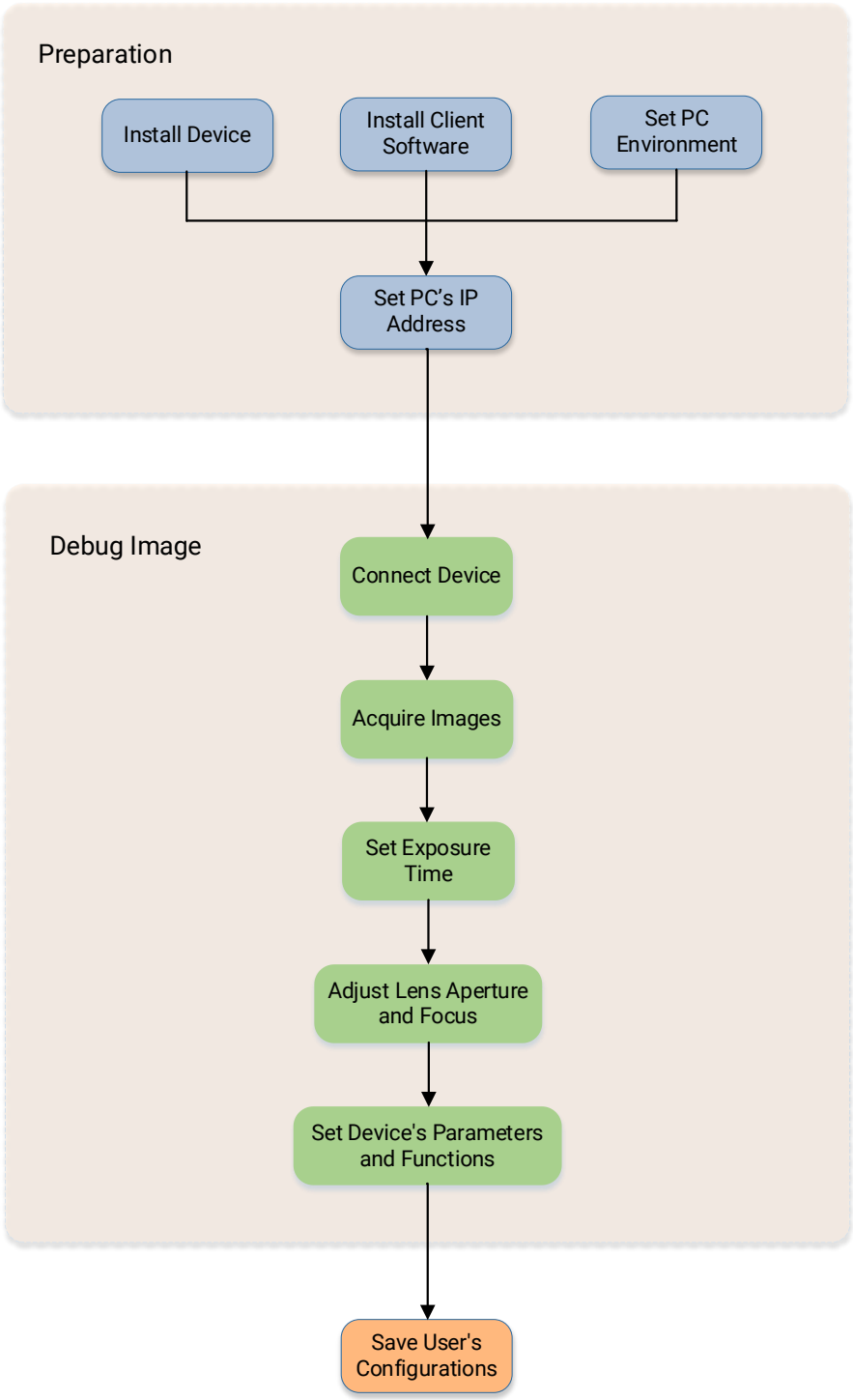


Figure 6-1 Workflow

6.1 Install Device

6.1.1 Installation Preparation

You need to prepare following accessories before device installation.

Table 6-1 Accessories

No.	Name	Quantity	Description
1	Power and I/O Cable (Required)	1	It refers to the 12-pin power and I/O cable. You need to purchase separately.
2	DC Power Supply (Required)	1	You should select suitable power adapter or power supply according to the power supply and consumption on the device' specifications. You need to purchase separately.
3	Frame Grabber (Required)	2	It refers to the 50 Gbps fiber port frame grabber. You need to purchase separately.
4	Optical Module (Required)	4	The device needs optical module to convert the electrical signal to an optical signal. You need to purchase optical modules for the device and the fiber port frame grabber separately according to the required quantity. **Note** The device and frame grabbers should be equipped with optical modules of the same model to ensure compatibility.
5	Optical Fiber Patch Cord (Required)	2	You can use 2 optical fiber patch cords to transmit data. You need to purchase separately. **Note** The length of 2 optical fiber patch cords should be the same.
6	Lens (Required)	1	It refers to the lens that is suitable for the device. You need to purchase separately.

No.	Name	Quantity	Description
7	Adapter Ring (Optional)	1	If the lens you used does not match with lens mount of the device, you need to use an adapter ring. You need to purchase separately.

Note

- The device mentioned in this manual is an electronic product that requires operation and storage under dry conditions. In case of hot and humid, acidic and alkaline environment, please take isolation and protection measures to avoid corrosion damage of the device's internal components.
- Refer to the specifications of devices for corresponding models of frame grabber, XoF optical module, and XoF optical fiber patch cord, which need to be purchased separately.
- When using the lens, it is necessary to prevent humid environment and avoid steam from entering inside, causing fogging.

6.1.2 Install Device

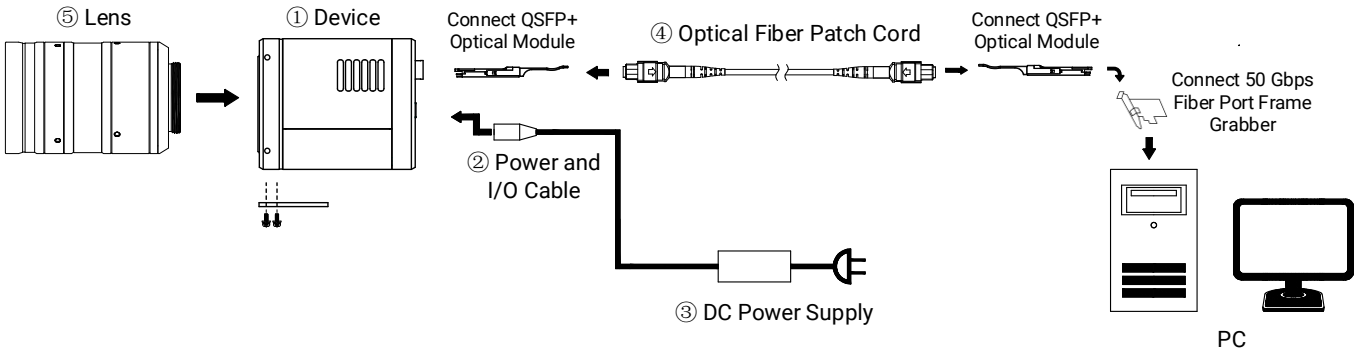


Figure 6-2 Topology Diagram

Before You Start

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

Steps

1. Fix the device to the installation position, and install the lens to the device.

Note

When fixing the device to the installation position, measures such as heat dissipation via the installation part or heat dissipation via the cooling fan can be taken to improve the heat dissipation efficiency of the device. Refer to section ***Heat Dissipation*** for details.

2. Install one QSFP+ optical module to the 50 Gbps fiber port frame grabber.

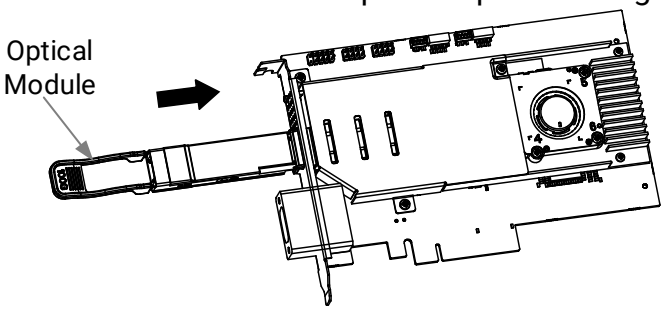


Figure 6-3 Install Optical Module to Frame Grabber

3. Install another QSFP+ optical module to the device.
4. Use a XoFLink optical fiber patch cord to connect two QSFP+ optical modules mentioned above. Upon hearing a "click" sound, it indicates that the connector of the optical fiber patch cord and the optical module have been successfully connected.

- Select the correct XoFLink optical fiber patch cord based on specifications for corresponding models.
- Data transmission will occur normally only when both XoFLink fiber ports are connected simultaneously.
- When using both fiber ports, the link configuration of the device is set to 8 Link 12.5 Gbps with total bandwidth of 100 Gbps. You can view and set the device's link configuration mode through the **LinkConfiguration** parameter found within the **XoFLink** attribute.

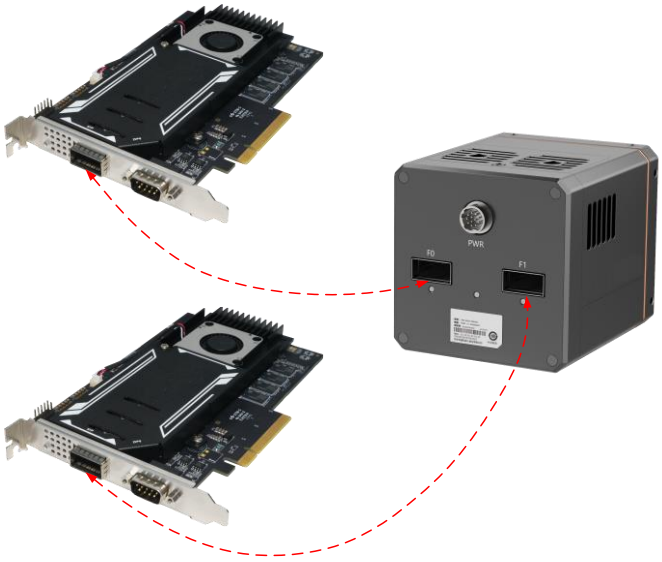


Figure 6-4 Install Device and Frame Grabber

5. Connect the device to a proper power adapter or power supply. For the definition of I/O connector, refer to section ***Power and I/O Connector*** for details.

6.2 Install MVS Client Software

MVS client software is used to connect and set device's parameters, and upgrade firmware. The MVS client version 3.4.0 or later supports access to XoFLink area scan cameras.

Note

- The MVS client software is compatible with 32/64-bit Windows XP/7/10, 64-bit Windows 11, 32/64-bit Linux, 64-bit MacOS, and Android 4.4 to 9.0 operating systems. Here we take Windows as an example.
- The graphic user interface may differ by different versions of client software you use. Please refer to the actual condition.
- The client software has integrated driver required by hardware, and no need to download and install other drivers.
- You can download the client software from ***en.hikrobotics.com***.

Steps

1. Double click the MVS installation package.
2. Select the language.
3. Read and check **Terms of the License Agreement**.

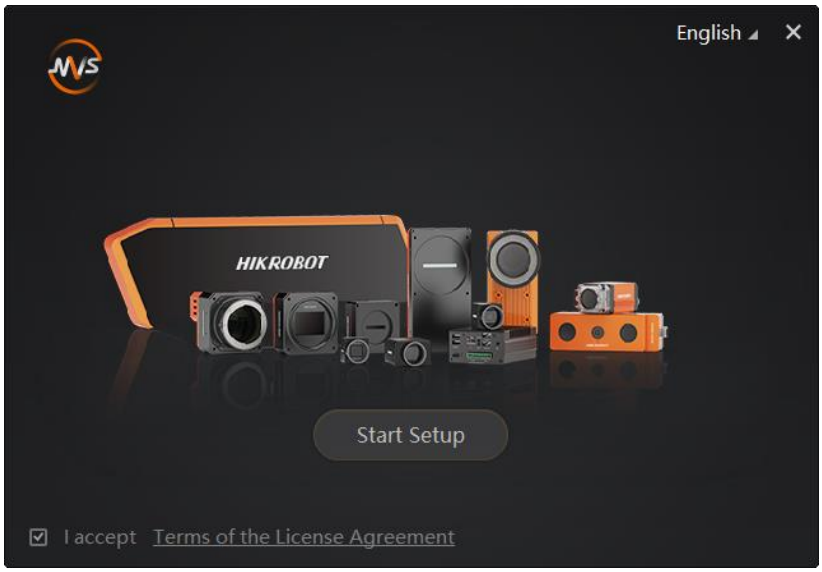


Figure 6-5 Installation Window

4. Click **Start Setup**.
5. Select installation directory, driver, and others.

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

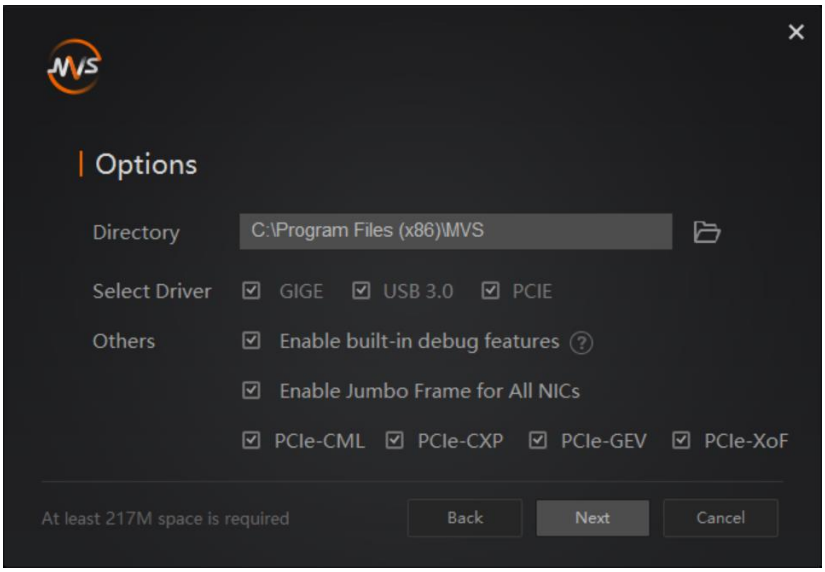


Figure 6-6 Installation Options

Note

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

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

6.3 Basic Operation of MVS Client Software

Steps

Note

Refer to the user manual of the device and client software for detailed operations.

1. Run the MVS client software.
2. Click in **GenTL** in device list, and select **Default Load** or **Import CTI File** to load CTI file.

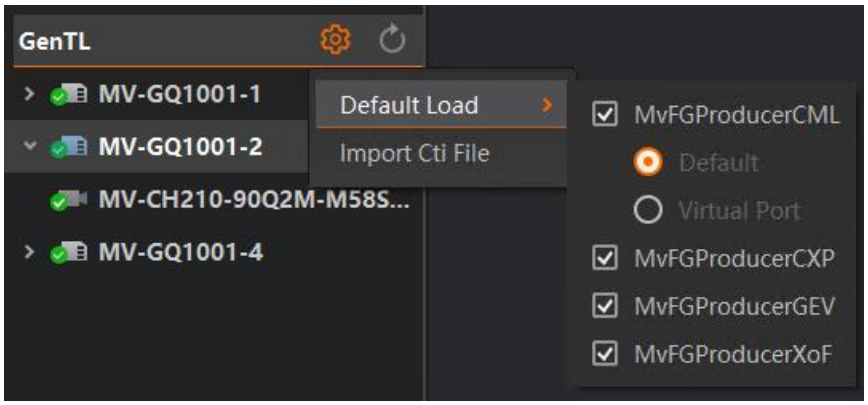


Figure 6-7 Select CTI File

- If you select **Default Load**, check **MvFGProducerXoF** and the client software will enumerate the frame grabber automatically.
- If you select **Import CTI File**, select **MvFGProducerXoF.cti** file from the local PC, and click **Open**.

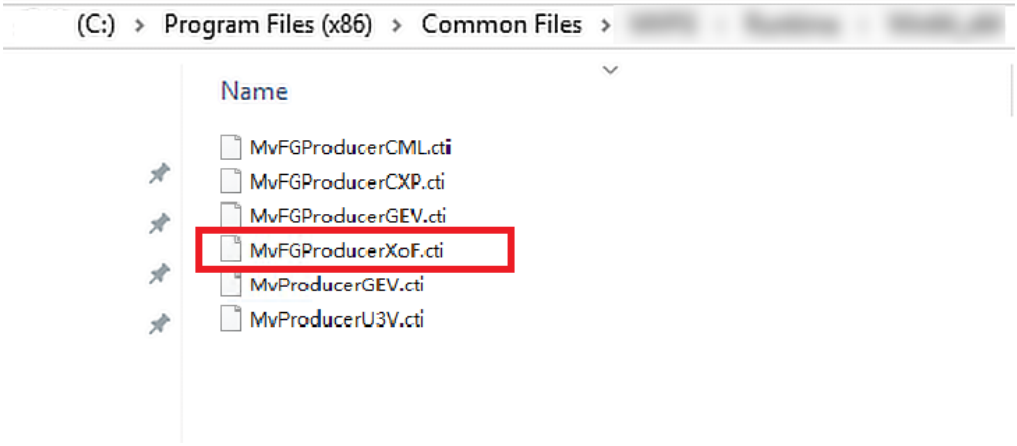


Figure 6-8 Load GenTL Library

Note

- The SDK file path for the GenTL standard library is C:\Program Files (x86)\CommonFiles\MVS\Runtime.
- The CTI file is divided into 32-bit and 64-bit, please select according to actual needs. The 32-bit CTI file path is located: C:\Program Files (x86)\Common Files\MVS\Runtime\Win32_i86. The 64-bit CTI file path is located: C:\Program Files (x86)\CommonFiles\MVS\Runtime\Win64_x64.

3. Click in the specific frame grabber name to connect it. The client software will enumerate and connect devices under the frame grabber automatically.

Figure 6-9 Connect Device under Frame Grabber

Note

The image is for reference only.

The client software displays the device's information after connecting, as shown below.

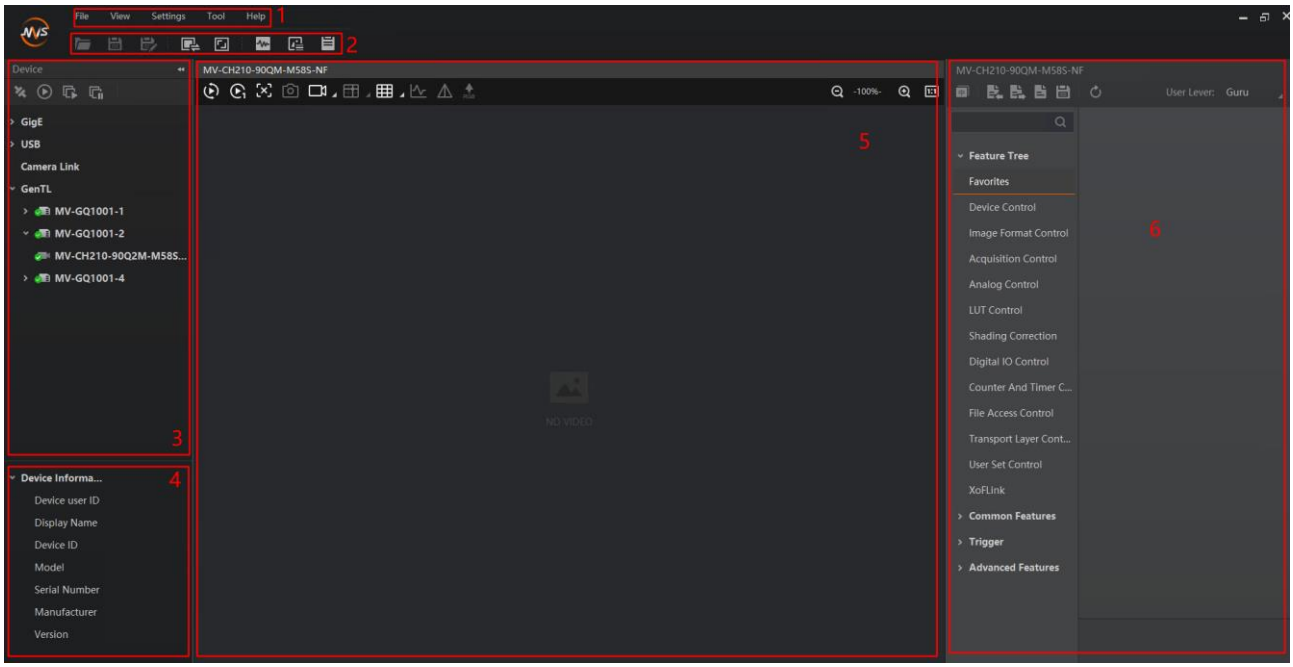


Figure 6-10 Main Window

Note

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

Table 6-2 Main Window Description

No.	Name	Description
1	Menu Bar	The menu bar displays function modules, including **File**, **View**, **Settings**, **Tool**, and **Help**.
2	Control Toolbar	The control toolbar provides quick operations for the device.
3	Device List Panel	This panel displays device list, and you can connect or disconnect device.

No.	Name	Description
4	Device Information Panel	This panel displays the detailed information of connected device.
5	Display Window	This area displays the acquired images in real-time.
6	Feature Panel	This panel displays the device's parameters, and you can configure them according to actual demands.

4. Click in the display window to acquire images continuously.
5. Set the device's pixel format, exposure time, etc., in the feature panel.
6. Adjust the device's aperture and focus to have clear images.
7. (Optional) Set the device's other parameters in the feature panel.

Note

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

Chapter 7 I/O Electrical Features and Wiring

7.1 I/O Electrical Features

7.1.1 Electrical Features of Input Signal

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

Note

- The maximum input current of Line 0 is 25 mA.
- Make sure that the input voltage is not from 1 VDC to 3.3 VDC as the electric status between these two values are not stable.
- The breakdown voltage is 30 VDC. Keep voltage stable.

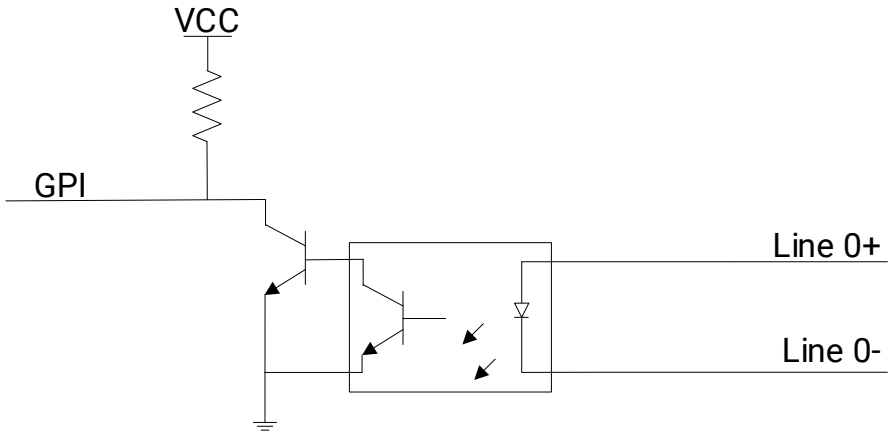


Figure 7-1 Internal Circuit of Input Signal

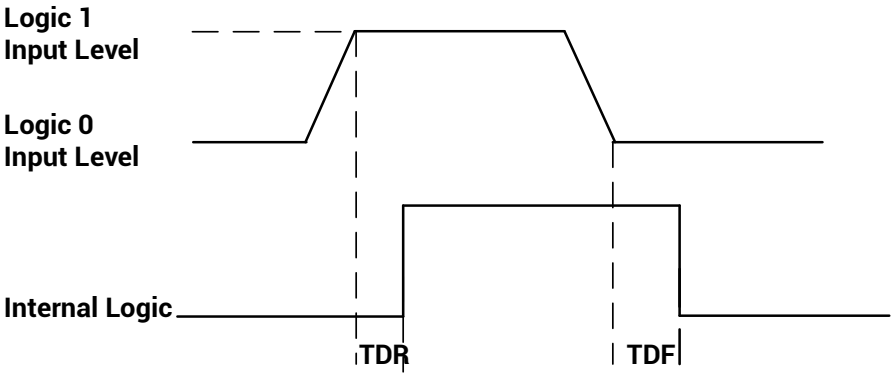


Figure 7-2 Input Logic Level

The electrical feature of opto-isolated input (Line 0) is as follows.

Table 7-1 Input Electrical Feature

Parameter Name	Parameter Symbol	Value
Input Logic Level Low	VL	0 VDC to 1 VDC
Input Logic Level High	VH	3.3 VDC to 24 VDC
Input Rising Delay	TDR	1.8 μs to 4.6 μs
Input Falling Delay	TDF	16.8 μs to 22 μs

7.1.2 Electrical Features of Output Signal

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

Note

The maximum output current of Line 1 is 25 mA.

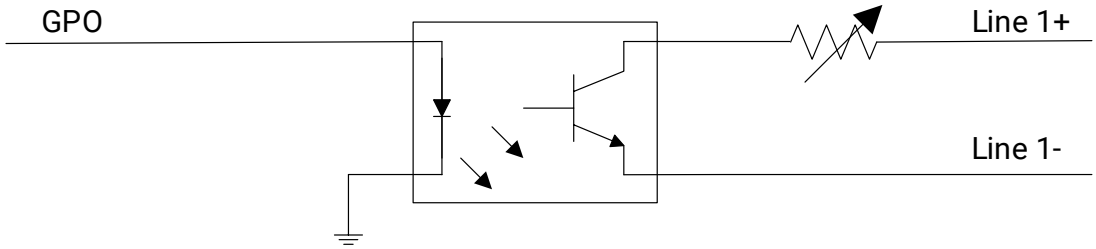


Figure 7-3 Internal Circuit of Output Signal

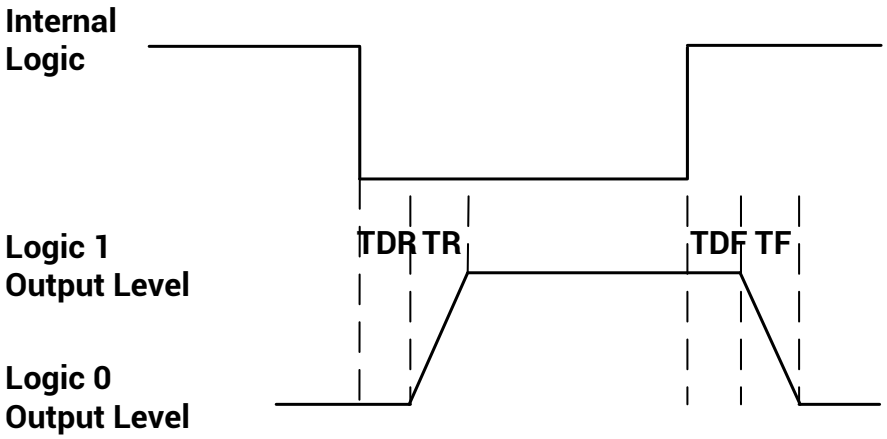


Figure 7-4 Output Logic Level

The electrical features of opto-isolated output when the external voltage is 3.3 VDC and the external resistance is 1 KΩ is shown below.

Table 7-2 Output Electrical Feature

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

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

Table 7-3 Parameters of Output Logic Level Low

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

7.1.3 Electrical Features of Bi-Directional Signal

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

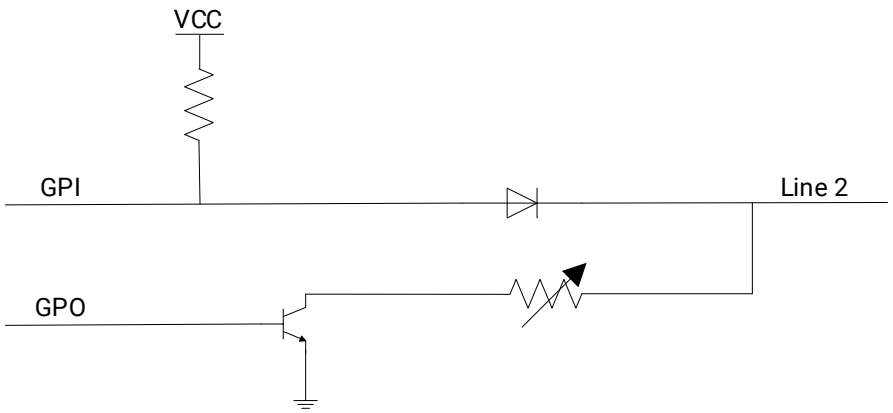


Figure 7-5 Internal Circuit of Bi-Directional Signal

Configured as Input Signal

Note

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

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

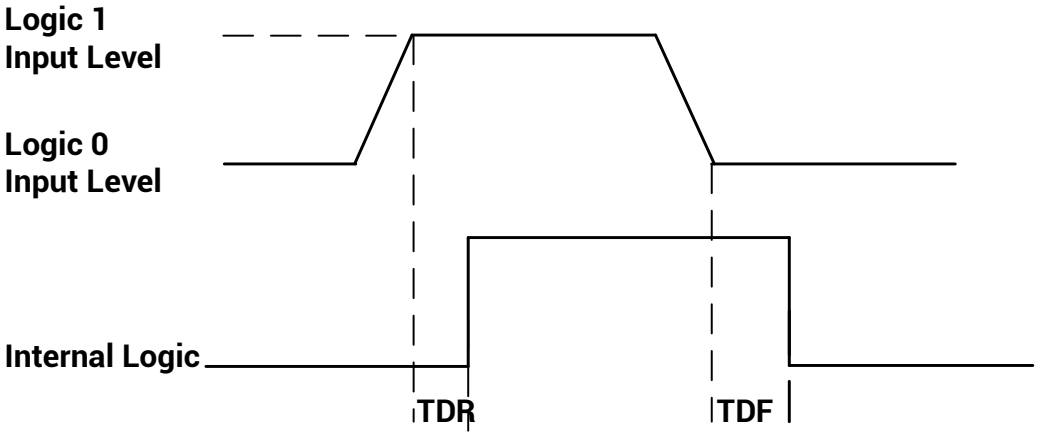


Figure 7-6 Input Logic Level

Table 7-4 Input Electrical Feature

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

Configured as Output Signal

Note

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

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

Table 7-5 Parameters of Output Logic Level Low

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

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

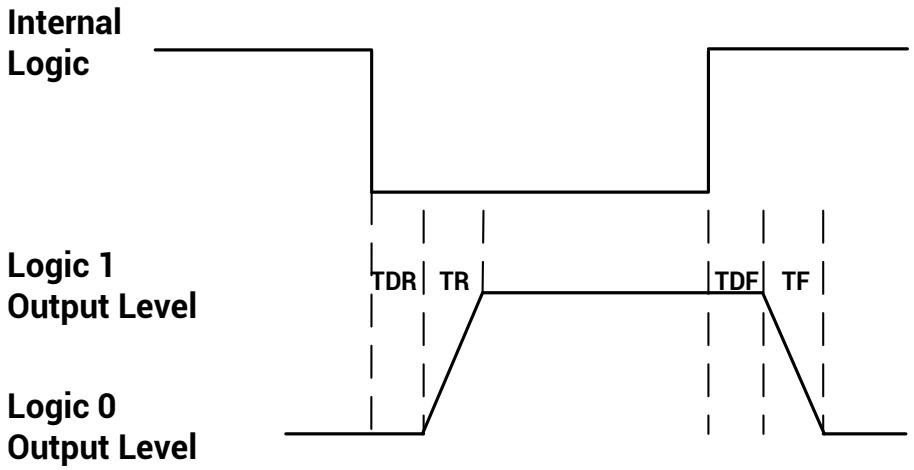


Figure 7-7 Output Logic Level

Table 7-6 Output Electrical Feature

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

7.1.4 Factors Affecting Transmission Delay of I/O Lines

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

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

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

Regarding the factors that affect the transmission delay of I/O lines in the table above, we provide the following explanations and suggestions:

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

7.2 I/O Wiring

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

Note

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

7.2.1 Input Signal Wiring

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

Note

Input signal wiring may differ by the external device type.

PNP Device

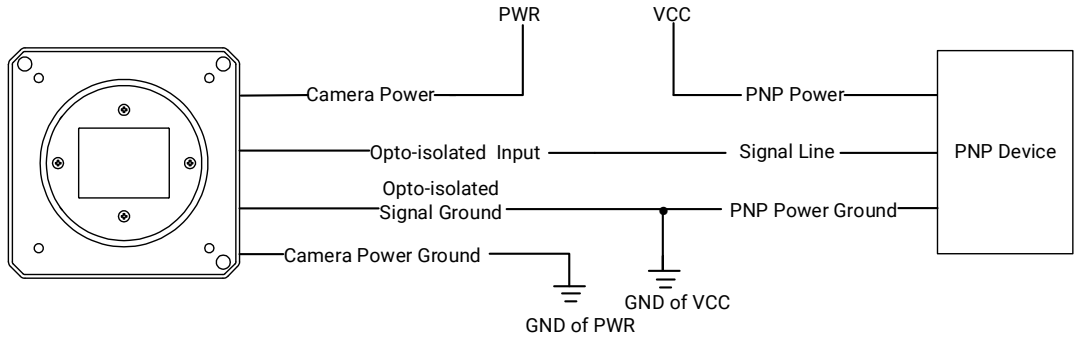


Figure 7-8 Input Signal Connects to PNP Device

NPN Device

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

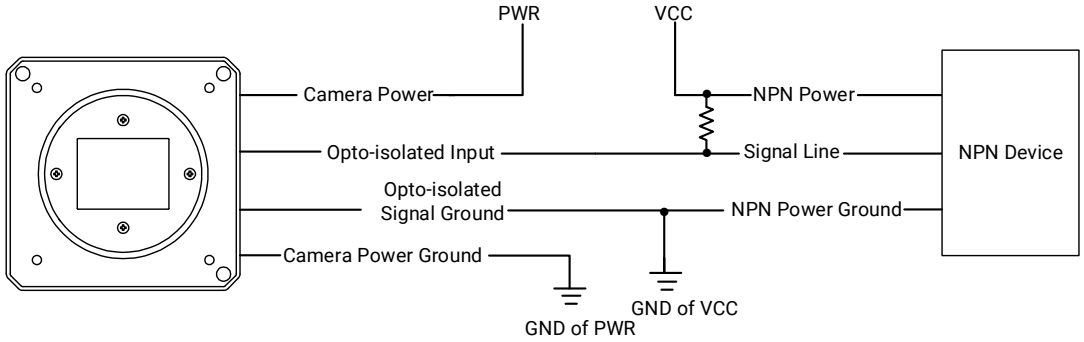


Figure 7-9 Input Signal Connects to NPN Device

Switch

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

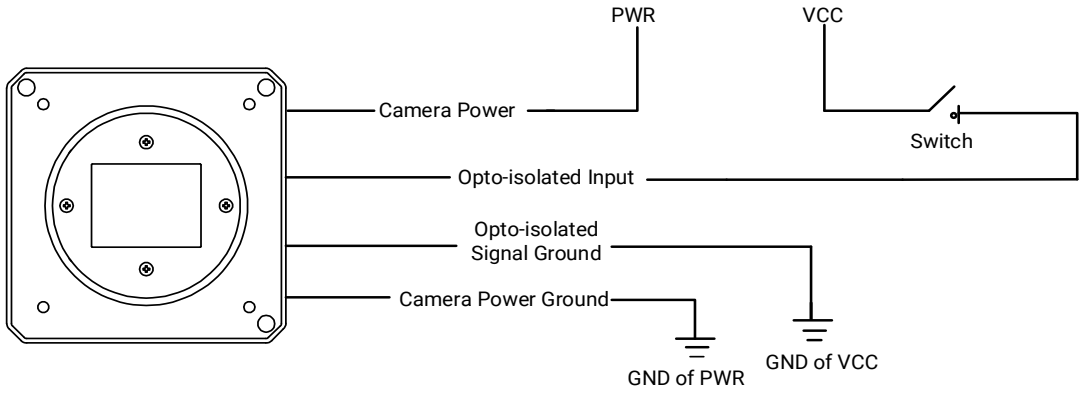


Figure 7-10 Input Signal Connects to Switch

7.2.2 Output Signal Wiring

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

Note

Output signal wiring may differ by the external device type.

PNP Device

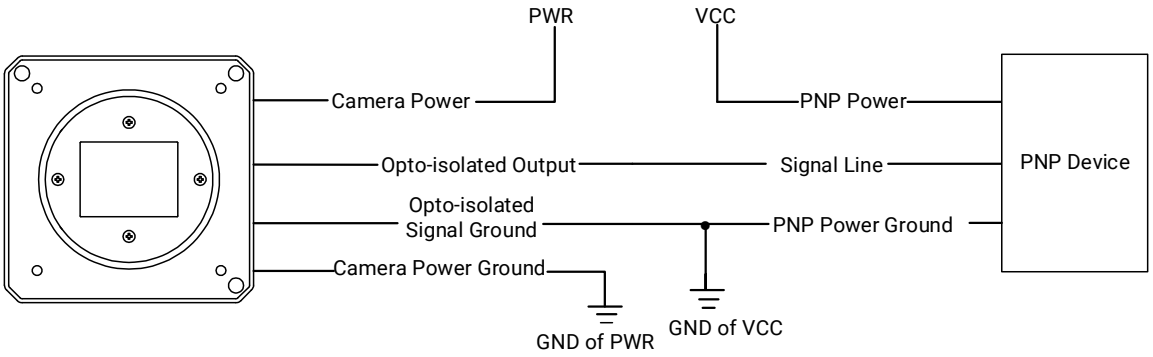


Figure 7-11 Output Signal Connects to PNP Device

NPN Device

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

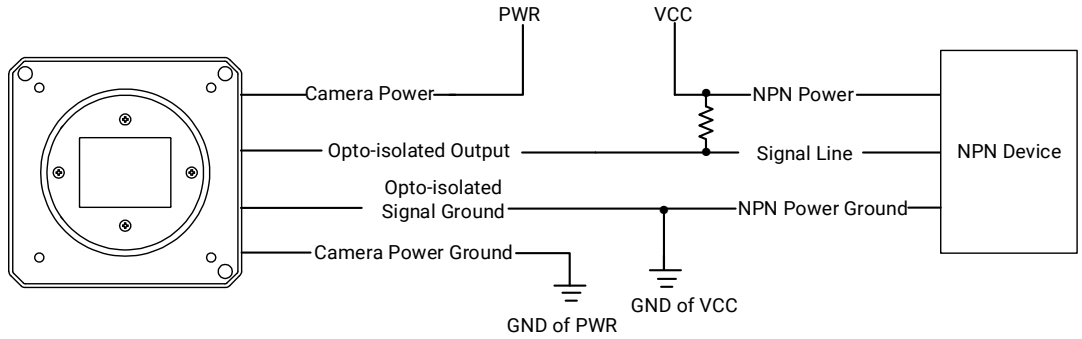


Figure 7-12 Output Signal Connects to NPN Device

7.2.3 Bi-Directional Signal Wiring

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

Configured as Input Signal

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

Note

Input signal wiring may differ by the external device type.

PNP Device

It is recommended to use 330 Ω pull-down resistor.

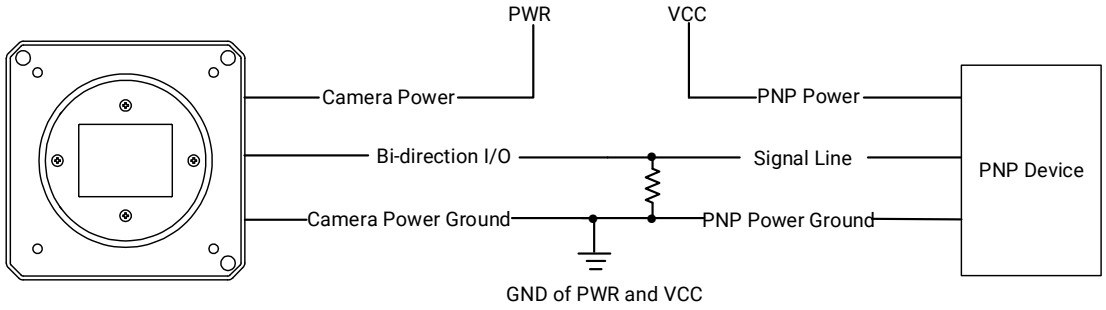


Figure 7-13 Input Signal Connects to PNP Device

Note

It is recommended to configure Line 0 rather than Line 2 as input signal for PNP device, because the latter will make the device get more heated.

NPN Device

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

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

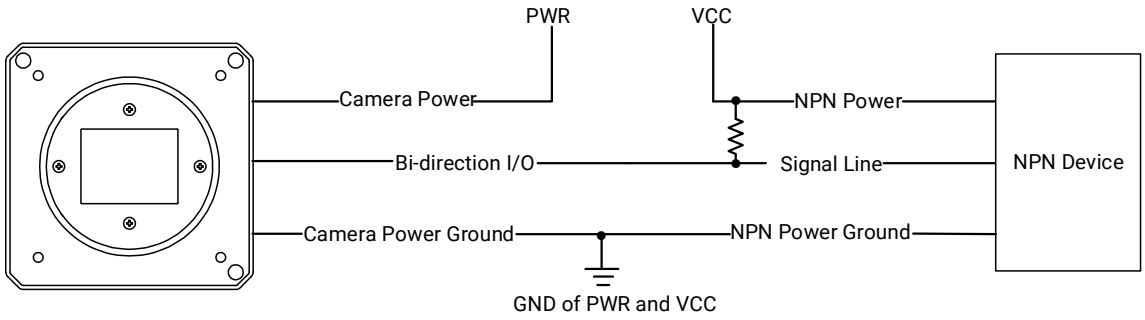


Figure 7-14 Input Signal Connects to NPN Device

Switch

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

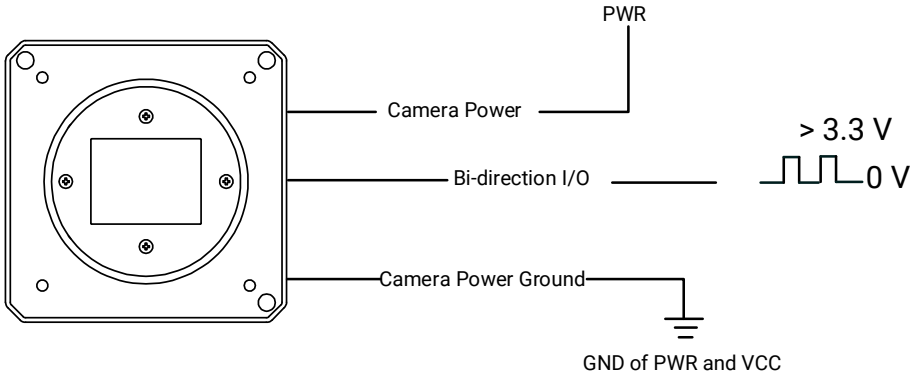


Figure 7-15 Input Signal Connects to Switch

Configured as Output Signal

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

Note

Output signal wiring may differ by the external device type.

PNP Device

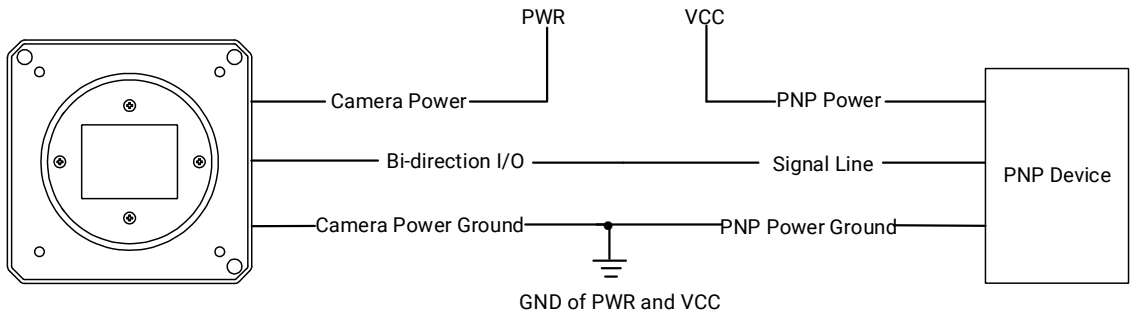


Figure 7-16 Output Signal Connects to PNP Device

NPN Device

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

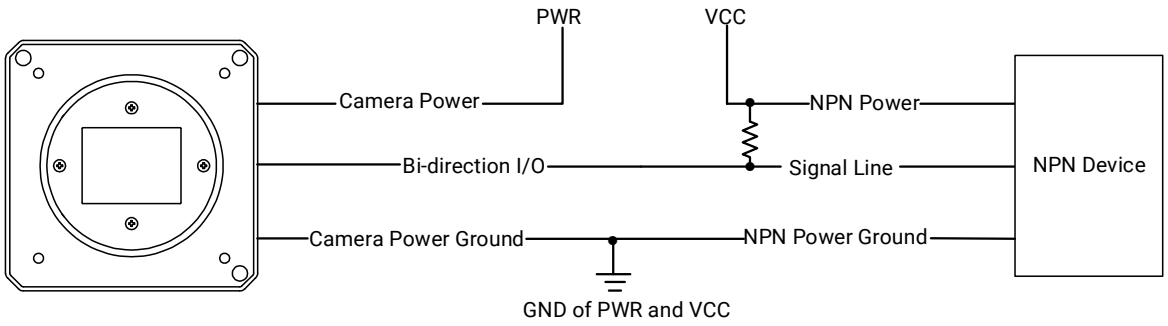


Figure 7-17 Output Signal Connects to NPN Device

Chapter 8 Trigger Input and Output

8.1 Trigger Input

8.1.1 Set Trigger Mode

The device supports two types of trigger modes, including internal trigger mode and external trigger mode. The trigger mode is controlled by **Trigger Mode** in **Acquisition Control**.

Table 8-1 Trigger Mode Description

Trigger Mode	Parameter	Trigger Mode Parameter	Description
Internal Trigger Mode	**Acquisition Control > Trigger Mode**	Off	In this mode, the device acquires images via its internal signals.
External Trigger Mode		On	In this mode, the device acquires images via external signals like software signal and hardware signal. The trigger source of external trigger mode includes software trigger, hardware trigger, counter trigger, action command trigger, and free trigger.

Enable Internal Trigger Mode

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

Note

Off refers to the internal trigger mode.

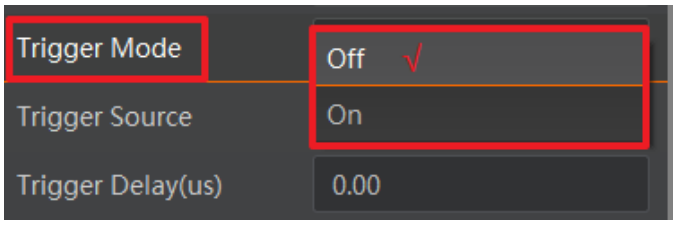


Figure 8-1 Enable Internal Trigger Mode

Enable External Trigger Mode

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

Note

On refers to the external trigger mode.

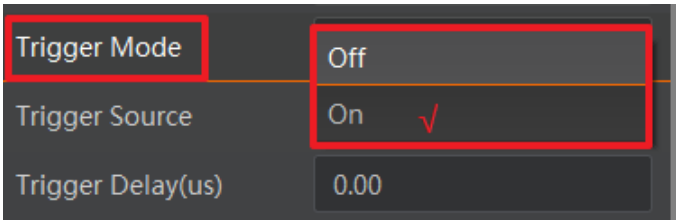


Figure 8-2 Enable External Trigger Mode

8.1.2 Set Trigger Source

External Trigger Source

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

Table 8-2 Trigger Source Description

External Trigger Source	Parameter	Description
Software Trigger	Software	The software sends trigger signal to the device via GigE interface to acquire images.
Hardware Trigger	Line 0, Line 2	External device connects device via device I/O interface. External device sends trigger signal to device to acquire images.
Counter Trigger	Counter 0	The counter sends trigger signal to the device to acquire images.
Free Trigger	Anyway	The device can receive software trigger, hardware trigger, and counter trigger to acquire images.
Link Trigger	Link Trigger 0	The frame grabber sends trigger signal to the device to acquire images. Refer to section ***Set and Execute Link Trigger*** for details

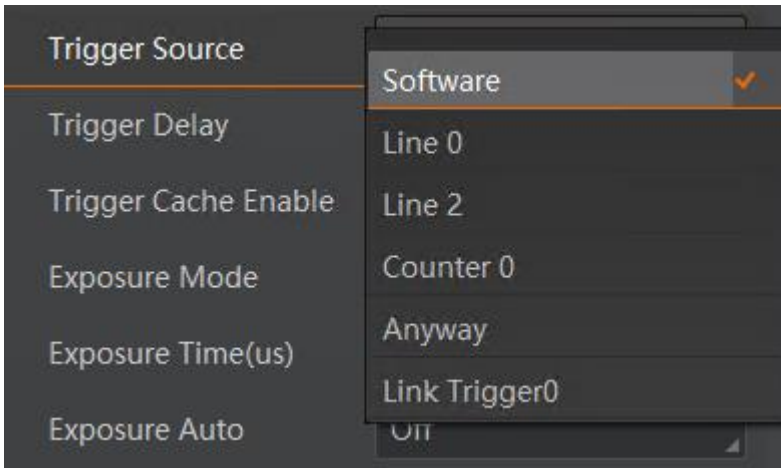


Figure 8-3 External Trigger Source

Note

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

Set and Execute Software Trigger

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

Steps

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

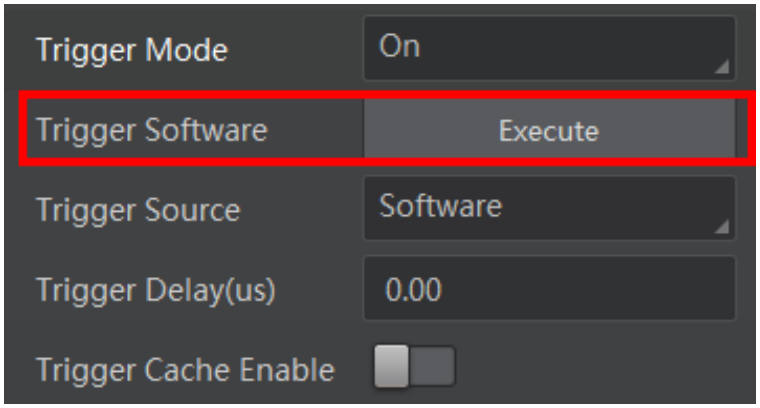


Figure 8-4 Set and Execute Software Trigger

Note

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

Set and Execute Hardware Trigger

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

Steps

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

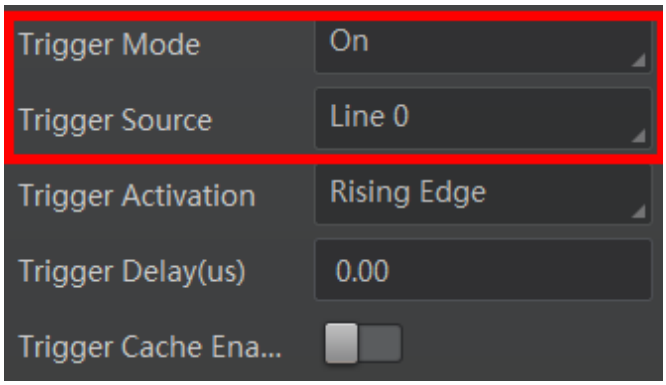


Figure 8-5 Set Line 0 or Line 2 as Input Signal

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

Steps

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

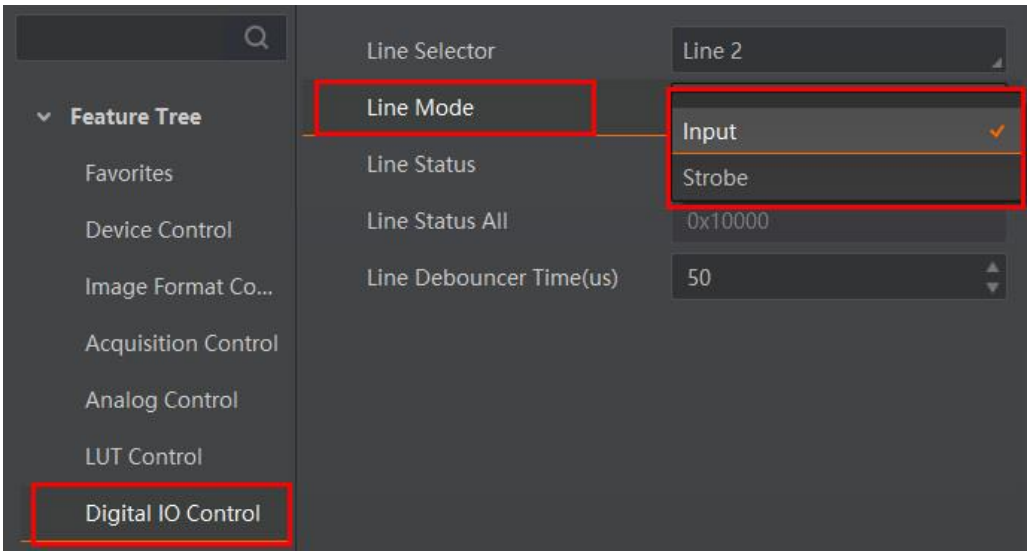


Figure 8-6 Set Line 2 as Input Signal

Note

Refer to section ***Set Trigger Related Parameters*** for parameters that can be configured in this external trigger source, including acquisition burst frame count, trigger delay, trigger cache, trigger activation, and trigger debouncer.
Refer to section ***I/O Electrical Features and Wiring*** for details.

Set and Execute Counter Trigger

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

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Counter 0** as **Trigger Source**.

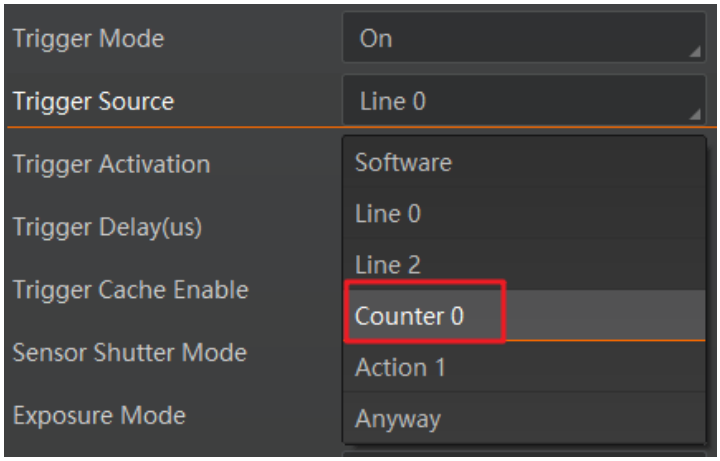


Figure 8-7 Set and Execute Counter Trigger

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

Table 8-3 Parameters of Counter and Timer Control

Parameter	Read/Write	Description
Counter Selector	Read & Write	It selects counter source. **Counter 0** is available only at present.
Counter Event Source	Read & Write	It selects the signal source of counter trigger. **Off**, **Line 0**, **Line 2**, or **Link Trigger0** is available. This parameter is disabled by default.
Counter Reset Source	Read & Write	It selects the signal source of resetting counter. **Off** or **Software** is available. This parameter is disabled by default.
Counter Reset	Write is available	It resets counter and it can be executed only

Parameter	Read/Write	Description
	under certain condition	when selecting **Software** as **Counter Reset Source**.
Counter Value	Read & Write	It is the counter value with the range of 1 to 1023.
Counter Current Value	Read Only	It displays the number of executed external trigger.

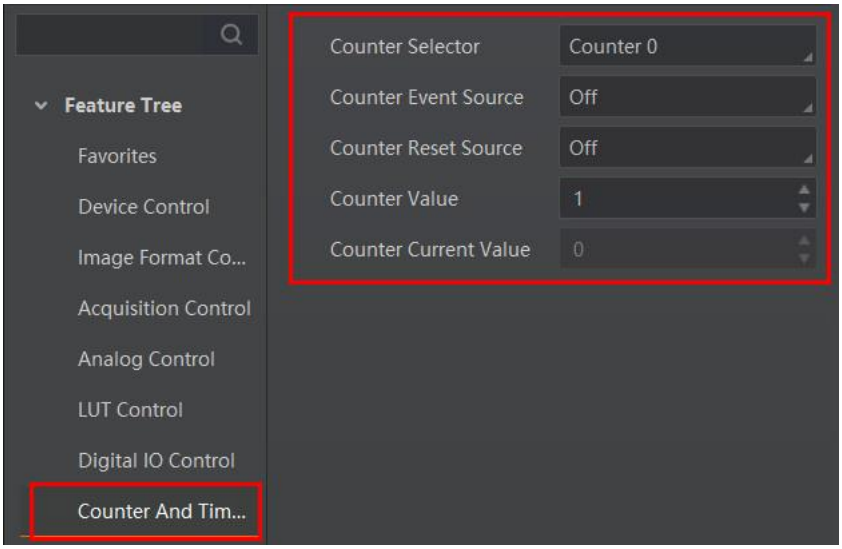


Figure 8-8 Counter and Timer Control

Note

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

Set and Execute Free Trigger

In free trigger, the device can receive software trigger, hardware trigger, and counter trigger to acquire images.

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Anyway** as **Trigger Source**.

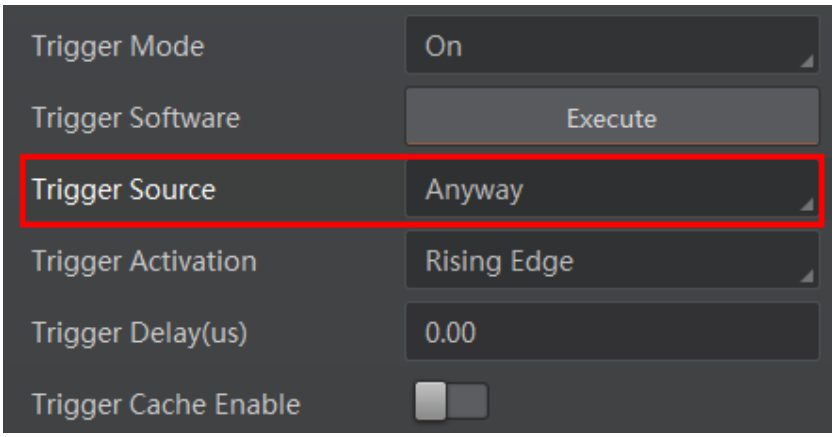


Figure 8-9 Set and Execute Free Trigger

Note

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

Set and Execute Link Trigger

In link trigger, the 50 Gbps fiber port frame grabber sends trigger signal to the device to acquire images.

Steps

1. Go to **Acquisition Control** → **Trigger Mode**, and select **On** as **Trigger Mode**.
2. Select **Link Trigger0** as **Trigger Source**.

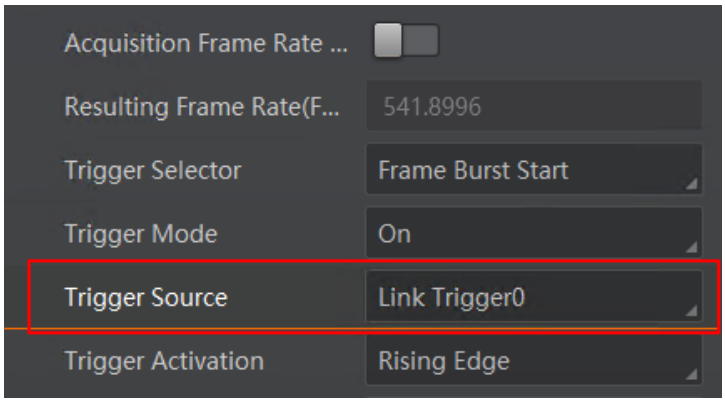


Figure 8-10 Set and Execute Link Trigger

Note

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

8.1.3 Set Trigger Related Parameters

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

Note

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

Table 8-4 Trigger Source and Trigger Related Parameters

Trigger Source / Trigger Parameters	Software Trigger	Hardware Trigger	Counter Trigger	Free Trigger	Link Trigger
Acquisition Burst Frame Count	√	√	√	√	√
Trigger Delay	√	√	√	√	√
Trigger Cache	√	√	√	√	√
Trigger Activation	×	√	√	×	√
Trigger Debouncer	×	√	√	Partially Supported	√

Set Acquisition Burst Frame Count

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

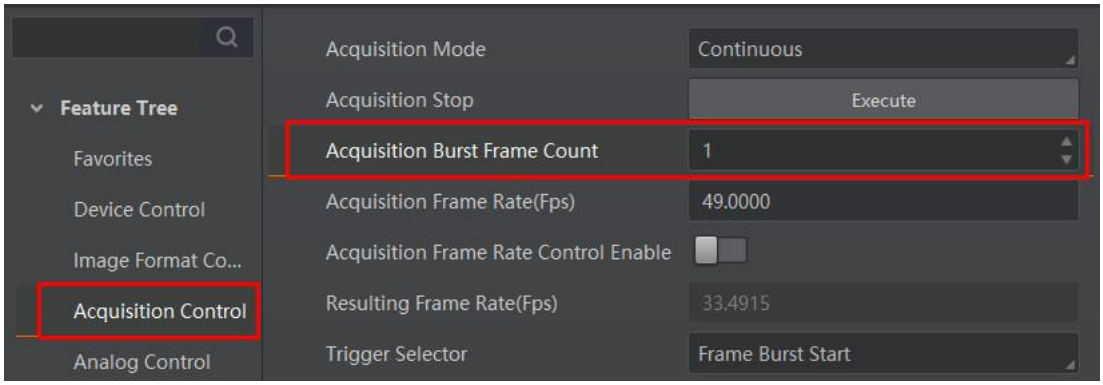


Figure 8-11 Set Acquisition Burst Frame Count

Note

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

Figure 8-12 Sequence Diagram of Acquisition Burst Frame Count

Set Trigger Delay

The trigger delay function allows the device to add a delay between the receipt of trigger signal and the moment the trigger becomes active. Go to **Acquisition Control** → **Trigger Delay**, and enter **Trigger Delay**, and the unit is μs.

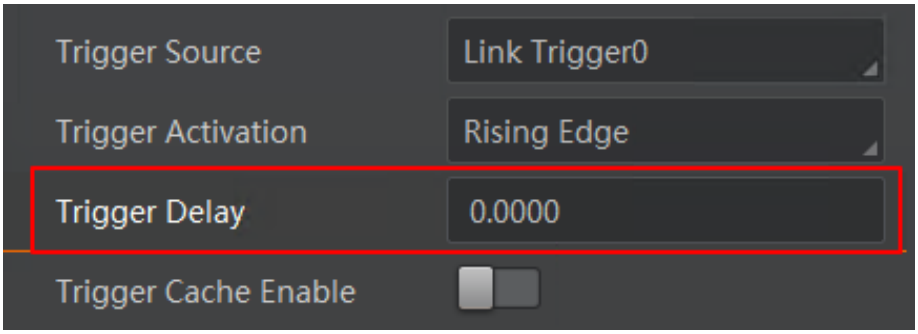


Figure 8-13 Set Trigger Delay

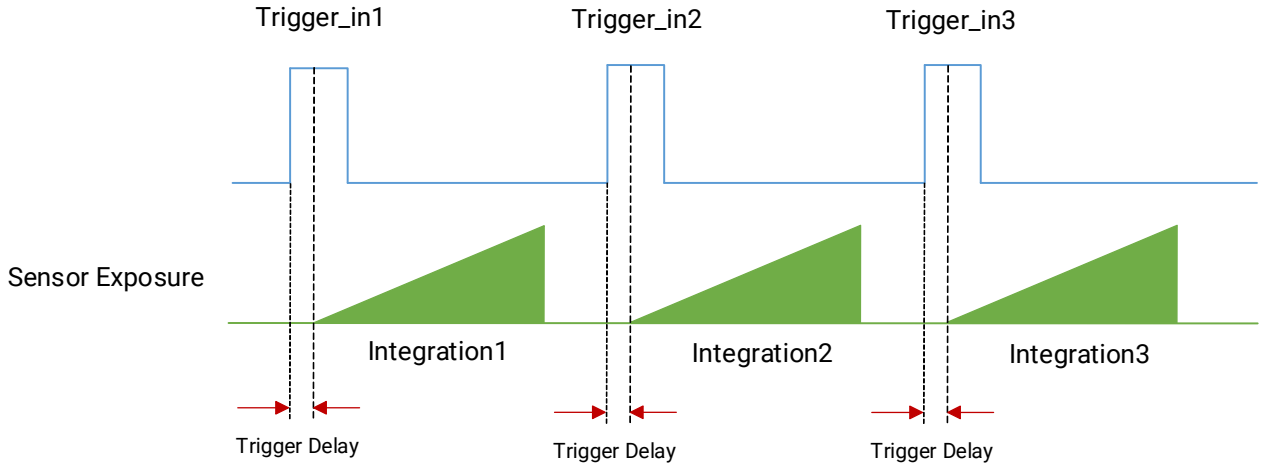


Figure 8-14 Sequence Diagram of Trigger Delay

Note

The sequence diagram above uses rising edge as trigger activation.

Set Trigger Cache

The trigger cache function allows the device to save and process new signal during trigger stage, and the device can save and process three trigger signals at most. Go to **Acquisition Control** → **Trigger Cache Enable**, and enable **Trigger Cache Enable**.

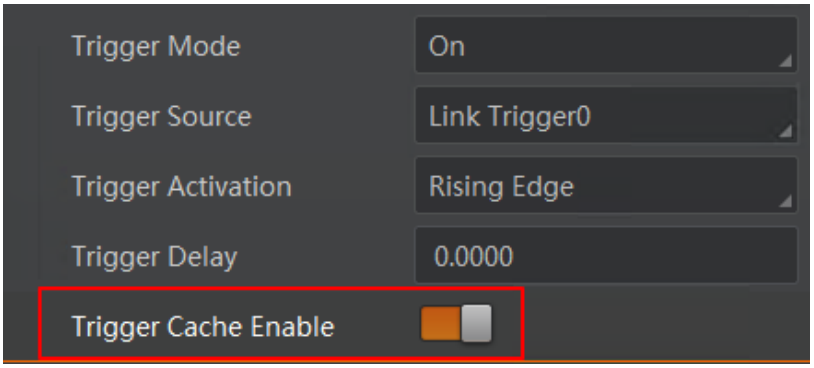


Figure 8-15 Set Trigger Cache

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

- The 2nd trigger signal will be filtered without processing if **Trigger Cache Enable** is disabled.

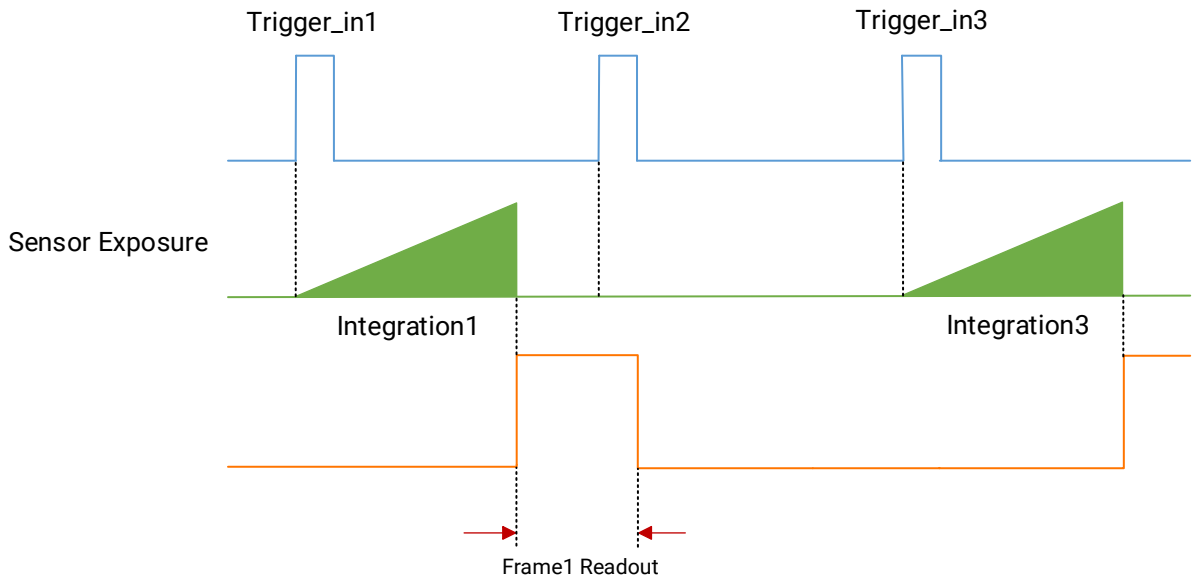


Figure 8-16 Second Frame Filtered

- The 2nd trigger signal will be saved if **Trigger Cache Enable** is enabled.
  - If the 1st frame image's exposure time of the 2nd trigger signal is not earlier than the device's last frame creation time of the 1st trigger signal, and then the 2nd trigger signal's 1st frame image is created normally.

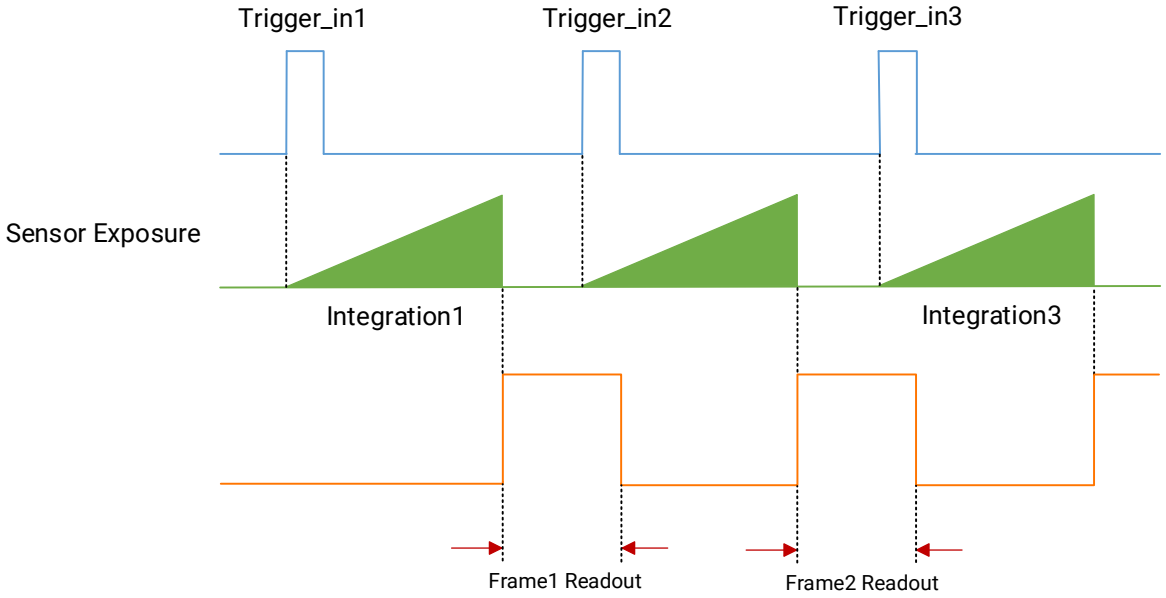


Figure 8-17 Second Frame Created Normally

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

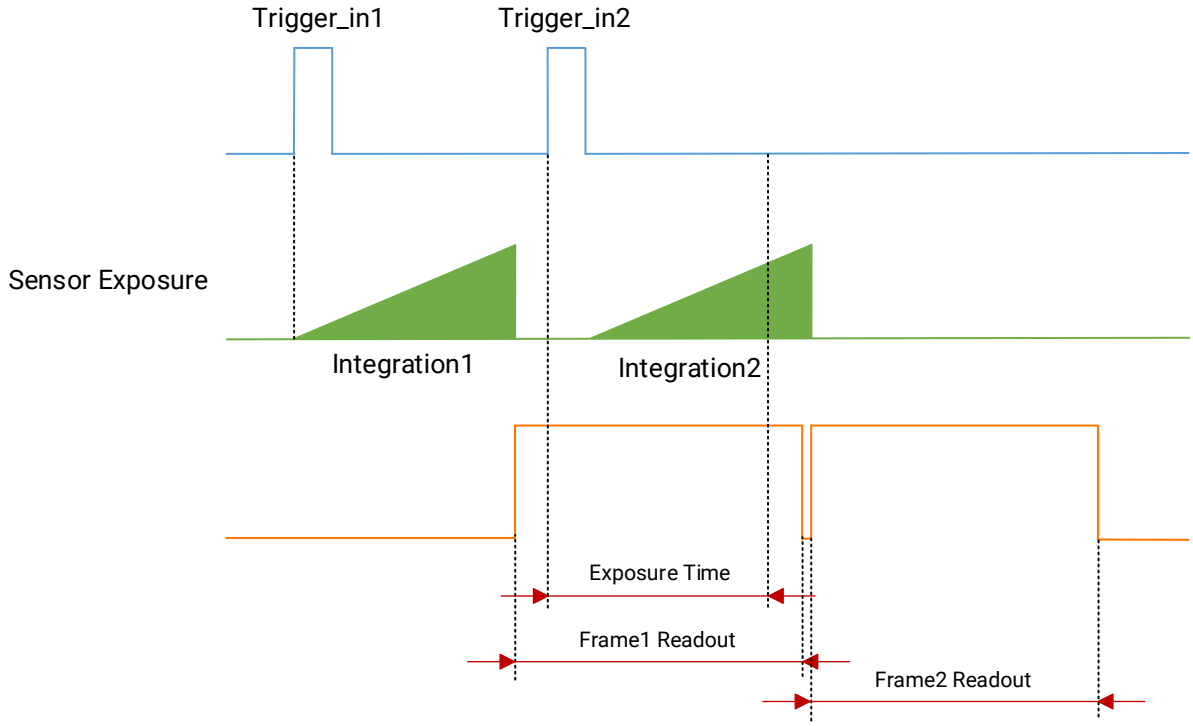


Figure 8-18 Sequence Diagram

Note

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

Set Trigger Activation

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

Table 8-5 Trigger Activation Description

Trigger Activation	Parameter	Description
Rising Edge	Rising Edge	It means that when the level signal sent by external device is in rising edge, the device receives trigger signal and starts to acquire images.
Falling Edge	Falling Edge	It means that when the level signal sent by external device is in falling edge, the device receives trigger signal and starts to acquire images.

Trigger Activation	Parameter	Description
Level High	Level High	The level high of the trigger signal is valid. As long as the trigger signal is in level high, the device is in image acquisition status.
Level Low	Level Low	The level low of the trigger signal is valid. As long as the trigger signal is in level low, the device is in image acquisition status.
Any Edge	Any Edge	It means that when the level signal sent by external device is in rising or falling edge, the device receives trigger signal and starts to acquire images.

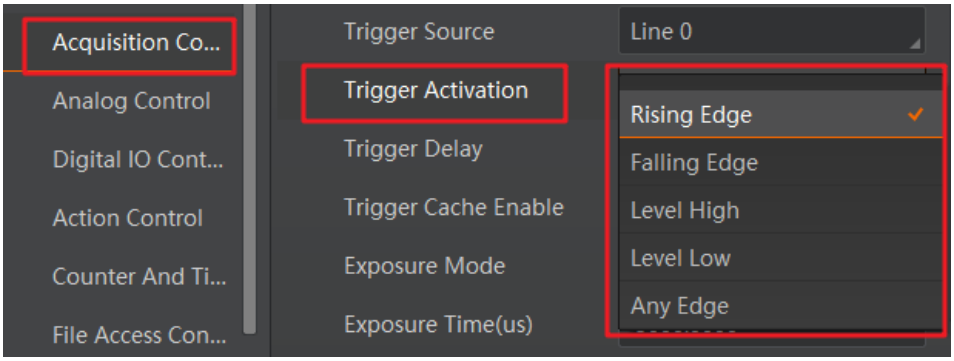


Figure 8-19 Set Trigger Activation

Note

The trigger activation may differ by trigger modes. Please refer to the actual condition.

Set Trigger Debouncer

The trigger debouncer function allows the device to filter out unwanted short external trigger signal that is input to the device.

Go to **Digital IO Control** → **Line Debouncer Time**, and enter **Line Debouncer Time** according to actual demands. The range of **Line Debouncer Time** is from zero μs to 1000000 μs.

Note

If the **Line Debouncer Time** you set is greater than the time of trigger signal, this trigger signal will be ignored.

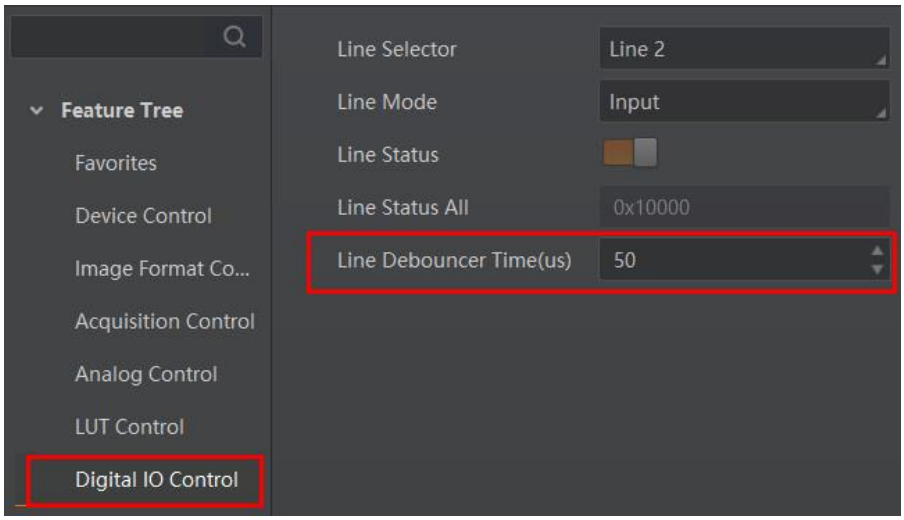


Figure 8-20 Set Trigger Debouncer

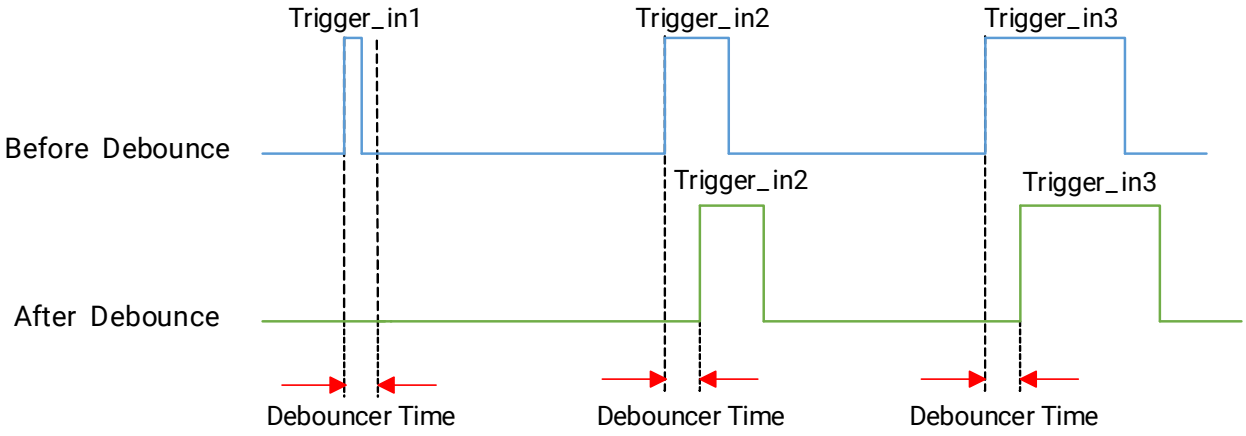


Figure 8-21 Sequence Diagram of Trigger Debouncer

Note

The sequence diagram above uses rising edge as trigger activation.

8.2 Trigger Output

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

Steps

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

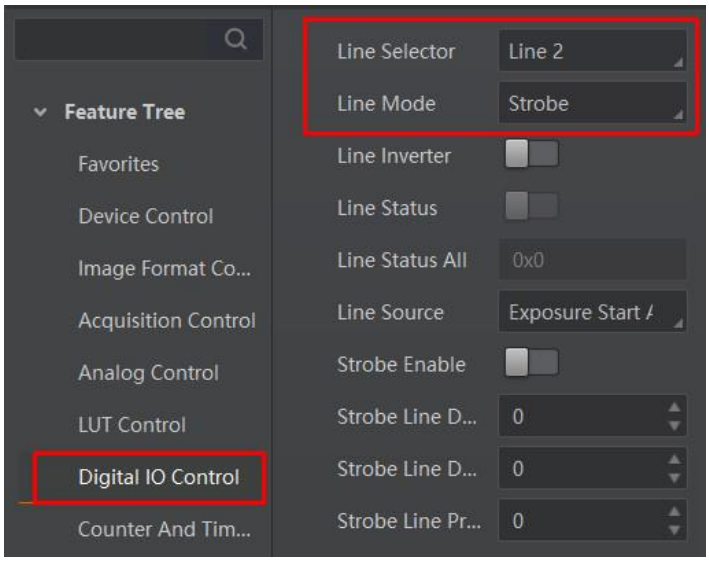


Figure 8-22 Set Line 2 as Output Signal

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

Note

Refer to section ***I/O Electrical Features and Wiring*** for details.

8.2.1 Enable Line Inverter

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

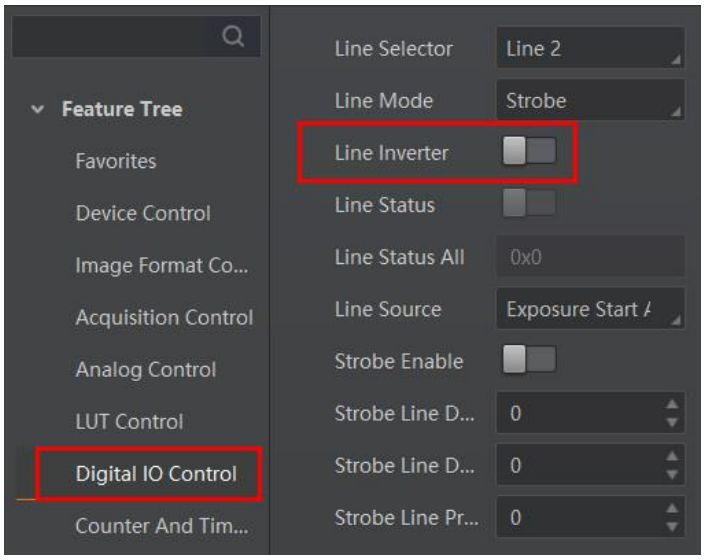


Figure 8-23 Enable Line Inverter

Note

The line inverter function is disabled by default.

8.2.2 Enable Strobe Signal

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

Steps

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

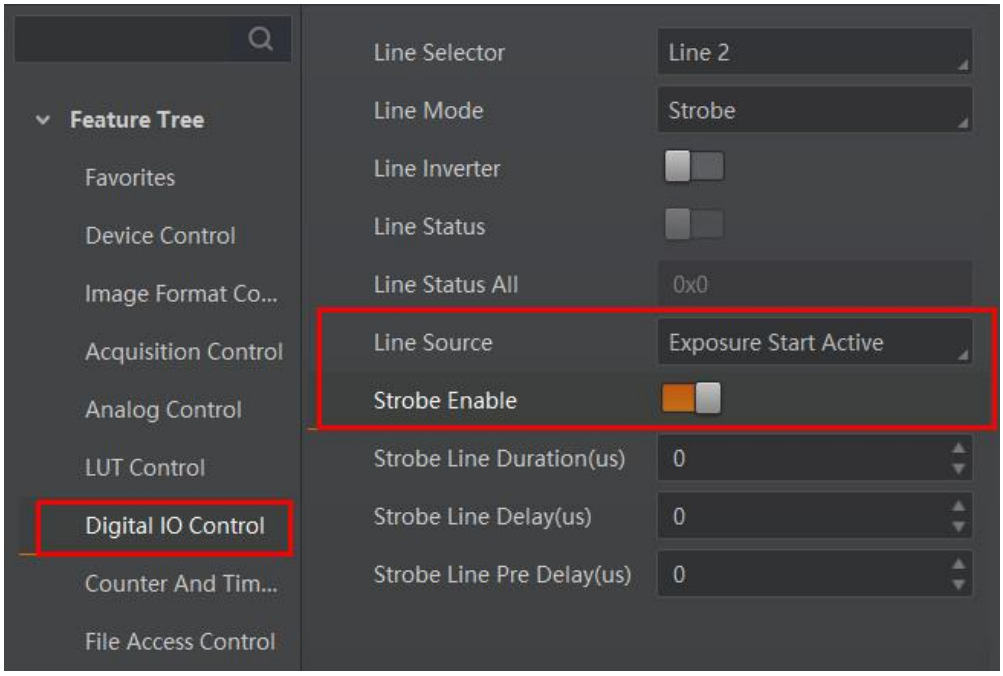


Figure 8-24 Enable Strobe Signal

The supported line sources are as follows:

Table 8-6 Line Source Description

Line Source	Description
Exposure Start Active	The device outputs signals to external devices when it starts exposure.
Exposure End Active	The device outputs signals to external devices when it stops exposure.
Acquisition Start Active	The device outputs signals to external devices when it starts acquiring images.

Line Source	Description
Acquisition Stop Active	The device outputs signals to external devices when it stops acquiring images.
Frame Burst Start Active	The device outputs signals to external devices when the device's frame burst starts.
Frame Burst End Active	The device outputs signals to external devices when the device's frame burst stops.
Frame Trigger Wait	The device is currently waiting for a frame start trigger.
Frame Start Active	The device outputs signals to external devices when it starts doing the capture of a frame.
Frame End Active	The device outputs signals to external devices when it stops doing the capture of a frame.
Soft Trigger Active	The device outputs signals to external devices when it has a software trigger.
Hard Trigger Active	The device outputs signals to external devices when it has a hardware trigger.
Counter Active	The device outputs signals to external devices when it has a counter trigger.
Timer Active	The device outputs signals to external devices when it has a timer trigger.

Note

The specific line sources may differ by device models.

If **Timer Active** is selected as **Line Source**, you can click **Execute** in **Line Trigger Software**, and enter **Strobe Line Delay** according to actual demands. The device will output signals whose duration is configured in **Strobe Line Duration**.

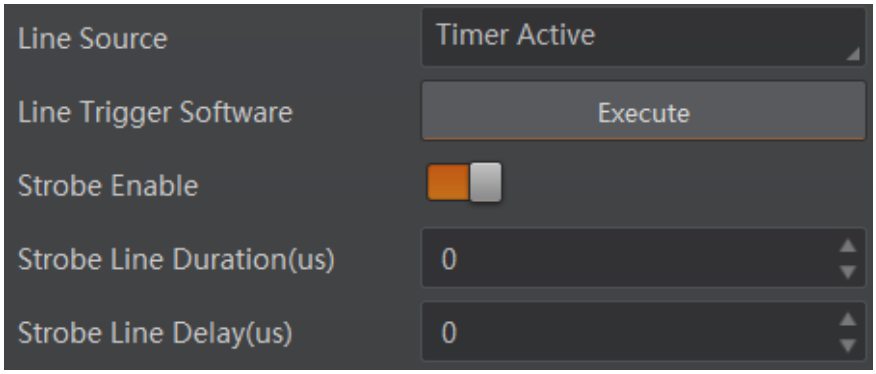


Figure 8-25 Timer Active Parameters

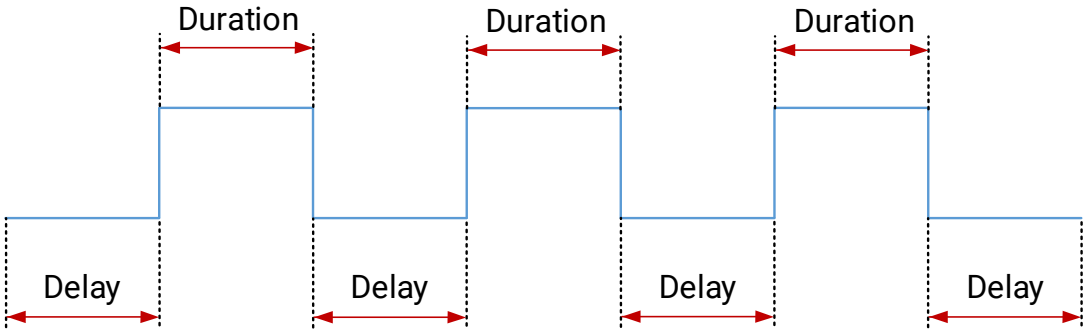


Figure 8-26 Sequence Diagram of Timer Active

Set Strobe Line Duration

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

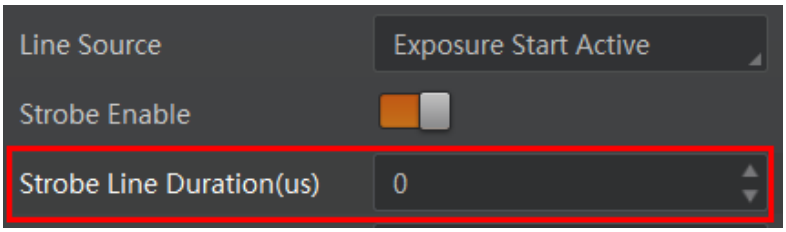


Figure 8-27 Set Strobe Line Duration

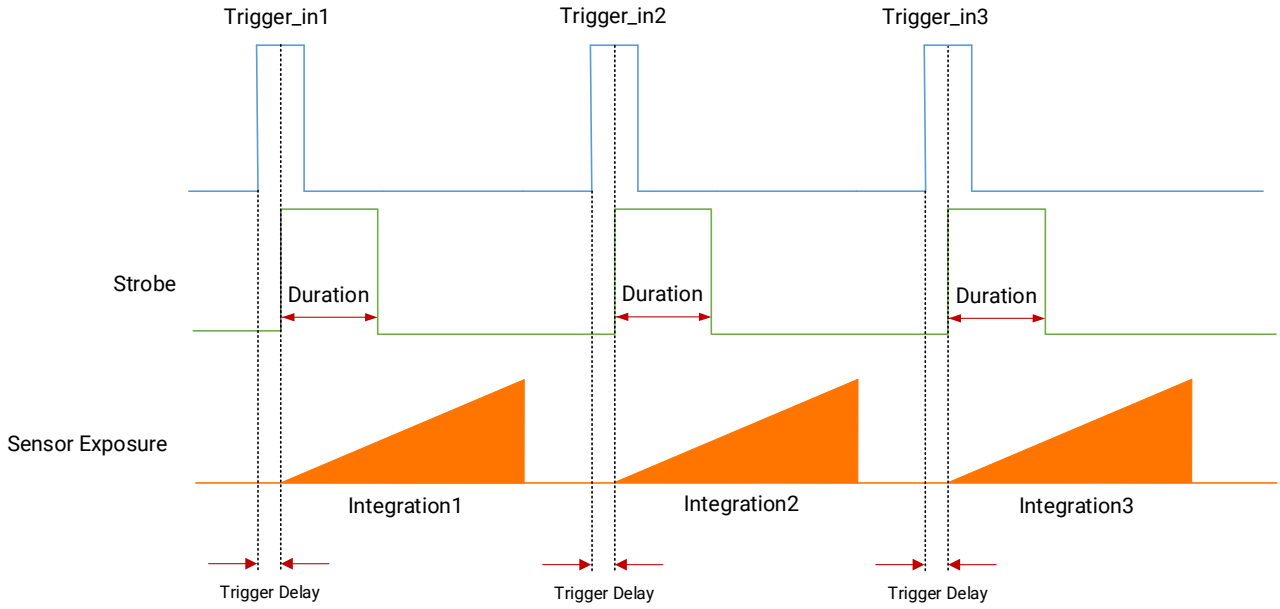


Figure 8-28 Sequence Diagram of Strobe Line Duration

Note

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

Set Strobe Line Delay

The strobe line delay function allows the device to output signal in a delay time. Go to **Digital IO Control** → **Strobe Line Delay**, and enter it according to actual demands. The range of **Strobe Line Delay** is from zero μs to 10000 μs.

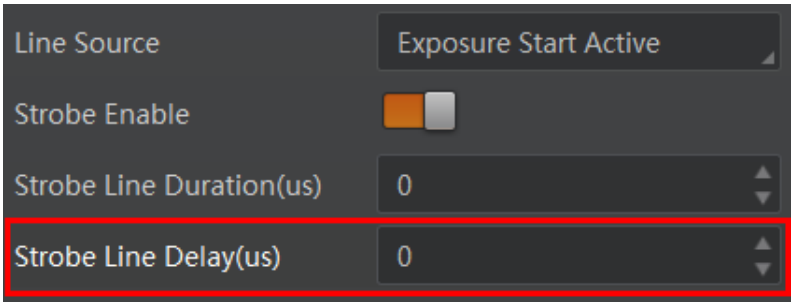


Figure 8-29 Set Strobe Line Delay

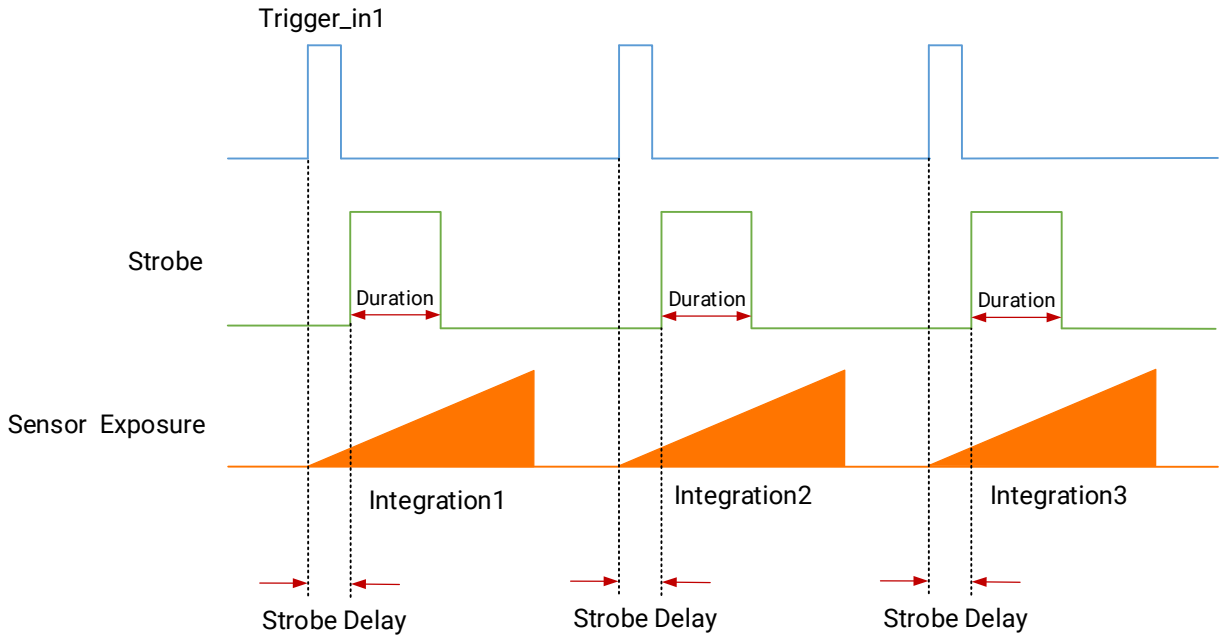


Figure 8-30 Sequence Diagram of Strobe Line Delay

Set Strobe Line Pre Delay

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

that have slow response speed.

Click **Digital IO Control → Strobe Line Pre Delay**, and enter **Strobe Line Pre Delay** according to actual demands.

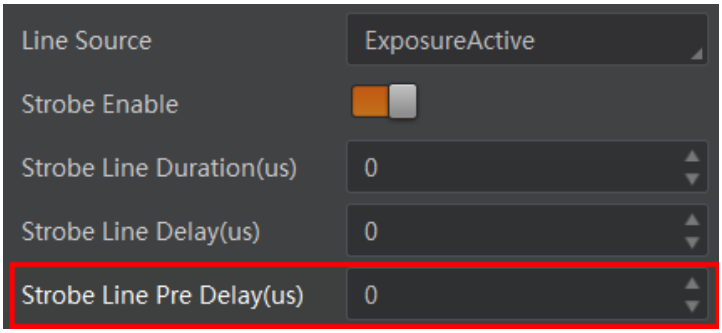


Figure 8-31 Set Strobe Pre Line Delay

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

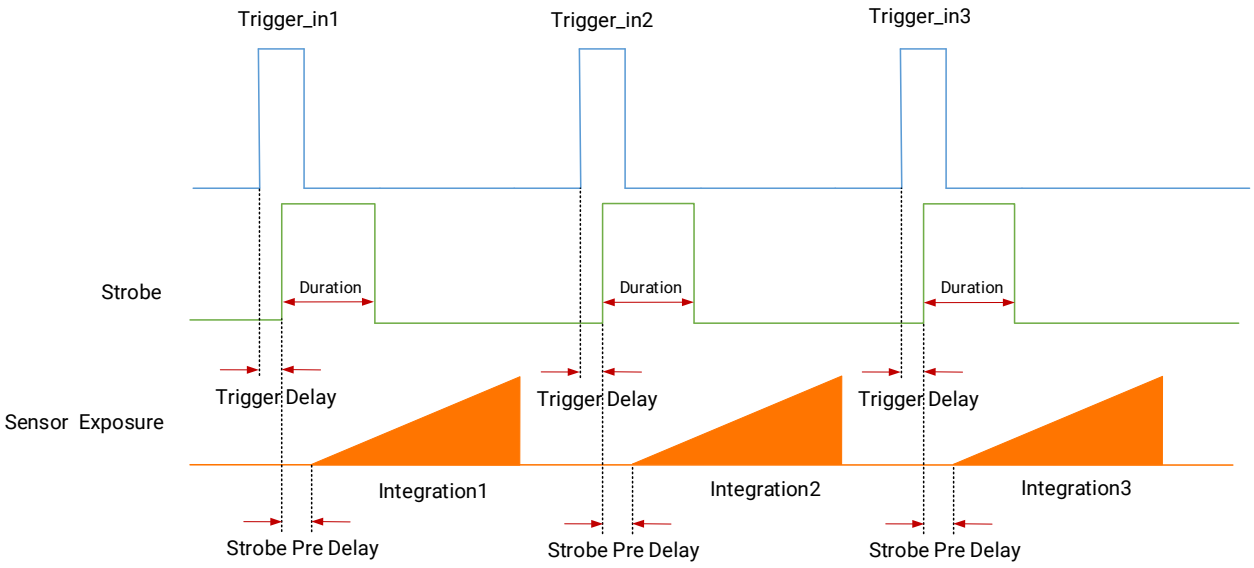


Figure 8-32 Sequence Diagram of Strobe Pre Line Delay

Chapter 9 Image Acquisition

9.1 Global Shutter and Rolling Shutter

The shutter mode of the device is 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.

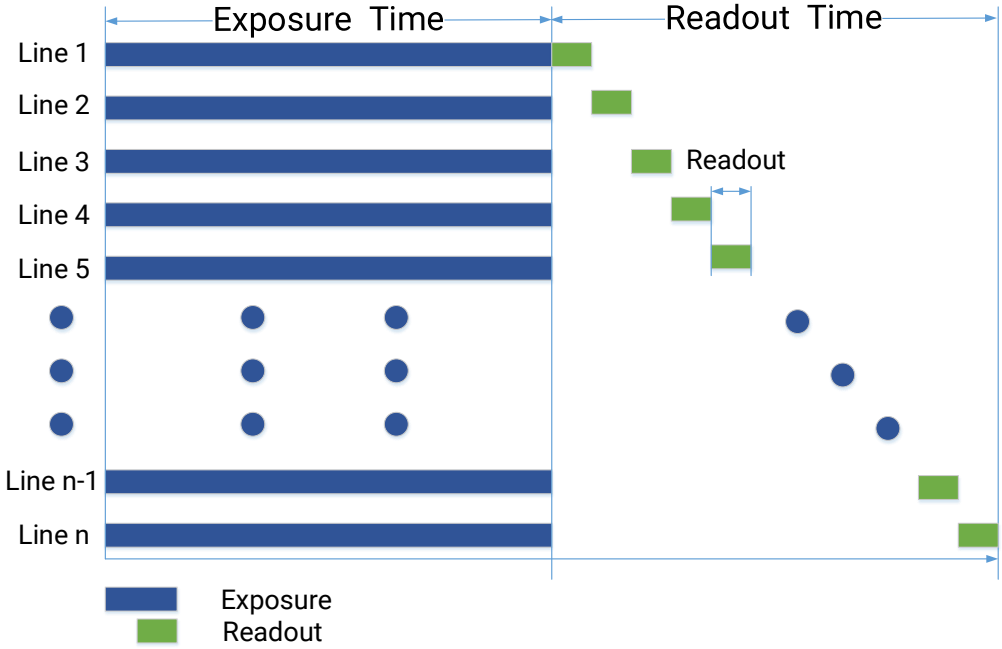


Figure 9-1 Global Shutter

9.2 Set Acquisition Mode

The device supports two types of acquisition modes, including **SingleFrame** mode and **Continuous** mode. Go to **Acquisition Control** → **Acquisition Mode**, and select **Continuous** or **SingleFrame** as **Acquisition Mode** according to actual demands.

Table 9-1 Acquisition Mode

Acquisition Mode	Parameter	Description
Single Frame Acquisition	SingleFrame	When device starts image acquisition, it acquires one image only, and then stops.

Acquisition Mode	Parameter	Description
Continuous Acquisition	Continuous	When device starts image acquisition, it acquires images continuously. Real-time frame rate decides the acquisition frame number per second. You can stop image acquisition manually.

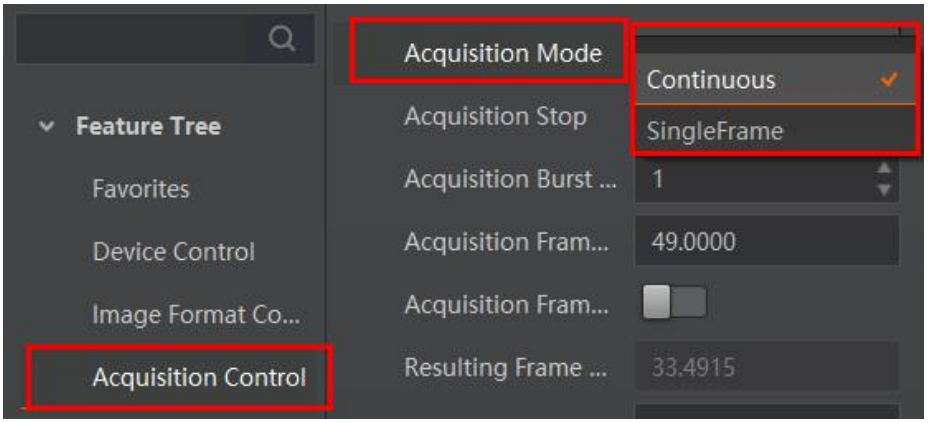


Figure 9-2 Set Acquisition Mode

9.3 Set Frame Rate

Note

The image compression function may differ by device models

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

- Frame readout time: The frame readout time is related with device's sensor performance and image height. The lower the image height and less the frame readout time, and the higher the frame rate will be.
- Exposure time: If the reciprocal of max. frame rate that the device supports is t, and when the configured exposure time is larger than t, the less the exposure time, the higher the frame rate will be. When the configured exposure time is less than or equal to t, exposure time will not influence the frame rate.
- Bandwidth: The larger the bandwidth, the higher the frame rate will be.
- Pixel format: The more bytes pixel format occupy, the lower the frame rate will be.
- Image compression mode: This function is used to compress data before transmitting to the PC, and increase the frame rate to some extent.

Steps

1. Go to **Acquisition Control** → **Acquisition Frame Rate**, and enter **Acquisition Frame Rate**.
2. Enable **Acquisition Frame Rate Control Enable**.

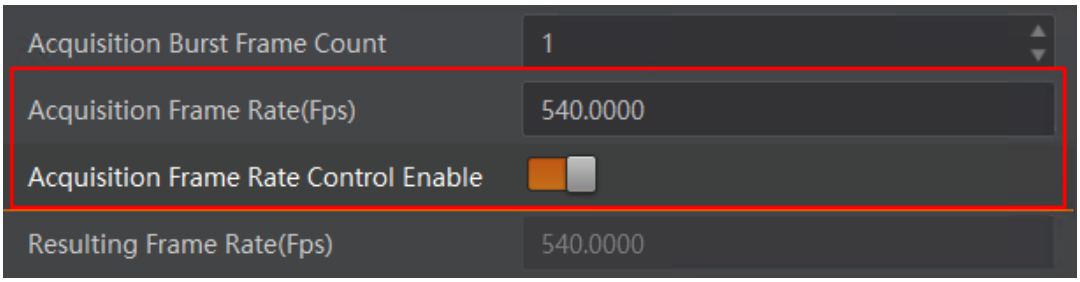


Figure 9-3 Set Frame Rate

Note

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

3. View the device's final frame rate in **Resulting Frame Rate**.

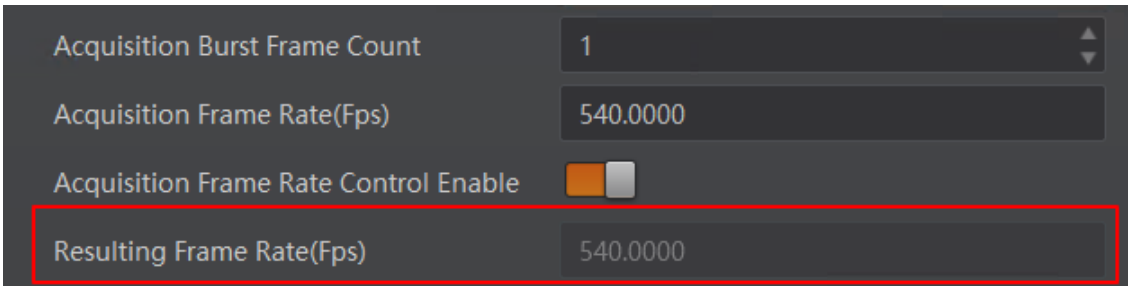


Figure 9-4 View Resulting Frame Rate

Chapter 10 Basic Functions

10.1 View Resolution and ROI

Note

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

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

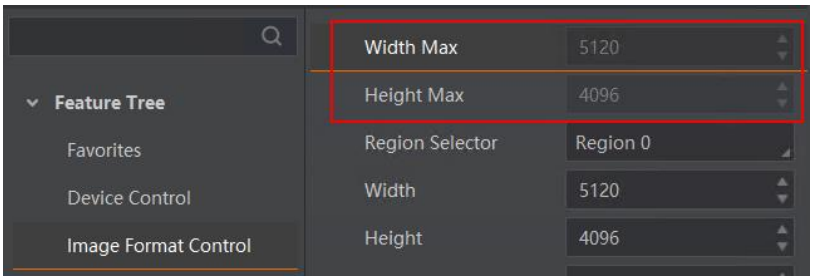


Figure 10-1 View Resolution

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

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

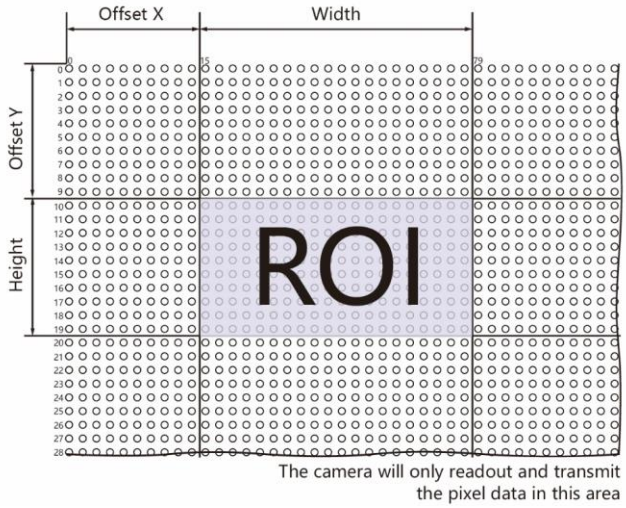


Figure 10-2 ROI

Note

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

Go to **Image Format Control** → **Region Selector**, and enter **Width**, **Height**, and **Offset X**.

- **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.

Figure 10-3 Set ROI

11.2 Set Image Reverse

Note

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

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

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

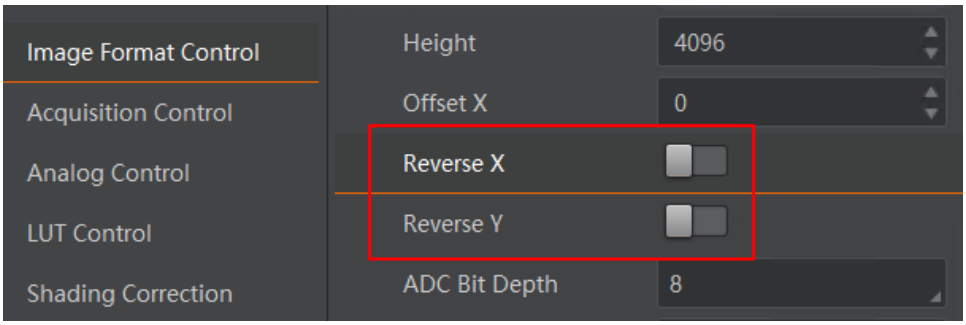


Figure 10-4 Set Image Reverse

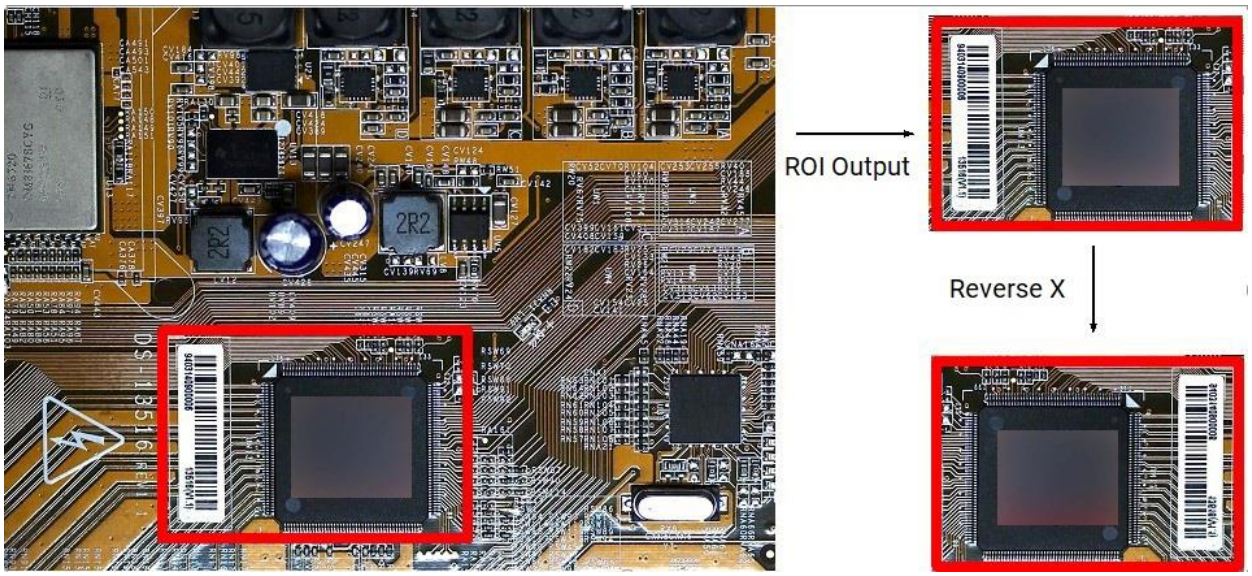


Figure 10-5 Image Reverse Comparison

10.3 Set Pixel Format

The device supports pixel format of Mono 8 with ADC bit depth of 8 and pixel size of 8 Bits/Pixel.

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

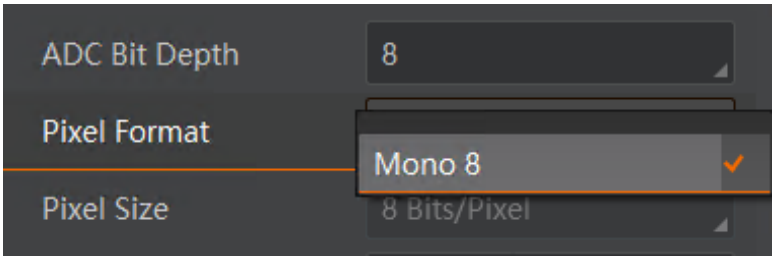


Figure 10-6 Set Pixel Format

10.4 Set Test Pattern

The device 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 device is real-time image. If this function is enabled, the outputted image by the device is test image.

Go to **Image Format Control** → **Test Pattern Generator Selector** → **Test Pattern**, and set **Test Pattern** according to actual demands.

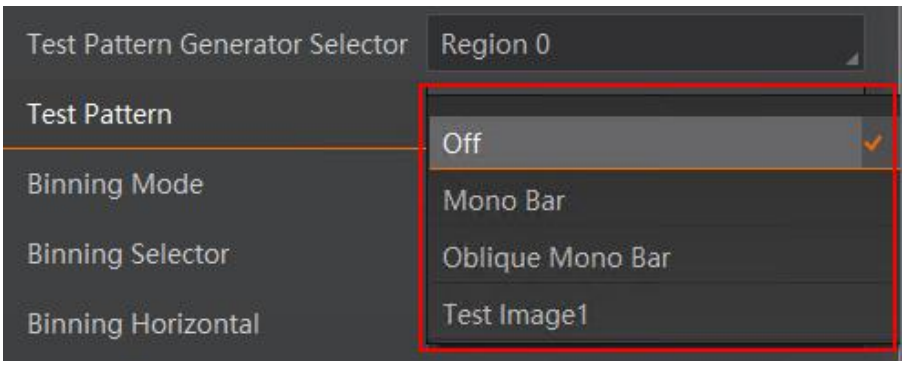
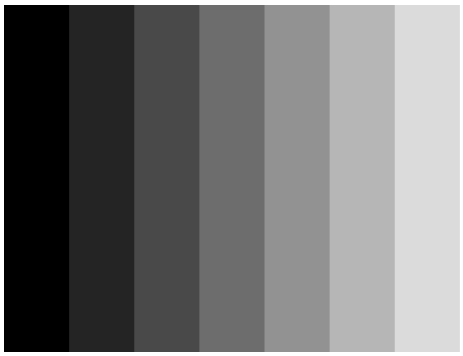
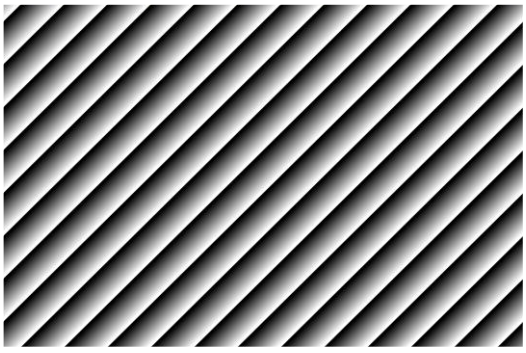
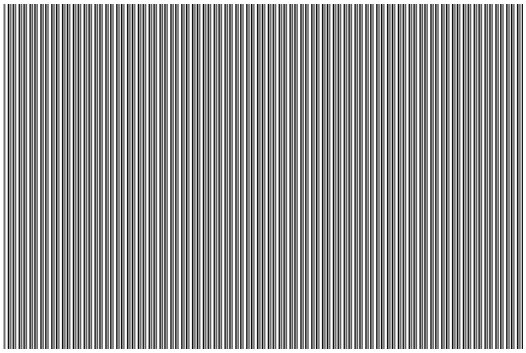


Figure 10-7 Set Test Pattern

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

Table 10-1 Test Pattern

Test Pattern	Image
Mono Bar	
Oblique Mono Bar	

Test Pattern	Image
Test Image 1	

Note

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

10.5 Set Binning

Note

- **Binning Horizontal** is the image's width, and **Binning Vertical** is the image's height.
- The binning related functions may differ by device models.

The purpose of setting binning is to enhance sensibility. With binning, multiple sensor pixels are combined as a single pixel to reduce resolution and improve image brightness.
Click **Binning Selector**, and set **Binning Horizontal** and **Binning Vertical** according to actual demands.

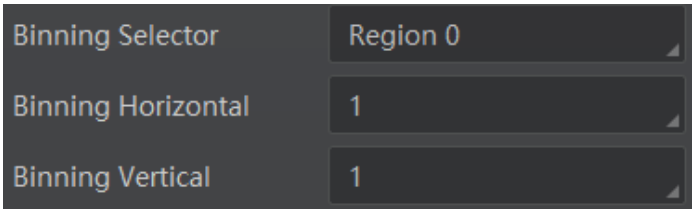


Figure 10-8 Set Binning

The device also supports binning mode function. Click **Binning Mode**, and select **Sum** or **Average** according to actual demands.

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

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

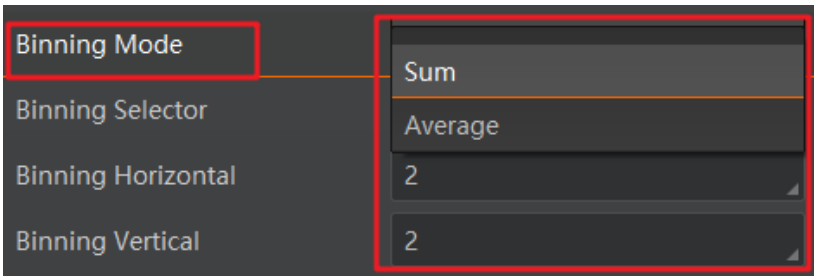


Figure 10-9 Set Binning Mode

10.6 Set Decimation

Note

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

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

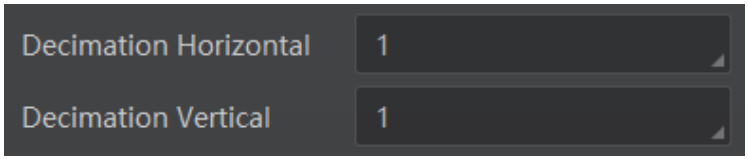


Figure 10-10 Set Decimation

10.7 Set Exposure Auto

Note

The exposure mode may differ by device models.

The device supports 2 types of exposure modes, including **Timed** and **Trigger Width**.

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

Note

Only when the **Trigger Mode** is **On**, **Trigger Source** is **Line 0** or **Line 2**, and **Trigger Activation** is **Level High** or **Level Low**, **Trigger Width** can be selected as **Exposure Mode**.

When **Timed** is selected as the **Exposure Mode**, the device supports 3 types of exposure mode, including **Off**, **Once** and **Continuous**. Click **Acquisition Control** → **Exposure Auto**, and select **Exposure Auto** according to actual demands.

Table 10-2 Exposure Mode

Exposure Auto	Parameter	Description
Manual Exposure	Off	The device exposures according to the value set in **Exposure Time (μs)**.
Once Auto Exposure	Once	The device adjusts the exposure time automatically according to the image brightness. After adjusting, it will switch to **Off** mode.
Continuous Auto Exposure	Continuous	The device adjusts the exposure time continuously according to the image brightness.

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

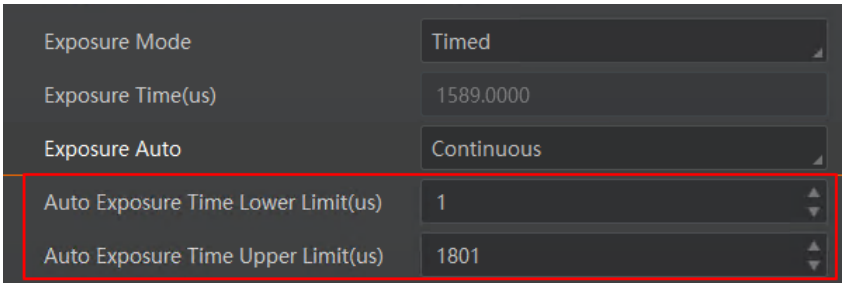


Figure 10-11 Set Exposure Time under Once or Continuous Mode

10.8 Set Brightness

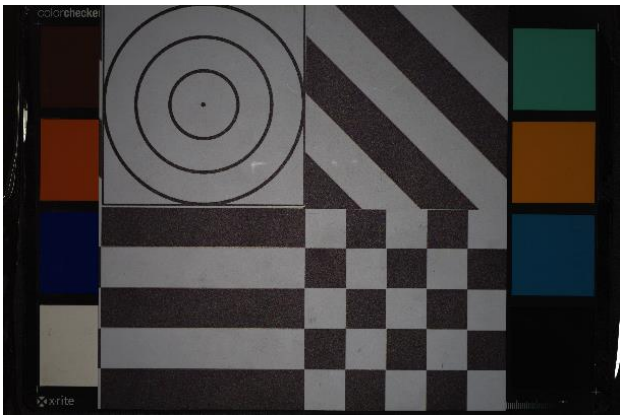
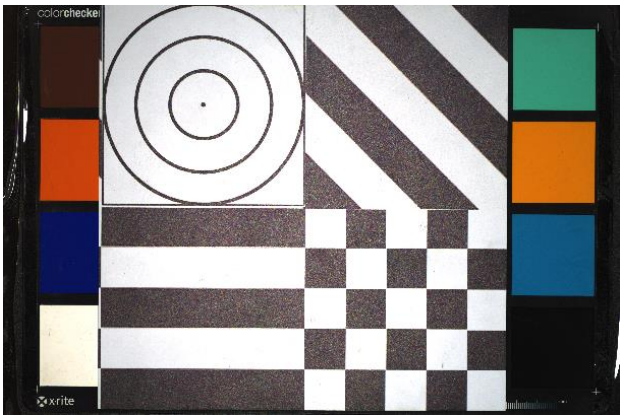
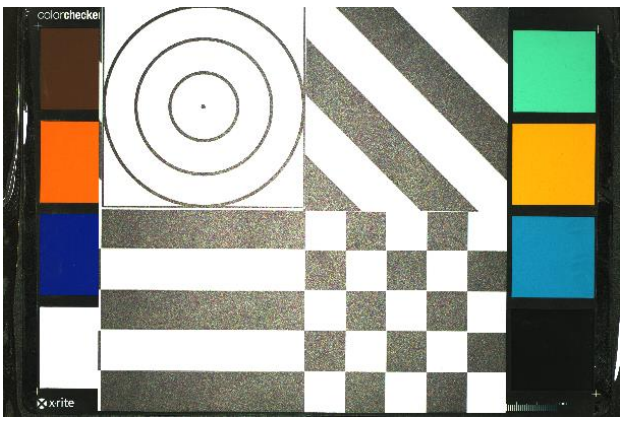
The device brightness refers to the brightness when the device adjusts image under **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain mode.

Note

- You should enable **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain mode first before setting brightness.
- After setting brightness, the device will automatically adjust exposure time to let image

brightness reach target one. Under **Once** or **Continuous** exposure mode, or **Once** or **Continuous** gain, the higher the brightness value, the brighter the image will be.

Table 10-3 Brightness Example

Brightness Value	Image
Brightness=25	
Brightness=75	
Brightness=120	

Go to **Analog Control** → **Brightness**, and enter **Brightness** according to actual demand.

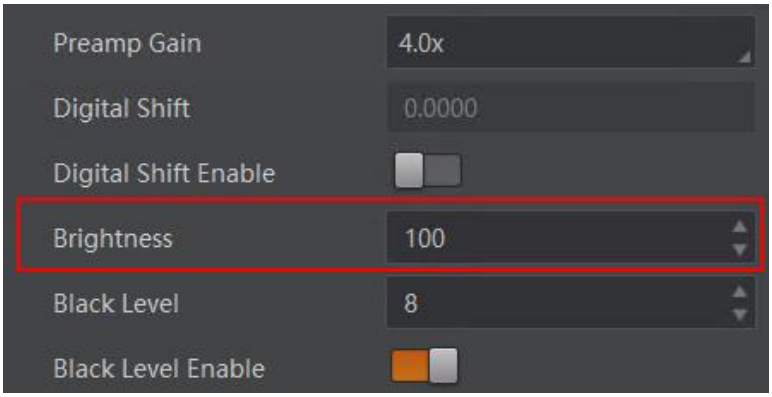


Figure 10-12 Set Brightness

10.9 Set HDR

Note

- 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**.

Note

Up to 4 HDR groups can be configured.

Figure 10-13 Set HDR

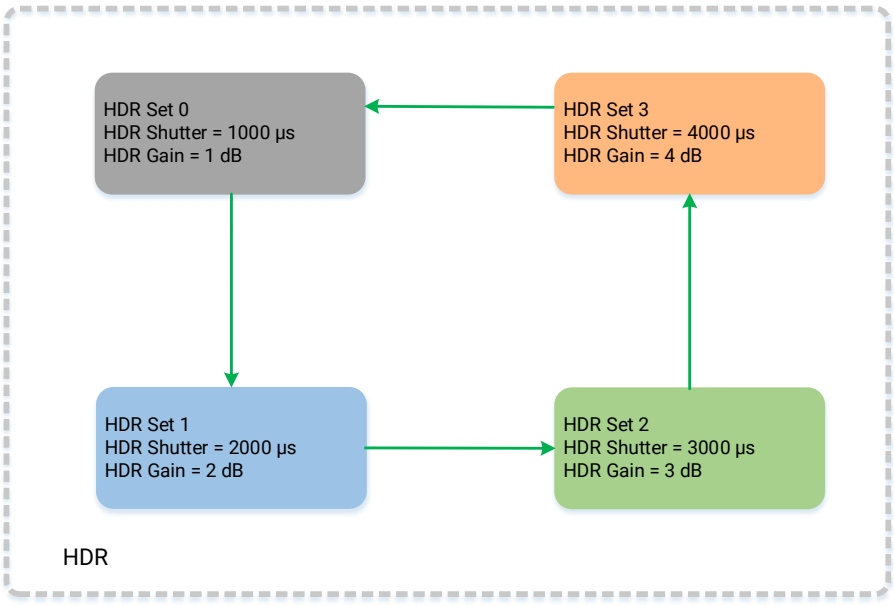


Figure 10-14 HDR Demonstration

10.10 Set Gain

Note

The gain function may differ by device models.

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

10.10.1 Set Analog Gain

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

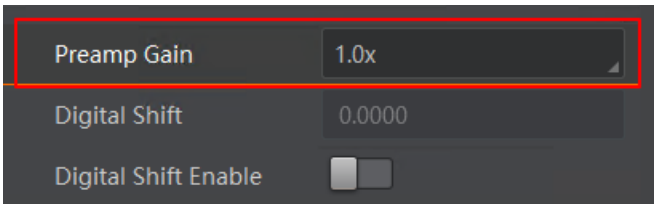


Figure 10-15 Preamp Gain

Note

When increasing gain, the image noise will increase too, which will influence image quality. If you want to increase image brightness, it is recommended to increase the device's

exposure time first. If the exposure time reaches its upper limit, and at this point, you can increase gain.

10.10.2 Set Digital Gain

Apart from analog gain, the device supports digital gain function. When analog gain reaching its upper limit and the image is still too dark, it is recommended to improve image brightness via digital gain with the range of –24.082399 to 23.999836. The digital gain is disabled by default.

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

Figure 10-16 Set Digital Gain

Note

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.

10.11 User Set Customization

This function allows you to save or load device settings. The device supports 4 sets of parameters, including one default set and three user sets, and the relation among four sets of parameters is shown below.

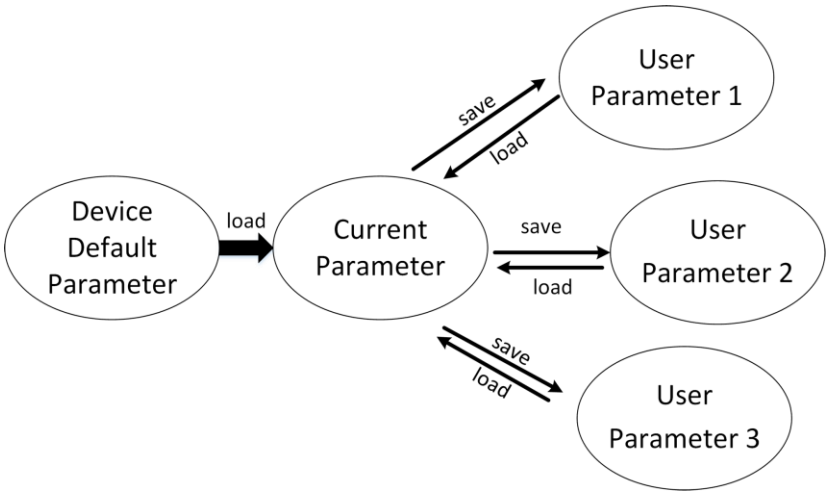


Figure 10-17 Parameter Relation

Note

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

10.11.1 Save User Set

Steps

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

Note

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

2. Click **Execute** in **User Set Save** to save parameter.
3. View **User Set Save Status**:

- Saving: User parameters are being saved.
- Ready: User parameters have been saved.

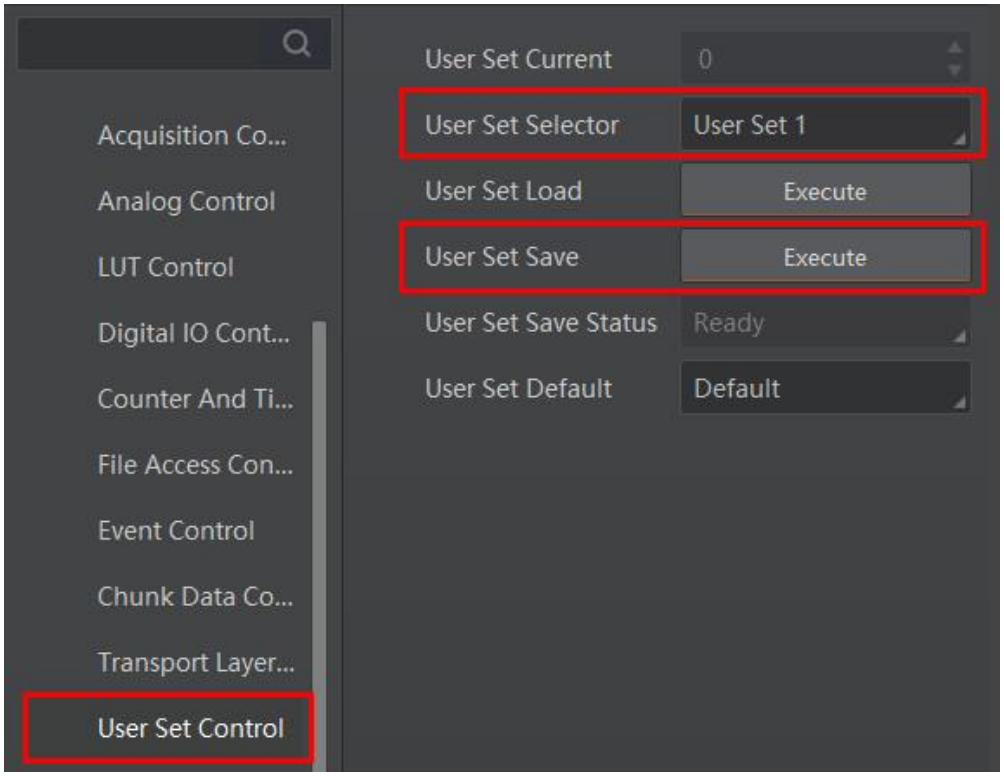


Figure 10-18 Save User Set

10.11.2 Load User Set

Note

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

Steps

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

Note

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

2. Click **Execute** in **User Set Load** to load parameter.
3. View **User Set Load Status**:

- Saving: User parameters are being loaded.
- Ready: User parameters are to be loaded.

Note

The parameter of **User Set Load Status** may differ by device models.

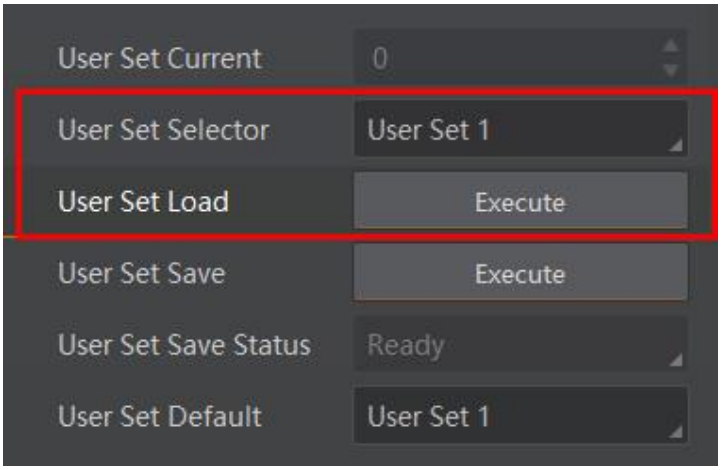


Figure 10-19 Load User Set

10.11.3 Set User Default

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

Note

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

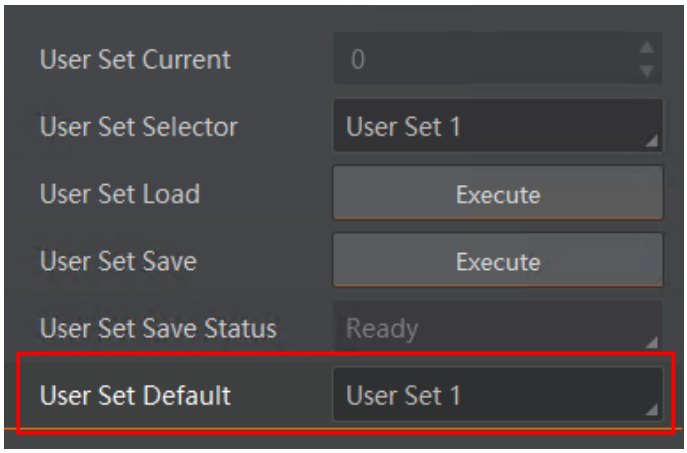


Figure 10-20 Set User Default

Chapter 11 Advanced Functions

11.1 Set Black Level

Note

The black level may differ by device models.

The device supports black level function that allows you to change the overall brightness of an image by changing the gray values of the pixels by a specified amount. The range of blact level is zero to 4095.

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

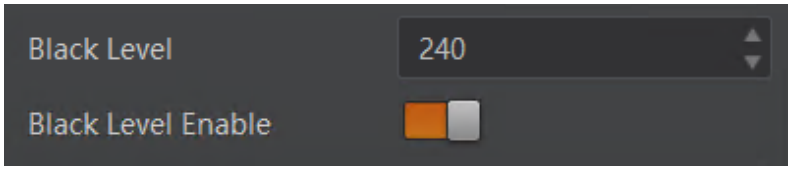


Figure 12-1 Set Black Level

11.2 Set Gamma Correction

Note

The Gamma correction function may differ by device models.

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

- Gamma between 0.5 and 1: image brightness increases, dark area becomes brighter.
- Gamma between 1 and 4: image brightness decreases, dark area becomes darker.

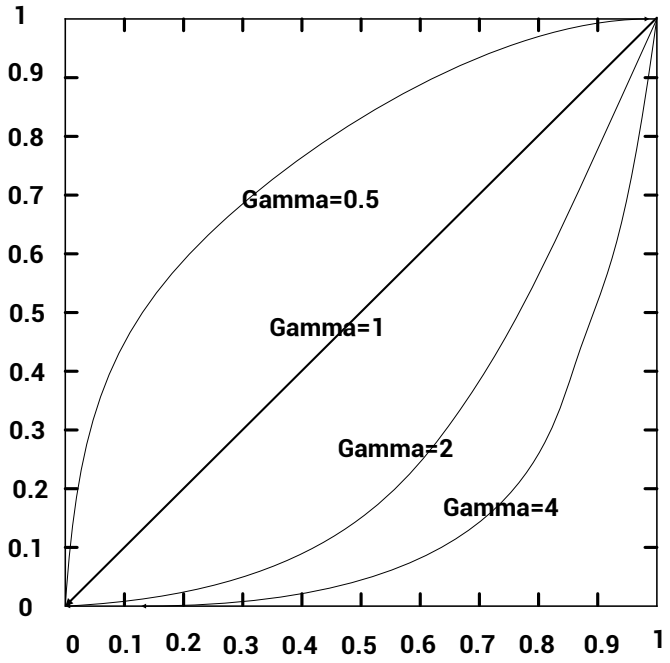


Figure 11-1 Set Gamma Correction

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

User Mode

Steps

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

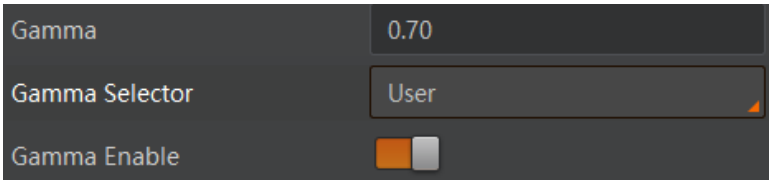


Figure 11-2 Set User Mode

sRGB Mode

Steps

1. Go to **Analog Control** → **Gamma Selector**.
2. Select **sRGB** as **Gamma Selector**.

3. Enable **Gamma Enable** to enable it.

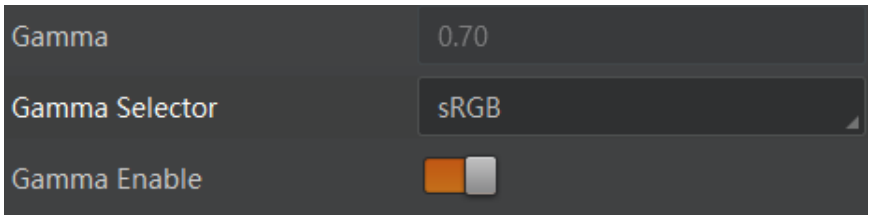


Figure 11-3 Set sRGB Mode

11.3 Set AOI

Note

- The AOI function may differ by device models.
- AOI 1 is used when the device is in once or continuous exposure mode, and AOI 2 is used when the device is in once or continuous white balance mode.

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

Steps

1. Click **Analog Control** → **Auto Function AOI Selector**, and select **AOI 1** or **AOI 2 Auto Function AOI Selector**.
2. Enter **Auto Function AOI Width**, **Auto Function AOI Height**, **Auto Function AOI Offset X**, and **Auto Function AOI Offset Y** according to actual demands.
3. Enable **Auto Function AOI Usage Intensity** if **AOI 1** is selected as **Auto Function AOI Selector**. Or enable **Auto Function AOI Usage White Balance** if **AOI 2** is selected as **Auto Function AOI Selector**.

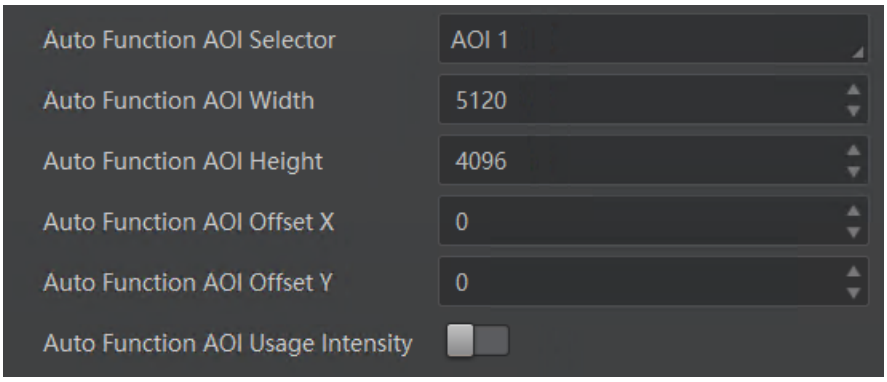


Figure 11-4 Set AOI

11.4 LSC Correction

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

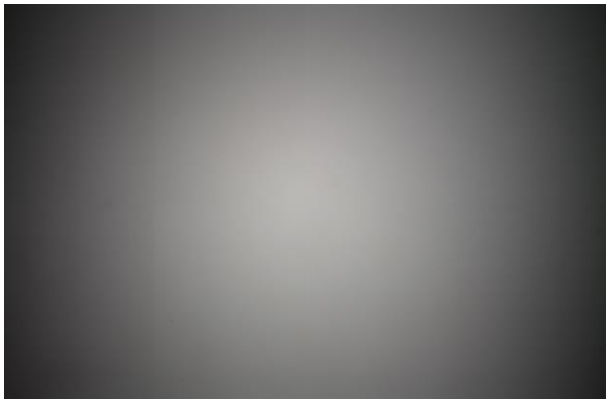


Figure 11-5 Before LSC Correction

Figure 11-6 After LSC Correction

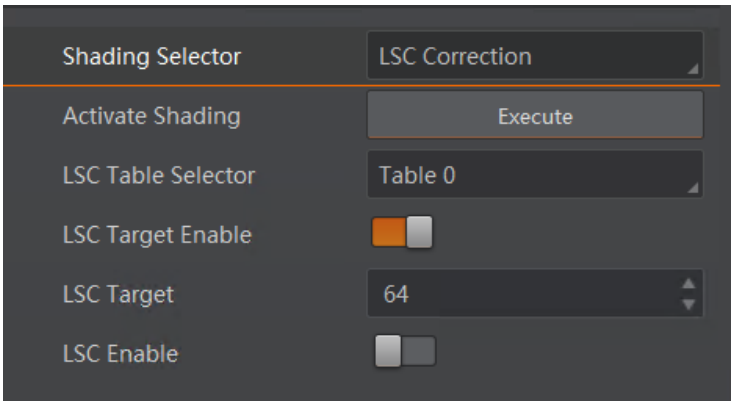


Figure 11-7 LSC Correction

Steps

1. Go to **Shading Correction**, and select **LSC Correction** as **Shading Selector**.
2. Select tables from **LSC Table Selector** ranging from Table 0 to Table 7 according to actual demands, which means LSC correction supports polling of 8 groups of parameters.
3. Enable **LSC Target Enable**. Set the brightness value in **LSC Target**. The higher the brightness value, the brighter the image; the lower the brightness value, the darker the image.
4. Click **Execute** in **Activate Shading** to let the client software automatically calculate.
5. Enable **LSC Enable**. The brightness of the image is corrected according to the set parameters, and the corrected parameters cannot be modified again.

Note

- The function of **LSC Target Enable** and **LSC Target** is only valid before executing **Activate Shading**. If **LSC Target Enable** is disabled, after clicking **Execute** in **Activate Shading**, enable **LSC Enable**. Then, the image will be corrected based on the current maximum brightness value.
- 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.
- Specific steps for executing LSC correction may differ by device models

11.5 Set LUT

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

Note

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

Steps

1. Click **LUT Control**, **and** enable **LUT Enable**.
2. Select **LUT Selector** according to actual demand.
3. Enter **LUT Index** with the range of zero to 1023.
4. Enter **LUT Value** with the range of zero to 4095, which is 4 times the value of **LUT Index**.
5. Click **Execute** in **LUT Save** to save it.

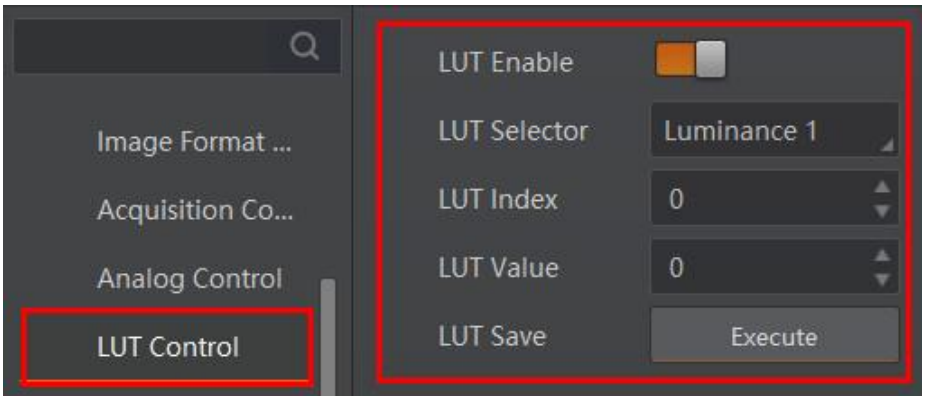


Figure 12-23 Set LUT

Chapter 12 Other Functions

12.1 Device Control

Note

The specific device control parameters may differ by device models.

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

Table 12-1 Parameter Description

Parameter	Read/Write	Description
Device Scan Type	Read Only	It is the scan type of the device's sensor.
Device Vendor Name	Read Only	It is the name of the manufacturer of the device.
Device Model Name	Read Only	It is the model of the device.
Device Manufacturer Info.	Read Only	It is the manufacturer information.
Device Firmware Version	Read Only	It is the firmware version of the device.
Device Serial Number	Read Only	It is device's serial number.
Device User ID	Read & Write	Device name and it is empty by default. You can set according to your preference. ● If User ID is empty, the client software displays the device model (device serial number). ● If you set it, the client software displays the User ID you set (device serial number).
Device Revision	Read Only	It is the version of XoFLink protocol.
Device Manifest Size	Read Only	It is the quantity of GenICam XML.
Device Manifest Selector	Read & Write	It is the ID of GenICam XML.
Device XML Version	Read Only	It is version of GenICam XML.
Device Schema Version	Read Only	It is the schema version of GenICam.
Device Uptime (s)	Read Only	It is the device's operation time.
Board Device Type	Read Only	It is the device type.

Parameter	Read/Write	Description
Device Reset	Write	Click **Execute** to reset the device.
Device Fan Enable	Write	After enabled, the device's fan is running.
Device Temperature Selector	Read & Write	It selects device component to view its temperature. Currently, sensor or mainboard can be selected.
Device Temperature	Read Only	It displays the temperature of selected components in **Device Temperature Selector**.
Find Me	Read & Write	Click **Execute** to find the currently operating device, and the device red indicator flashes once.
Device PJ Number	Read Only	It is the device's project number.

12.2 Transport Layer Control

You can go to **Transport Layer Control** to view the device's payload size, image stream ID, etc.

Note

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

Table 12-2 Parameters of Transport Layer Control

Parameter	Read/Write	Description
Paylode Size	Read Only	It is the device's load size.
Device Tap Geometry	Read & Write	It is the device's tap geometry.
Image 1 Stream ID	Read Only	It is the ID of image 1.
Image 2 Stream ID	Read Only	It is the ID of image 2.

12.3 XoFLink Parameters

You can go to **XoFLink** to view and set the parameters of fiber port.

Note

The specific XoFLink parameters may differ by device models.

Table 12-3 XoFLink Parameters

Parameter	Read/Write	Description
Device Connection ID	Read Only	It is the device's connection ID.
Master Host Connection ID	Read, and Write if not Acquisition	It is connected master host ID.
Control Packet Max Size	Read Only	It is the max. size of single control packet.
Device Steam Max Size	Read, and Write if not Acquisition	It is the max. size of single stream packet.
LinkConfiguration	Read, and Write if not Acquisition	It sets link configuration mode, as show below.
LinkConfigurationPreferred	Read Only	It is recommended link configuration mode. You can click **Execute** in **User Set Save** after configuring **Link Configuration** to save it. At this time, **Link Configuration Preferred** is related with **Link Configuration**.
ConnectionTestMode	Read & Write	It checks test data sent between the device and frame grabber.
TestErrorCountSelector	Read & Write	It selects link that needs checking test results.
TestErrorCount	Read & Write	It is error count of current link.
TestPacketCountTx	Read & Write	It is transmitted test data quantity of current link.
TestPacketCountRx	Read & Write	It is received test data quantity of current link.
TestPacketModeTx	Read & Write	It is transmitted test data mode of current link. You can select **Mode 1** and **Mode 2**. ● If you select **Mode 1**, the test data is a byte-by-byte incrementing loop from zero to 255. ● If you select **Mode 2**, the test data is a specified value, i.e., the value of **TestPackedValue**.
TestPacketGroupTx	Read & Write	It is the group number of transmitted test data of current link.
TestPackedValue	Read & Write	It is the transmitted test data value of current link.

12.4 File Access Control

Note

- The file access control function may differ by device model.
- Importing and exporting the device feature among the same model of devices and same firmware versions are supported.

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

Steps

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

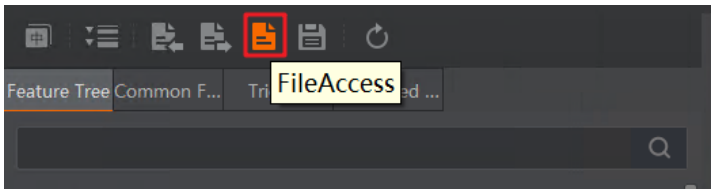


Figure 12-1 File Access

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

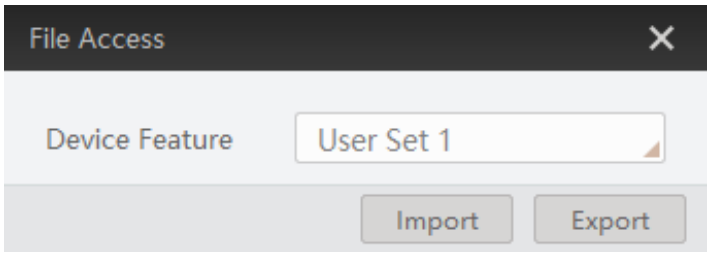


Figure 12-2 Import or Export

3. Select a mfa file from local PC to import or select a saving path and enter file name to save and export.

Note

- If User Set 1/2/3 is selected as device feature, you need to load the corresponding user set you selected to take effect.
- If LUT Luminance 1/2/3 is selected as device feature, and they will take effect only when you select the same parameters in LUT Selector.
- USER PRNUC 1/2/3 has the same mechanism with LUT Luminance 1/2/3 mentioned above.
- If USER FPNC 1/2/3 is selected as device feature, and they will take effect immediately when **FPNC User Enable** is enabled.
- If License Notice is selected as device feature, and it will take effect immediately when it is imported.

12.5 Update Firmware

The device supports updating firmware via the MVS client software.

Note

- The device will reboot automatically after updating the firmware.

Steps

1. Go to **Tool** → **Toolkit** to open MVS Tool Kit.
2. Go to **All** → **Configuration Tool** → **Firmware Upgrade Tool** after running MVS Tool Kit.
3. Select **Camera** from **Select Type**.

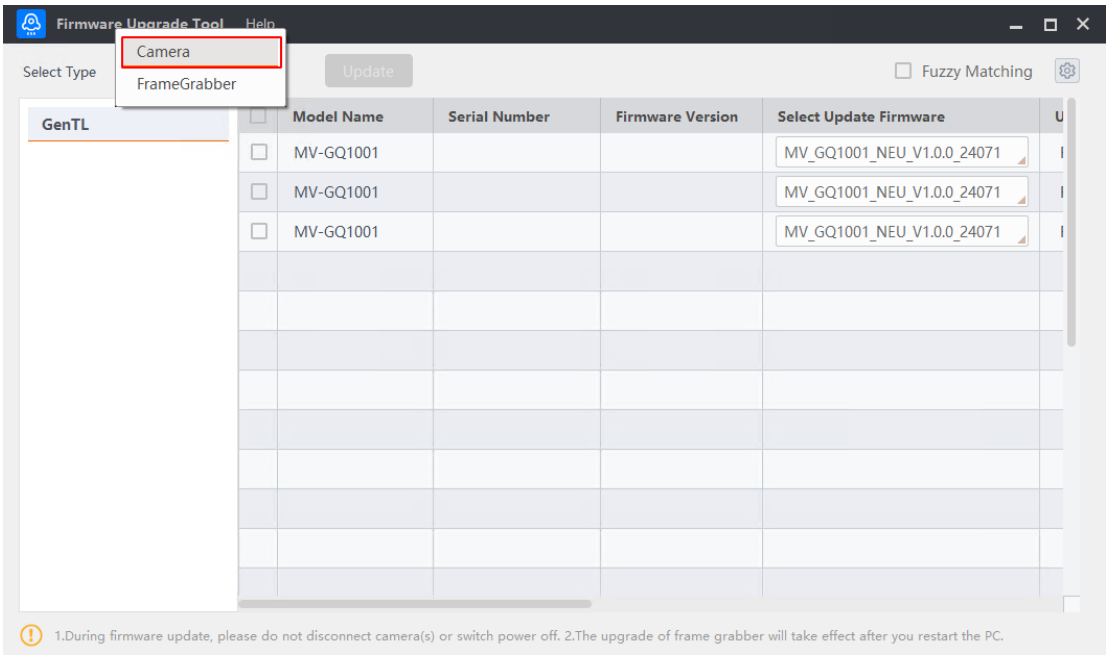


Figure 12-3 Select Camera

4. After the CTI file is auto-loaded or imported, the tool automatically refreshes and enumerates all the devices searched by the frame grabber under the CTI file.
5. Click to select firmware upgrade package (dav file).
6. Click **Update** to start updating.

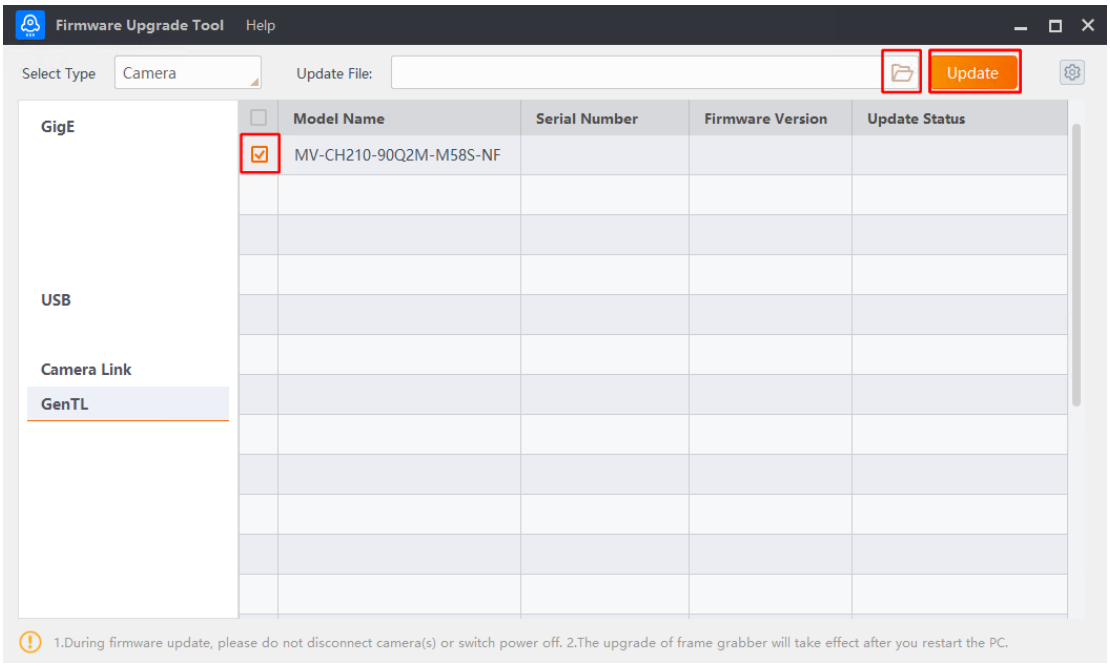


Figure 12-4 Update Firmware

Note

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

Chapter 13 FAQ (Frequently Asked Question)

13.1 Why the client software cannot list devices?

Reason

- The device is not powered on normally.
- Connection of fiber patch cable exception occurs.

Solution

- Check the device's power supply by observing the device LED indicator.
- Check connection of fiber patch cable.

13.2 Why the live view is back?

Reason

The device's lens aperture is not removed.

Solution

Remove the device's lens aperture.

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

Reason

- Incorrect trigger wiring.
- The trigger mode is not enabled correctly.

Solution

- Check wirings of different trigger modes.
- Enable the trigger mode and make sure that the selected trigger source matches with the corresponding trigger signal.

13.4 Why images required by algorithm cannot get although the live view and trigger signal are normal?

Reason

The image's output format is not matched with the algorithm.

Solution

Check the image format required by the algorithm, and configure the device's image output format in the client software.

13.5 Why the device cannot reach full frame rate or full bandwidth during image acquisition?

Reason

- The specification of frame grabber slot is not up to standard.
- The PC to which the device is connected is not equipped with dual-channel memory modules.
- The buffer count on both the frame grabber and client software is insufficient.
- The live view function is initiated with the start of image acquisition.

Solution

- Check the specification of frame grabber slot.
- Adopt dual-channel memory modules for the PC to which the device is connected.
- Configure a higher value of buffer count on both the frame grabber and client software.
- Disable the live view function during image acquisition.

Chapter 14 Revision History

Table 14-1 Revision History

Version	Document No.	Revision Date	Revision Details
V1.0.0	UD38894B	Aug. 12, 2024	Original version.

Appendix A Device Parameter Index

Table Appendix A-1 Device Parameter Index

Attribute	Parameters	Section
Device Control	Device Scan Type	Section Device Control
	Device Vendor Name	
	Device Model Name	
	Device Manufacturer Info	
	Device Firmware Version	
	Device Serial Number	
	Device User ID	
	Device Revsion	
	Device Manifest Num	
	Device Manifest Selector	
	Device Xml Version	
	Device Schema Version	
	Device Uptime(s)	
	Board Device Type	
	Device Reset	
	Device Fan Enable	
	Device Temperature Selector	
	Device Temperature	
	Find Me	
Image Format Control	Width Max	Section View Resolution and ROI
	Height Max	
	Region Selector	
	Width	
	Height	

Attribute	Parameters	Section
	Offset X	
	Reverse X	Section Set Image Reverse
	Reverse Y	
	ADC Bit Depth	Section Set Pixel Format
	Pixel Format	
	Pixel Size	
	Test Pattern Generator Selector	Section Set Test Pattern
	Test Pattern	
	Binning Mode	Section Set Binning
	Binning Selector	
	Binning Horizontal	
	Binning Vertical	
	Decimation Horizontal	Section Set Decimation
	Decimation Vertical	
Acquisition Control	Acqusition Mode	Section Set Acquisition Mode
	Acqusition Stop	
	Acqusition Burst Frame Count	Section Set Frame Rate
	Acqusition Frame Rate(Fps)	
	Acqusition Frame Rate Control Enable	
	Resulting Frame Rate(Fps)	
	Trigger Selector	Section Set Trigger Mode
	Trigger Mode	
	Trigger Software	
	Trigger Source	
	Trigger Activation	
	Trigger Delay	

Attribute	Parameters	Section
	Trigger Cache Enable	
	Exposure Mode	Section Set Exposure Auto
	Exposure Time(us)	
	Exposure Auto	
	Auto Exposure Time Lower Limit(us)	
	Auto Exposure Time Upper Limit(us)	
	HDR Enable	Section Set HDR
	HDR Selector	
	HDR Shutter(us)	
Analog Control	Preamp Gain	Section Set Analog Gain
	Digital Shift	
	Digital Shift Enable	
	Brightness	Section Set Brightness
	Black Level	Section Set Black Level
	Black Level Enable	
	Gamma	Section Set Gamma Correction
	Gamma Selector	
	Gamma Enable	
	Auto Function AOI Selector	Section Set AOI
	Auto Function AOI Width	
	Auto Function AOI Height	
	Auto Function AOI OffsetX	
	Auto Function AOI OffsetY	
	Auto Function AOI Usage Intensity	
LUT Control	LUT Enable	Section Set LUT
	LUT Selector	

Attribute	Parameters	Section
	LUT Index	
	LUT Value	
	LUT Save	
Shading Correction	Shading Selector	Section LSC Correction
	Activate Shading	
	LSC Table Selector	
	LSC Table Enable	
	LSC Target	
	LSC Enable	
Digital IO Control	Line Selector	Section Trigger Output
	Line Mode	
	Line Inverter	
	Line Status	
	Line Status All	
	Line Debouncer Time(us)	
	Line Source	
	Strobe Enable	
	Strobe Line Duration	
	Strobe Line Delay(μs)	
	Strobe Line Pre Delay(μs)	
Counter and Timer Control	Counter Selector	Section Set Trigger Source
	Counter Event Source	
	Counter Reset Source	
	Counter Reset	
	Counter Value	
	Counter Current Value	
File Access Control	File Selector	Section File Access Control

Attribute	Parameters	Section
	File Operation Selector	
	File Operation Execute	
	File Open Mode	
	File Operation Status	
	File Operation Result	
	File Size (B)	
Transport Layer Control	Payload Size	Section Transport Layer Control
	Device Tap Geometry	
	Image1StreamID	
	Image2StreamID	
XoFLink	Device Connection ID	Section XoFLink Parameters
	Master Host Connection ID	
	Control Packet Max Size	
	Device Stream Max Size	
	LinkConfiguration	
	LinkConfigurationPreferred	
	ConnectionTestMode	
	TestErrorCountSelector	
	TestErrorCount	
	TestPacketCountTx	
	TestPacketCountRx	
	TestPacketModeTx	
	TestPacketGroupRx	
	TestPacketValue	
User Set Control	User Set Current	Section User Set Customization
	User Set Selector	
	User Set Load	

Attribute	Parameters	Section
	User Set Save	
	User Set Save Status	
	User Set Default	

HIKROBOT

SHAPE OUR FUTURE INTELLIGENTLY

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