

Hikrobot Co., Ltd.

CoaXPress-12 Frame Grabber

User Manual

HIKROBOT

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

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

Available Model

This manual is applicable to the CoaXPress-12 Frame Grabber.

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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 storing and transporting the device in places where have water splashing and rain, direct sunlight, strong electric fields, strong magnetic fields, strong vibrations, etc.
- Avoid dropping, smashing, or vigorously vibrating the device and components during handling.
- Do not touch the electronic components of the device with bare hands, which may cause damage to the device due to ESD.
- When installing the device, it needs to be installed by professionals under the condition of electrostatic protection. The PCB should not be exposed after the device is installed.
- 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.
- When the device is installed in a cabinet or terminal equipment, the cabinet or terminal equipment shall be provided with corresponding protective devices such as fireproof enclosures, electrical protective enclosures and mechanical protective enclosures, and

the protection level shall comply with IEC standards and local laws and regulations.

- In the use of the device, you must be in strict compliance with the electrical safety regulations of the nation and region.
- Make sure that the power consumption of ATX meets that of the device. For the specific power consumption of the device, please refer to the device's specifications.
- 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.
- If the device is not working properly, contact the store or the nearest service center. Do not disassemble or modify the device in any way. (The company does not bear any liability for any problem arising from unauthorized modification or maintenance).
- 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.
- Please read the manual and safety instructions carefully before installing the device.
- The device must not be exposed to water droplets or splashes, and it is strictly prohibited to place anything containing liquids (such as vases) on the device.
- The device should not be placed with exposed flame sources, such as lighted candles.
- Do not touch sharp edges of 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.

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.
- The unused cables of the device must be insulated.
- 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.
- Make sure that the connector metal barrier of the device is well connected to the PC and other chassis, and if necessary, copper foil should be used to enhance the grounding effect.
- 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.

Chapter 2 Overview

2.1 Introduction

The CoaXPress-12 frame grabber supports CXP-12 protocol. Its HD-BNC connectors can be connected to 1 to 4 cameras, and each channel supports accessing up to 12.5 Gbps data transfer speed. The frame grabber can connect to the computer via the PCIe Gen3 × 8 bus and use bus-master DMA technology to transmit data, which hardly occupies CPU resources.

2.2 Key Feature

- Supports CXP-12 protocol with each channel accessing up to 12.5 Gbps data transfer speed.
- Supports PoCXP with each channel providing 13 W at most.
- Various indicators indicate frame grabber status in real time.
- Adopts multiple I/O connectors for input and output.
- Provides SDK for secondary development.
- Complies with GenICam standard.

Note

Refer to the specification of the frame grabber for detailed parameters.

Chapter 3 Appearance, Connector, and Indicator

3.1 Appearance

Note

- Refer to the specification of the frame grabber for specific appearance and dimension.
 - The appearance is subject to change, and the actual device you purchased shall prevail.
-

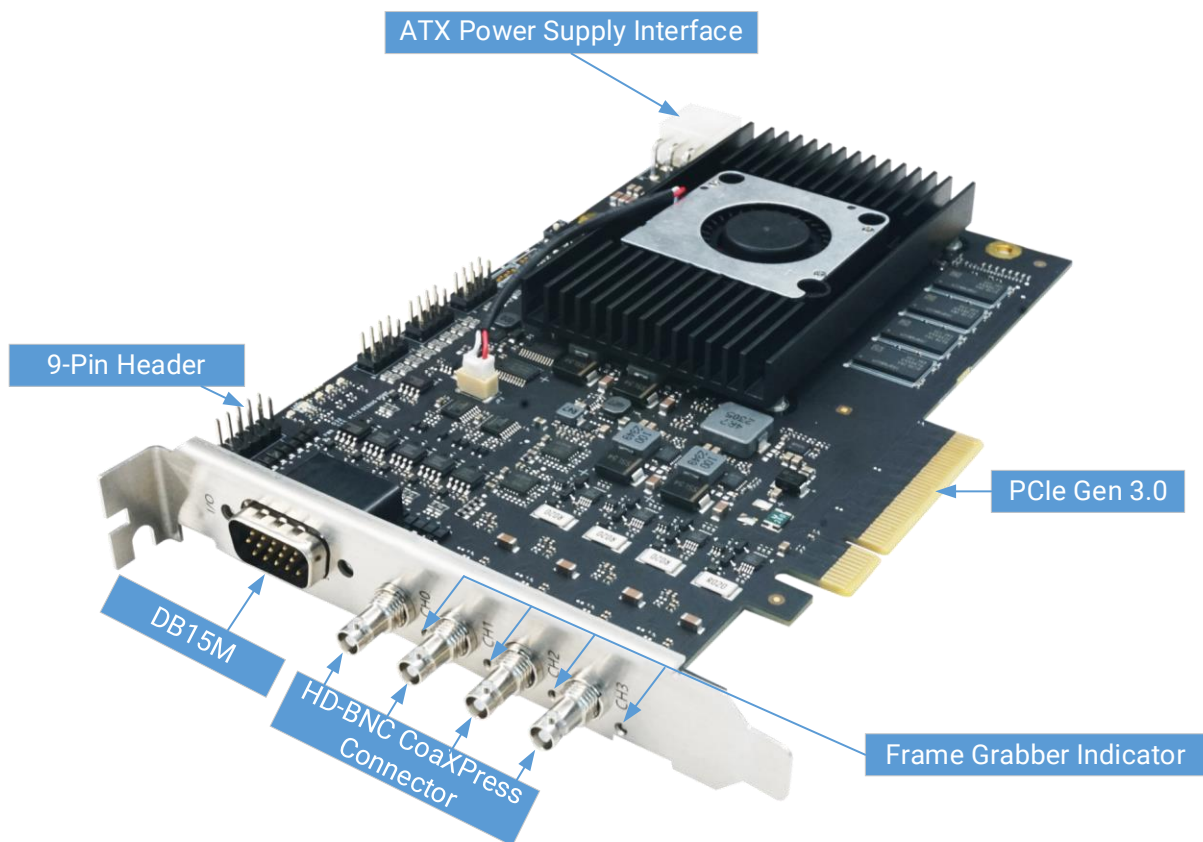


Figure 3-1 Appearance

3.2 ATX Power Supply Interface

The ATX power supply interface is used to power the PoCXP link. Make sure that the cable of 6-pin ATX 12V is inserted if the PoCXP function is used.

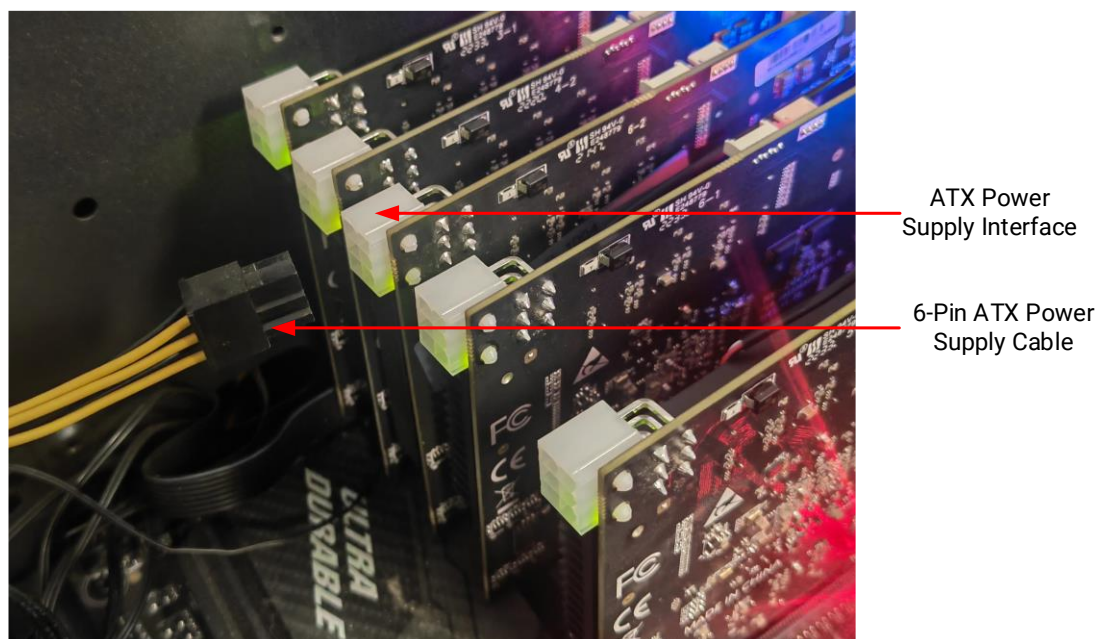


Figure 3-2 Appearance

3.3 I/O Connector

The frame grabber has multiple I/O connectors that provide input and output signals. It adopts DB15F connector and 9-pin header, and you can use I/O trigger cable and I/O adapter cable to wire the device.

DB15 Female Connector

Refer to the figure and table below for the connector definition of the DB15 female connector.

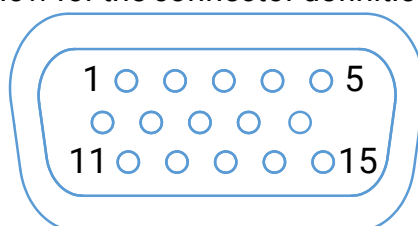


Figure 3-3 DB15F Connector

Table 3-1 Connector Definition of DB15F Connector

No.	Signal	Description	No.	Signal	Description
5	LINE_0P	Differential input/output IO0 positive	1	LINE_4P	Differential input/output IO4 positive
10	LINE_0N	Differential input/output IO0 negative	6	LINE_4N	Differential input/output IO4 negative

No.	Signal	Description	No.	Signal	Description
4	LINE_1P	Differential input/output IO1 positive	15	LINE_5P	Differential input/output IO5 positive
9	LINE_1N	Differential input/output IO1 negative	14	LINE_5N	Differential input/output IO5 negative
3	LINE_2P	Differential input/output IO2 positive	13	LINE_6P	Differential input/output IO6 positive
8	LINE_2N	Differential input/output IO2 negative	12	LINE_6N	Differential input/output IO6 negative
2	LINE_3P	Differential input/output IO3 positive	11	GND	Non-isolated I/O ground
7	LINE_3N	Differential input/output IO3 negative	/	/	/

I/O Trigger Cable

The two ends of the I/O trigger cable are DB15M and open to have seven input and output signals. The DB15M connector is connected to the DB15F connector on the frame grabber.

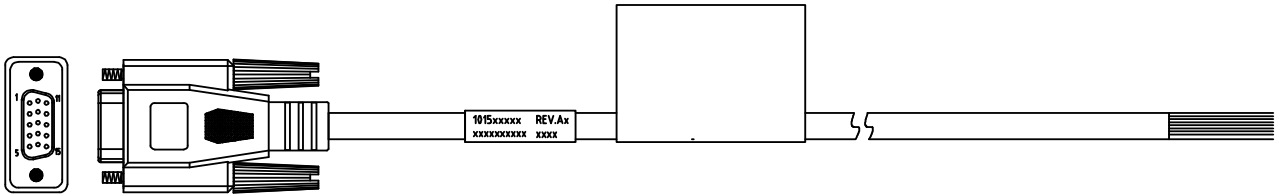


Figure 3-4 I/O Trigger Cable

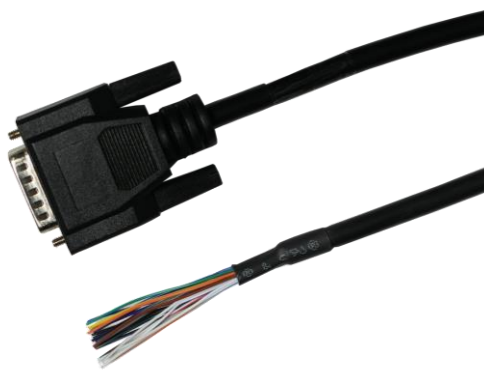


Figure 3-5 Appearance of I/O Trigger Cable

9-Pin Header

Refer to the figure and table below for the pin definition of the 9-pin header.

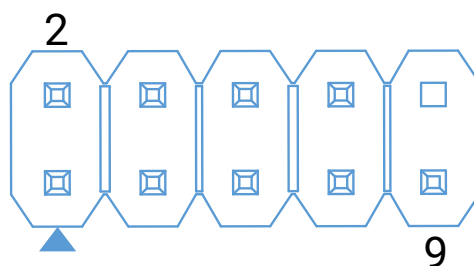


Figure 3-6 9-Pin Header

Table 3-2 Pin Definition of 9-Pin Header

No.	Signal	Description	No.	Signal	Description
1	LINE_7P	Differential input/output IO7 positive	6	LINE_9P	Differential input/output IO9 positive
2	LINE_7N	Differential input/output IO7 negative	7	LINE_9N	Differential input/output IO9 negative
3	LINE_8P	Differential input/output IO8 positive	8	LINE_10P	Differential input/output IO10 positive
4	LINE_8N	Differential input/output IO8 negative	9	LINE_10N	Differential input/output IO10 negative
5	GND	Non-isolated I/O ground	/	/	/

I/O Adapter Cable

The I/O adapter cable connects the 9-pin header of the frame grabber at one end, connects PC at the other end, and connects I/O trigger cable to have four input and output signals.

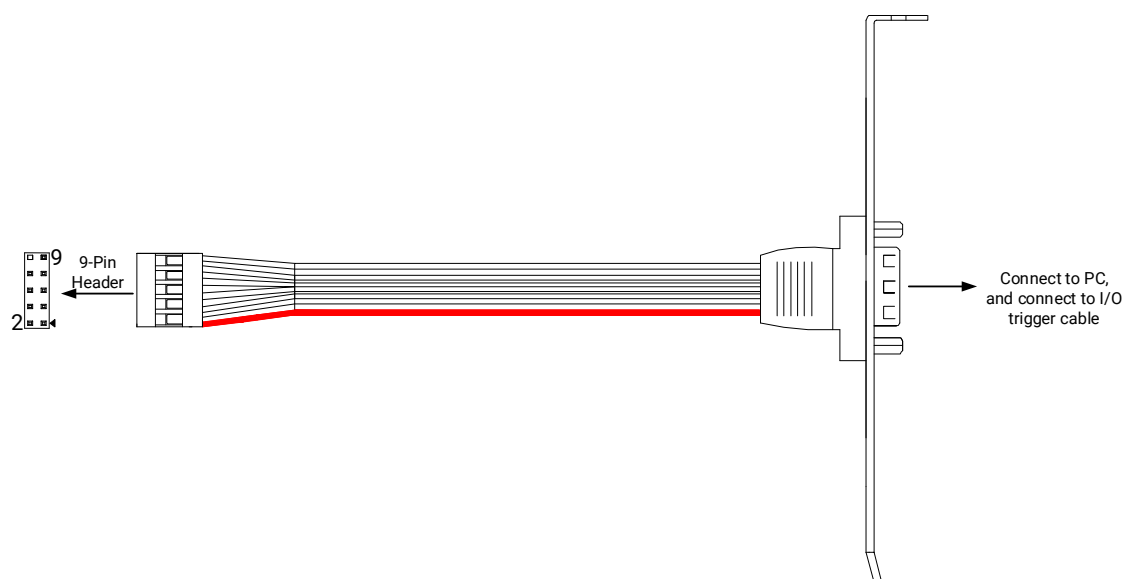


Figure 3-7 I/O Adapter Cable

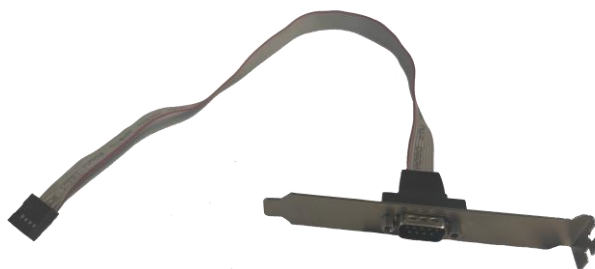


Figure 3-8 Appearance of I/O Adapter Cable

Note

The I/O trigger cable and the I/O adapter cable are sold separately, and you should purchase them according to actual demands.

3.4 HD-BNC CoaXPress Connector

The frame grabber has four HD-BNC CoaXPress connectors (CH0 to CH3), and the connectors are used to connect four CoaXPress links. The CXP-12 connector near the PCIe3.0 slot is CH3, and the CXP-12 connector far from the PCIe3.0 slot is CH0. PoCXP is supported.

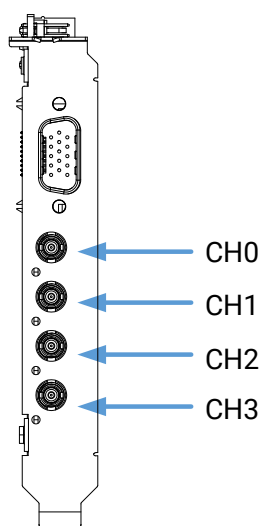


Figure 3-9 HD-BNC CoaXPress Connector

3.5 PCIe3.0 Interface

The frame grabber has a PCIe3.0 interface in x8 mode, which can be connected to the host. When in use, the PCIe3.0 interface of the frame grabber can be inserted into the X8 or X16 slots of the host, as shown below.

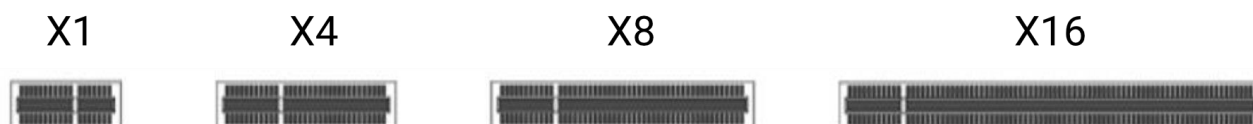


Figure 3-10 PCIe3.0 Interface

3.6 Indicators

The frame grabber provides feedback on various information and status through 2 types of indicators, including stream indicator and bus indicator. Refer to the table below for indicator definition.

Table 3-3 Indicator Definition

Definition	Description
Flashing Rapidly	The indicator turns on for 20 ms, and then turns off for 60 ms.
Flashing Slowly	The indicator turns on for 1 second, and then turns off for 1 second.

3.6.1 Stream Indicator

The frame grabber has four stream indicators for indicating the status of four CoaXPress links. Refer to the table below for the description of indicator status.

Table 3-4 Stream Indicator Status

Indicator Color	Status	Description
N/A	Unlit	The frame grabber is not powered on.
Red	Flashing Slowly	The frame grabber is powered on, but not connected to the camera.
Green	Solid	The frame grabber is connected to the camera, but no data is transmitted.
Green	Flashing Rapidly	The frame grabber is connected to the camera, and data is transmitting.

3.6.2 Bus Indicator

The bus indicator (D30) is used to indicate whether the host's PCIe identifies the frame grabber.

Table 3-5 Bus Indicator Description

Status	Description
Solid	The PCIe identifies the frame grabber.
Unlit	The PCIe does not identify the frame grabber.

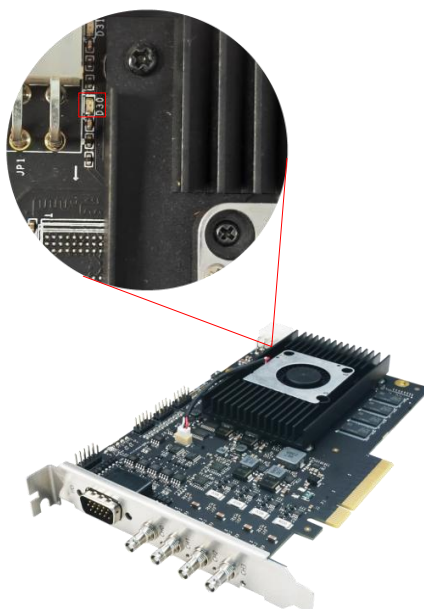


Figure 3-11 On-Board Indicator

Chapter 4 Installation

4.1 Installation Preparation

Table 4-1 Installation Preparation

Category	Name	Description
Software	MVS Client Software	It is used to enumerate and set the frame grabber's parameters.
	MVS Tool Kit	It is used to provide tool kit for you to finish the frame grabber's function configuration.
Hardware	HD-BNC CoaXPress Cable	It is used to connect the frame grabber and cameras.
	I/O Trigger Cable	They are used to connect the frame grabber via I/O connector (DB15F connector or 9-pin header) to other external devices.
	I/O Adapter Cable	
API Function Library	SDK	It is used for the secondary development.
Drive Package	MVFG_DRIVER_..._GY1004_... .zip	It is used to update the frame grabber's firmware to match the SDK. There are three versions. • 1-stream version: It can connect to 1 camera at most, process 1 set of streaming data, and support up to 4 links. • 2-stream version: It can connect to 2 cameras at most, process 2 sets of streaming data, and support up to 2 links. • 4-stream version: It can connect to 4 cameras at most, process 4 sets of streaming data, and support up to 1 link.

4.2 Frame Grabber Installation

Before You Start

- Before installing the frame grabber, make sure that the computer is powered off.
- Before installing the frame grabber, please remove static electricity from your body via touching a grounded metal object.

Steps

1. Insert the frame grabber into the computer's PCIe3.0 × 8 slot or above.
2. Use screws to fix the frame grabber with the computer.
3. Use the cable of 6-pin ATX to connect the frame grabber's ATX power supply interface to the computer if the PoCXP function is used.
4. (Optional) For using I/O, refer to [I/O Wiring](#) for wiring methods.
5. Connect one or two cameras to the frame grabber according to actual demands.

Here we list some common wirings, and you can wire the camera and the frame grabber according to actual demands.

Note

The images below are for reference only.

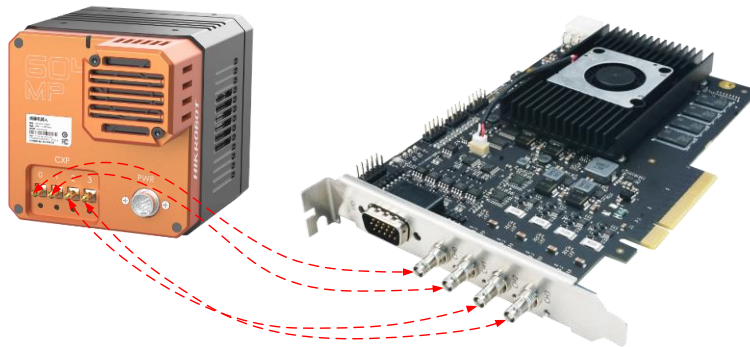


Figure 4-1 Wiring of One Camera

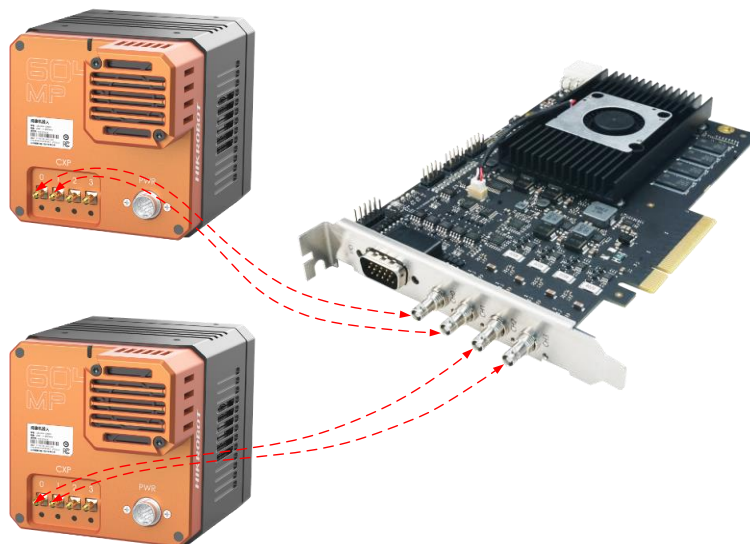


Figure 4-2 Wiring of Two Cameras

6. After booting up, install the MVS client to enumerate frame grabbers and perform related operations within the client.

Note

If you are using Windows 7, a New Device Detected dialog will pop up. Select **Ask me later**, and proceed with subsequent installation steps.

4.3 MVS Client Software Installation

MVS client software is used to connect and set frame grabber parameters, etc.

Steps

Note

- The MVS client software is compatible with 32/64-bit Windows 7/10, 64-bit Windows 11, and 32/64-bit Linux operating system. Here we take Windows as an example.
 - Only MVS client software of V3.4.1 220324 and later is applicable for the frame grabber. The MVS client software of V4.3.1 and later is recommended for more functions.
 - Make sure that the MVS is closed before installing or updating it.
 - The graphic user interface may differ by versions of the client software you use.
 - You can download the client software and SDK from **en.hikrobotics.com**.
 - The client integrates the required drivers for the frame grabber, so there is no need to download and install other drivers.
-

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

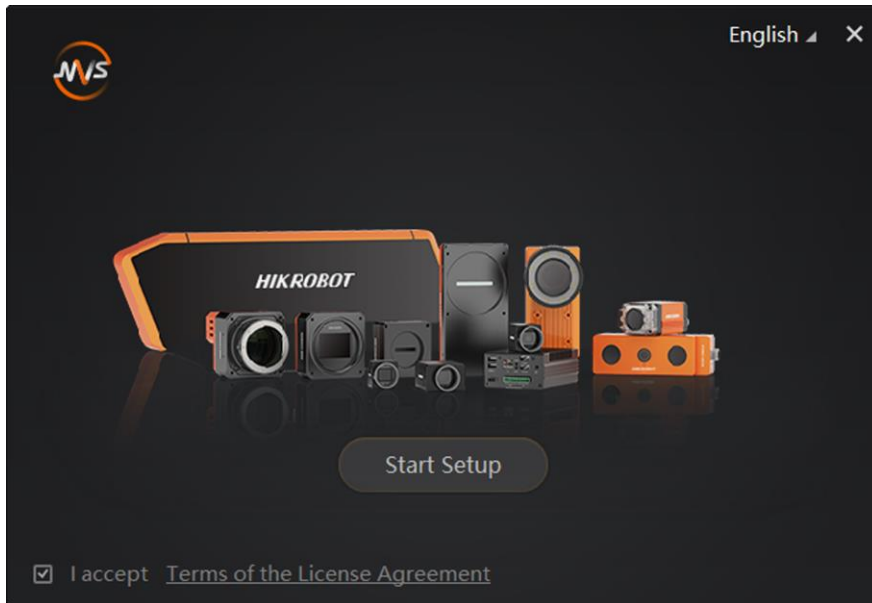


Figure 4-3 Installation Interface

4. Click **Start Setup**.

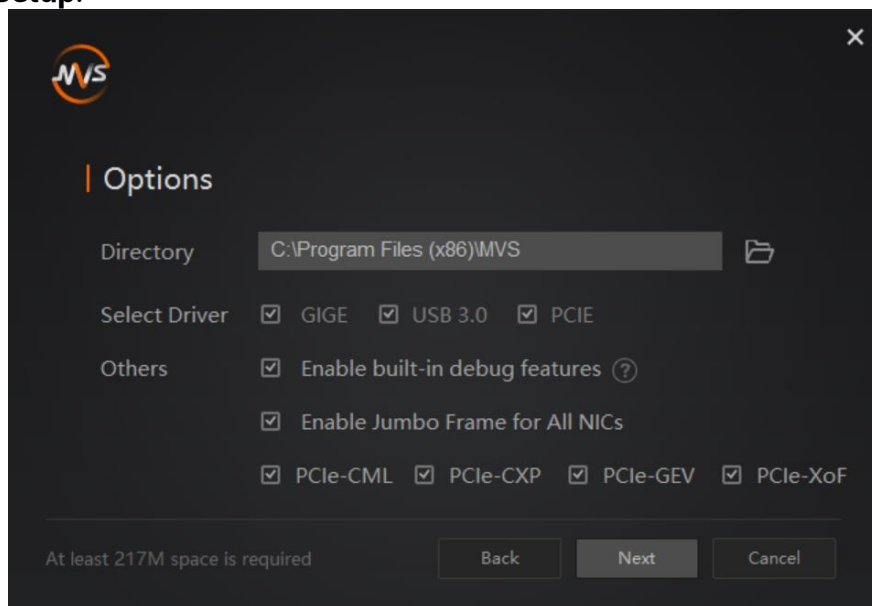


Figure 4-4 Default Settings

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

6. Finish the installation according to the interface prompts.

Chapter 5 Basic Operation of Client Software

You can enumerate frame grabbers and cameras connected to the frame grabber in GenTL of MVS, and set parameters and update firmware in the device list.

5.1 Connect Frame Grabber to Client Software

Steps

Note

Refer to the user manual of the camera and client software for detailed camera operation.

1. Run the MVS software.
2. Right click the **GenTL** in the device list, and click **Select CTI File**.

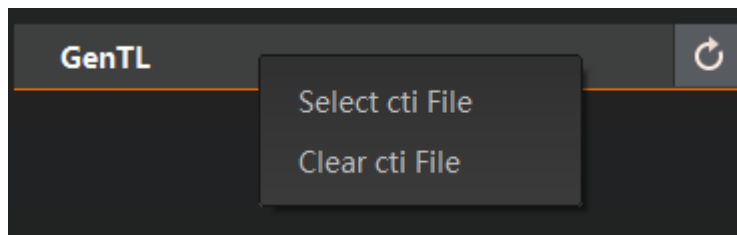


Figure 5-1 Select CTI File

3. Select **MvFGProducerCXP.cti** file from the local PC and click **Open**.

Note

- The SDK file path for the GenTL standard library is C:\Program Files (x86)\Common Files\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)\Common Files\MVS\Runtime\Win64_x64.
-

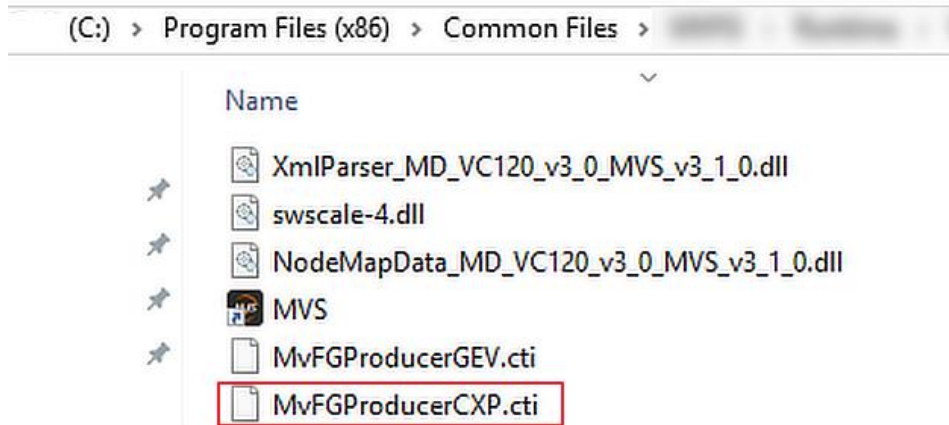


Figure 5-2 Select File

4. Click  in the specific frame grabber name to connect it.
5. After loading GenTL library, the client software will enumerate the frame grabber and connected cameras automatically.

5.2 Client Software Layout

The main window of the MVS client software is displayed after you connect a frame grabber to it.

Note

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

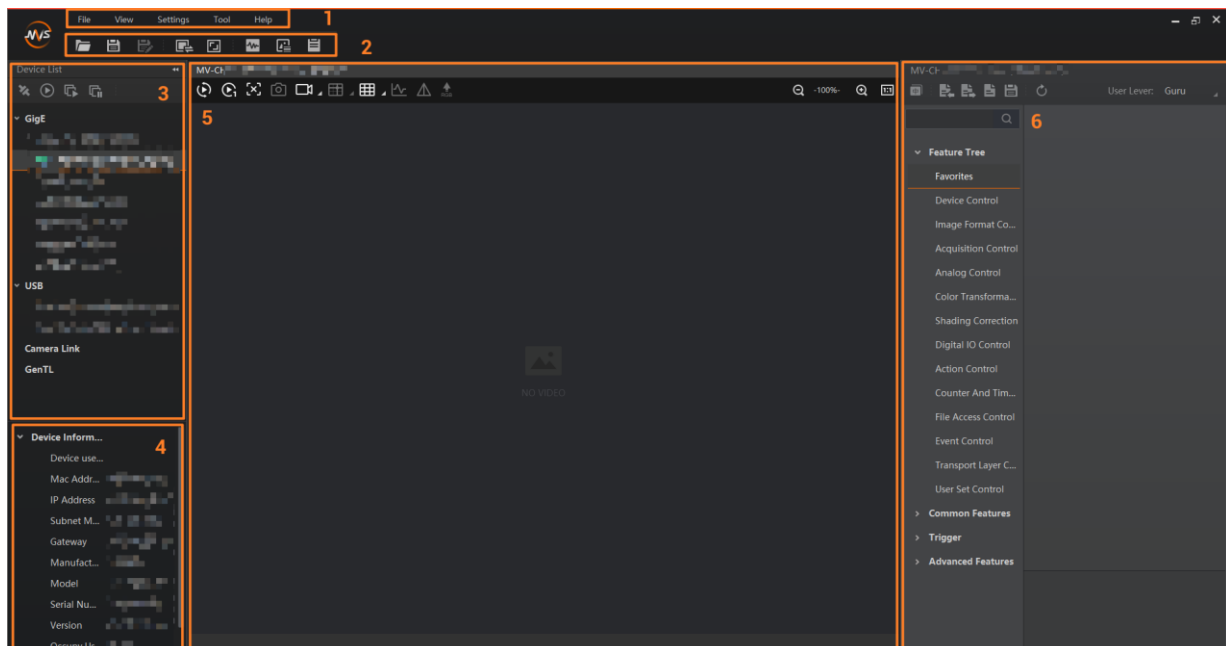


Figure 5-3 Main Window

Table 5-1 Main Window Description

No.	Area Name	Description
1	Menu Bar	The menu bar displays function modules, including File , View , Settings , Tool , and Help .
2	Control Toolbar	The control toolbar provides quick operations for the device.
3	Device List Panel	This panel displays device list, and you can connect or disconnect device, etc.
4	Device Information Panel	This panel displays the detailed device information.
5	Display Window	This area displays the acquisition images in real time. You can click different icons to capture and save image, record, etc.
6	Feature Panel	You can view and set features of the selected device.

Table 5-2 Parameter Description

Parameter Name	Description
Device Control	It displays the basic information about the frame grabber, and you can set the PoCXP function here.
Basic Setting	It allows you to set parameters of stream, trigger, camera, etc.
External Trigger	It allows you to set and manage external trigger signals.
Advanced Setting	It allows you to set the timer-related signal source and other parameters, and set and manage advanced I/O control.
User Set Control	It allows you to save and load the parameter group of the frame grabber, and set the default parameter group.

5.3 Drive Package Installation

To ensure that the frame grabber's SDK matches the firmware version of the frame grabber, you can update the firmware by installing a drive package.

Note

Contact the technical support to get the drive package for CoaXPress-12 frame grabber. The drive package is named with "MVFG_DRIVER_***".

Before You Start

Close the MVS client software before installing the drive package.

Steps

1. Decompress the patch package, open the folder, and double-click the .exe file.

2. Click **Install** to continue.

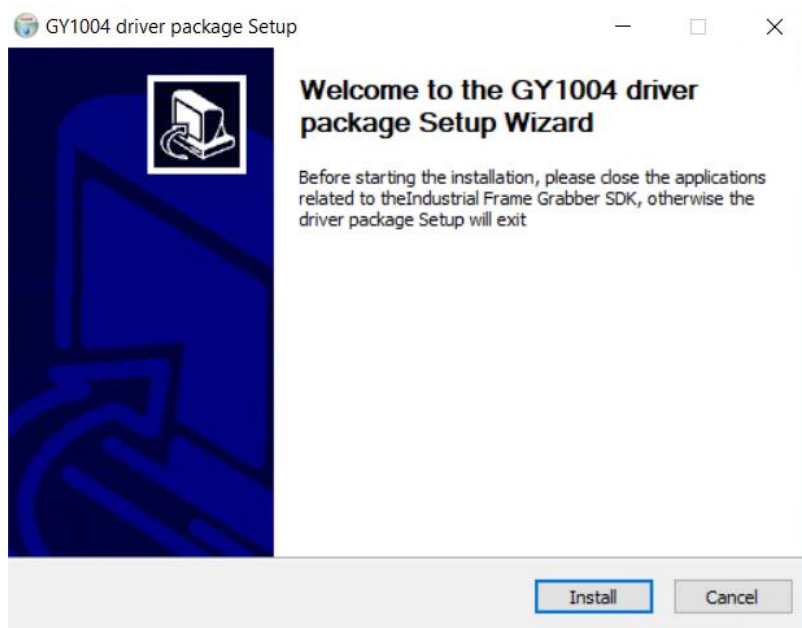


Figure 5-4 Install

3. Select **Open Firmware Updater** or **Open Release Note** according to your needs, and click **Finish** after selection.

Note

Refer to section [Upgrade Firmware](#) to see frame grabber upgrade via the firmware upgrade tool.

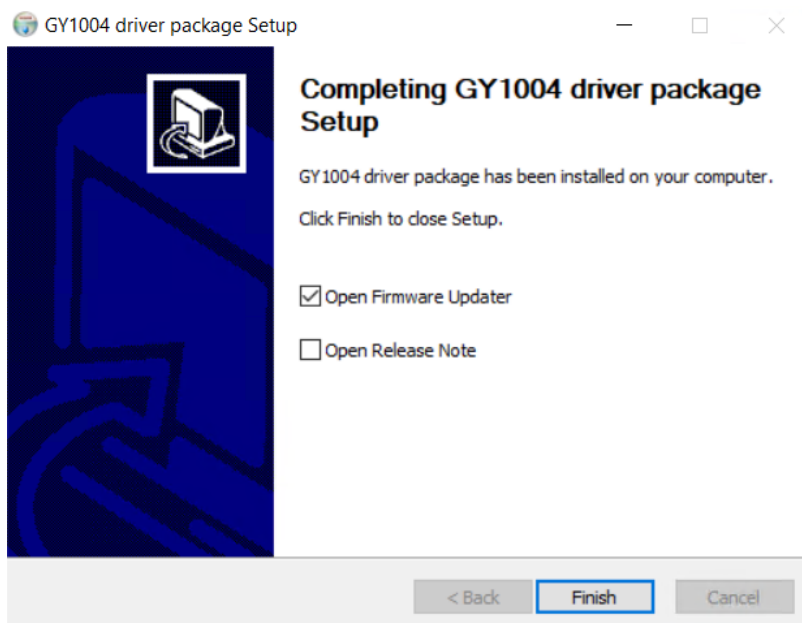


Figure 5-5 Finish Installation

5.4 Secondary Development

Users can perform secondary development of the frame grabber. The SDK secondary development data path is located: C:\Program Files (x86)\MVS\Development\MVF, as shown below. Please refer to the following table for the specific contents of each folder.

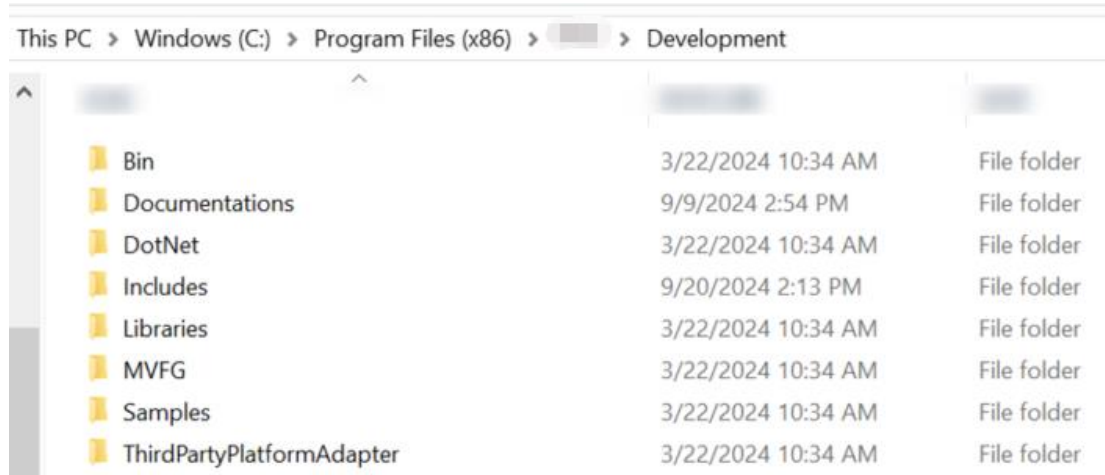


Figure 5-6 Secondary Development

Table 5-3 Parameter Description

Folder Name	Content Description
Bin	It is the result of the compilation.
Documentations	It is secondary development documentation, including SDK development guide and Demo instructions.
DotNet	Some dynamic libraries developed in C#.
Includes	Header files.
Libraries	Static library.
MVFG	The SDK content of frame grabber, including secondary development documentation, some dynamic libraries developed in C#, header files, static library, sample code, and third-party platform plug-ins.
Samples	Sample code for various programming languages.
ThirdPartyPlatformAdapter	Third-party platform plug-ins.

Chapter 6 Operating Principle

The onboard diagram of the frame grabber is shown below. The external I/O trigger signal sends the Link Trigger signal, transmits UpLink to the camera, and controls the camera to output the corresponding image.

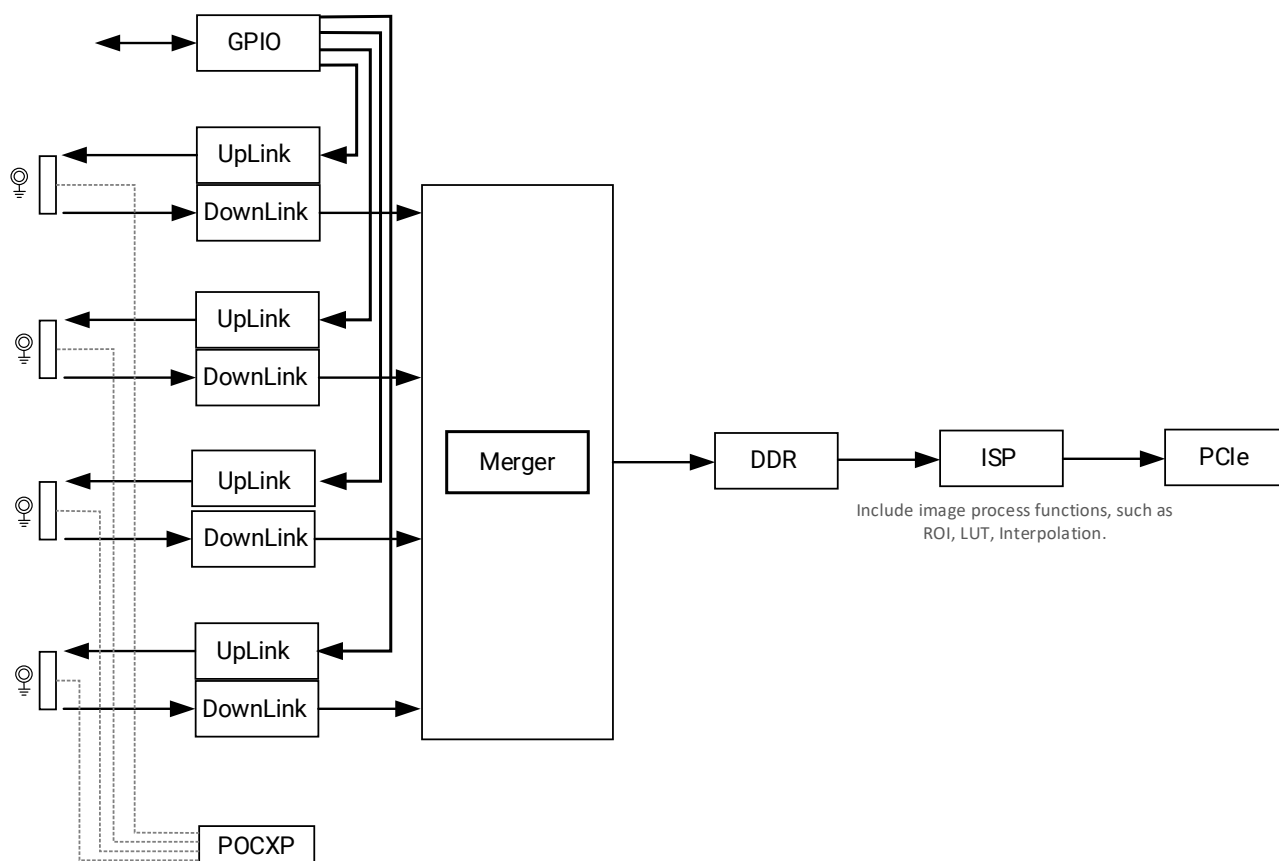


Figure 6-1 Operating Principle

Chapter 7 I/O Introduction

The frame grabber has 11 configurable differential input/output signals (D485 InOut 0 to D485 InOut 10). You can configure them as differential input or differential output according to actual demands.

7.1 I/O Electrical Feature

7.1.1 Differential Input Circuit

The differential input signals in I/O support the single-ended input, and the internal circuit is shown below.

The external differential signal (EXTERNAL SIGNAL) is converted into a single-ended input signal through the RS-485 transceiver and sent to the FPGA for triggering counter.

The external single-ended signal is compared with the internal threshold level of the frame grabber, converted into a single-ended signal through the RS-485 transceiver, and sent to the FPGA for triggering counter.

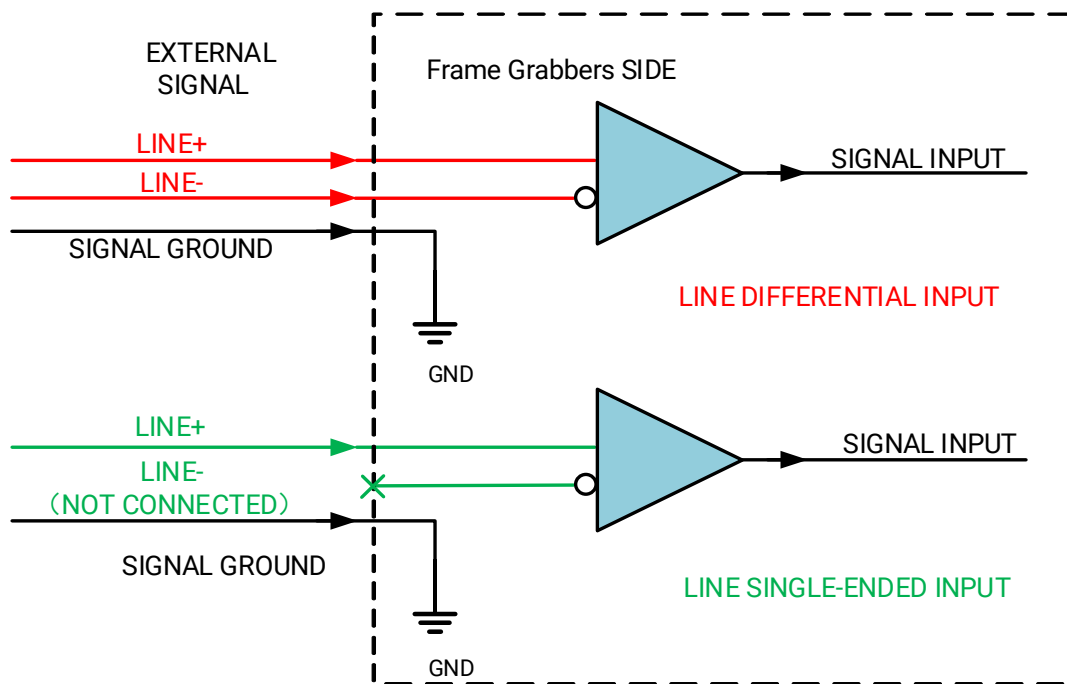


Figure 7-1 Internal Circuit of Differential Input

The RS-422 standard and TTL & LVTTTL standard input signal are applied to the differential input.

RS-422 Standard Input

In order to make sure the normal operation of input circuit, it is required to connect camera's ground signal with external ground signal if the differential input adopts RS-422 standard signal.

TTL & LVTTTL Standard Input

If the differential input adopts TTL & LVTTTL standard signal, its input electrical feature requirement is shown below.

Table 7-1 Electrical Feature Requirement of TTL & LVTTTL

Voltage Range	Definition
0 V to 1 V	Level low
1 V to 3 V	Unstable voltage, and it is not recommended to use it.
3.3 V to 24 V	Line 0 to Line 10 level high

7.1.2 Differential Output Circuit

The internal circuit of differential output signals in I/O is shown below.

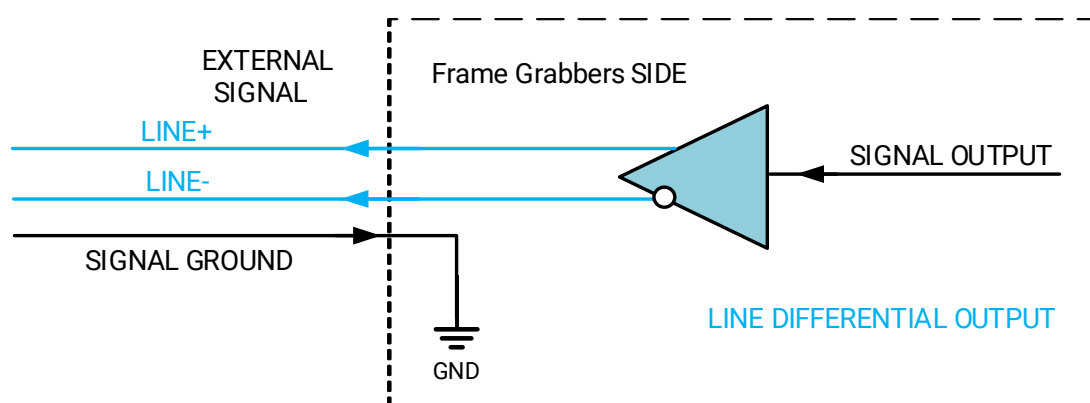


Figure 7-2 Internal Circuit of Differential Output

The single-ended signal from the FPGA is converted into a differential output signal through the RS-485 transceiver.

The differential output uses RS-422 standard signal. In order to make sure the normal operation of output circuit, it is required to connect camera's ground signal with external ground signal. The output interface can be connected to the RS-422 bus structure as a main dispenser.

7.2 I/O Wiring

7.2.1 Input Wiring

The frame grabber receives input signals to trigger the camera to acquire images. The input signals include differential signal and single-ended signal.

Note

- Make sure that the hardware trigger signals have been configured as input signal.
 - Wirings may differ by different signal sources.
- The wiring is shown below if differential signal source provides trigger signal.

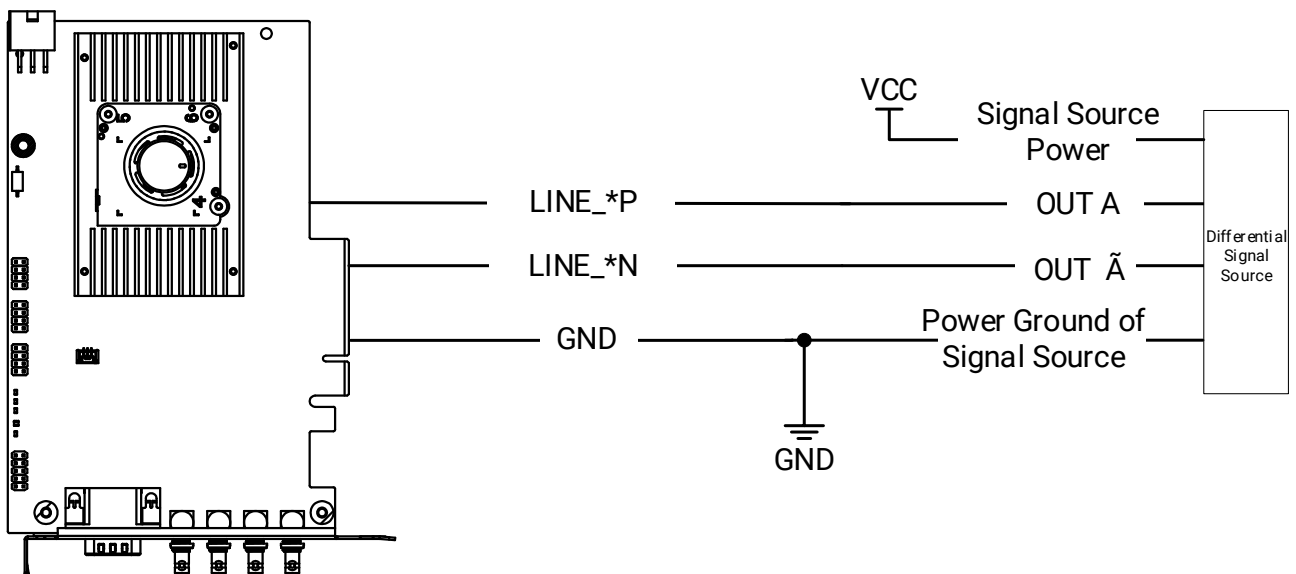


Figure 7-3 Differential Input Wiring

- There are two wirings as shown below if the PNP single-ended signal source provides the signal source.

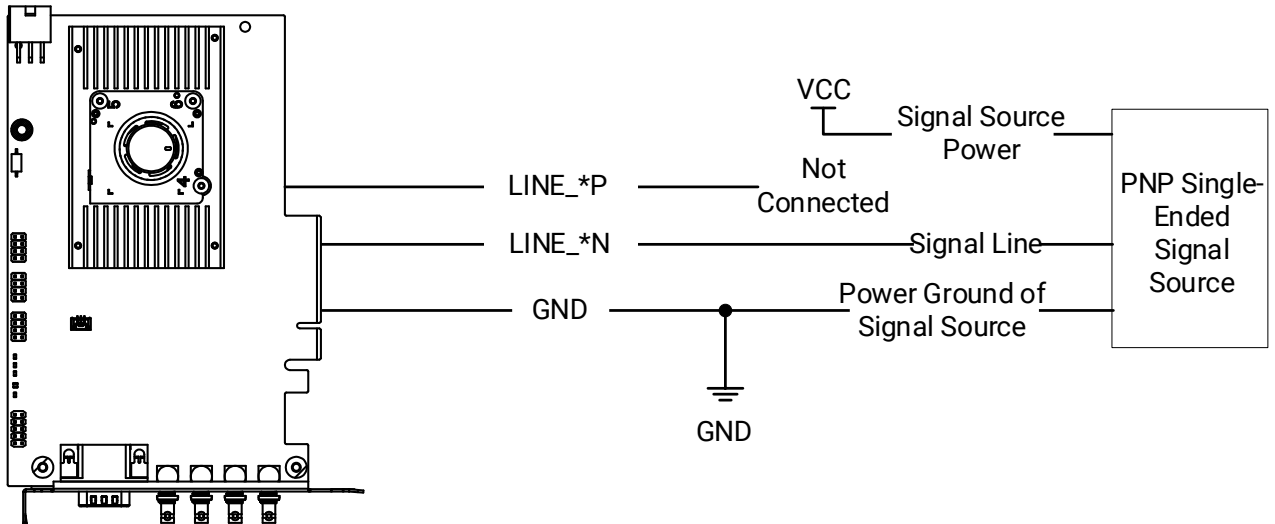


Figure 7-4 PNP Single-Ended Input Wiring Without Pull-Down Resistor

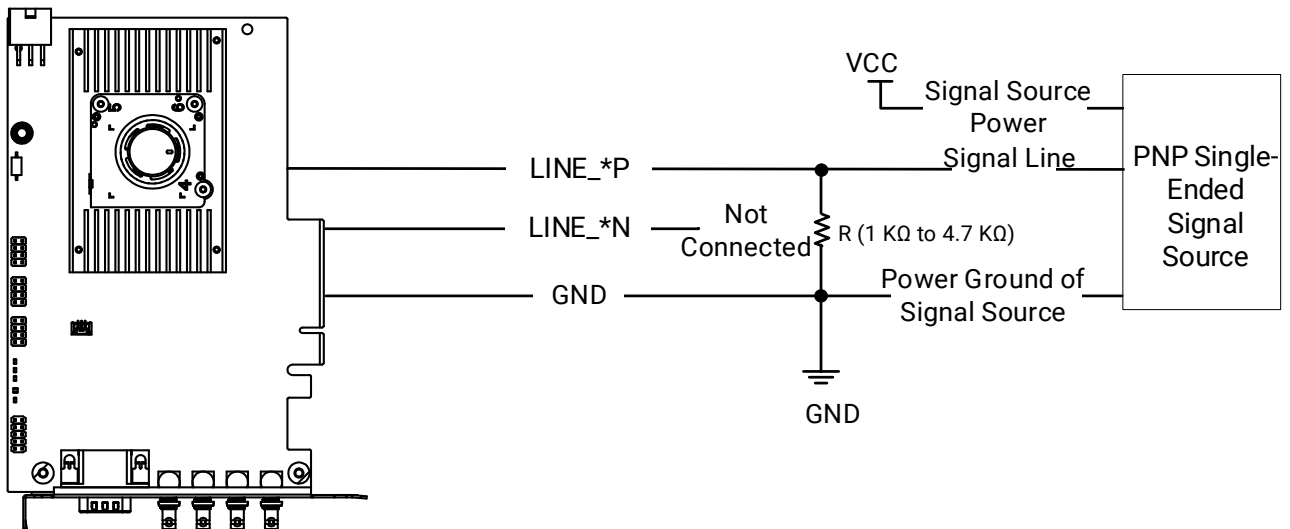


Figure 7-5 PNP Single-Ended Input Wiring with Pull-Down Resistor (1 KΩ to 4.7 KΩ)

- There are two wirings as shown below if the NPN single-ended signal source provides the signal source.

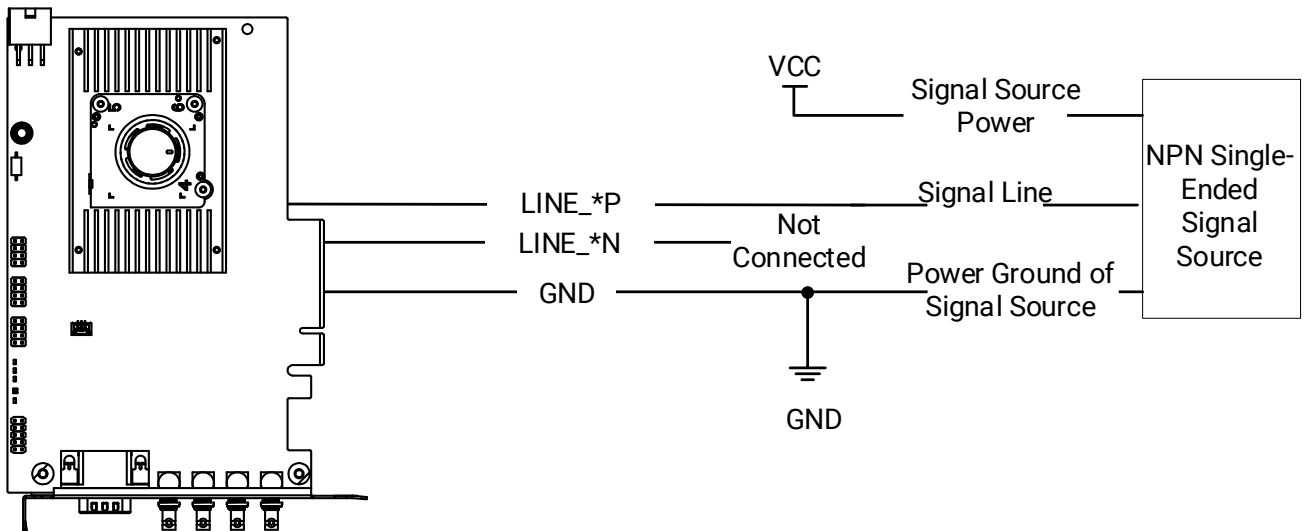


Figure 7-6 NPN Single-Ended Input Wiring Without Pull-Up Resistor

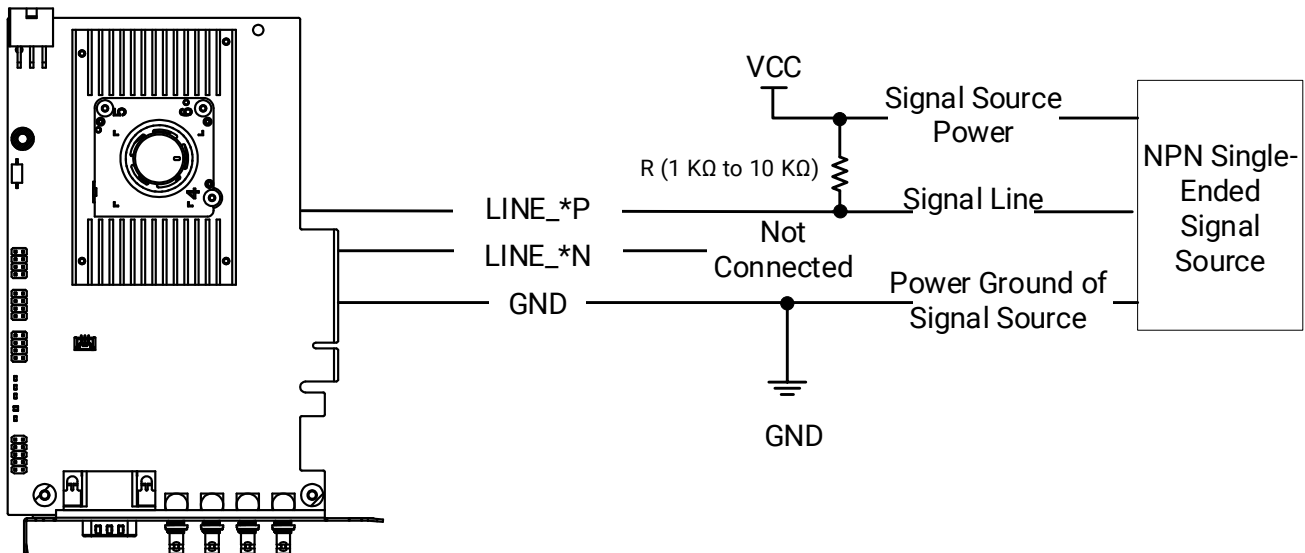


Figure 7-7 NPN Single-Ended Input Wiring with Pull-Up Resistor (1 KΩ to 10 KΩ)

7.2.2 Output Wiring

The frame grabber's 11 differential signals can be configured as output signals to trigger other devices.

Note

Wirings are different if I/O signal is configured as differential output or single-ended output.

The wiring is shown below if the I/O signal is configured as differential output.

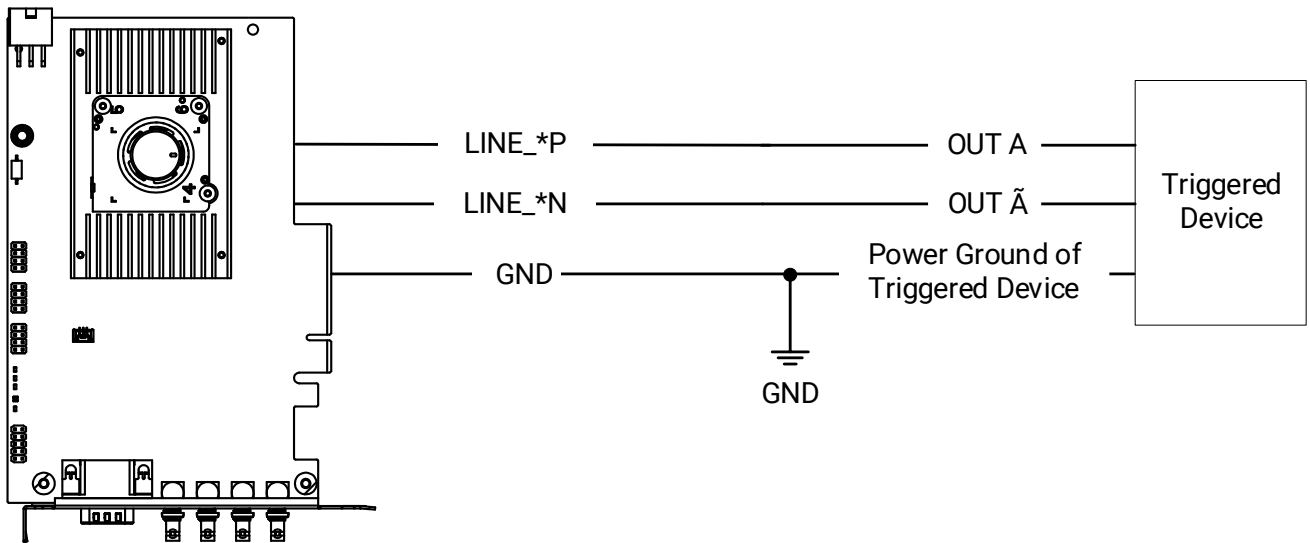


Figure 7-8 Differential Output Wiring

The wiring is shown below if the Line 7 to Line 10 are configured as the single-ended output and the output voltage is 3.3 V.

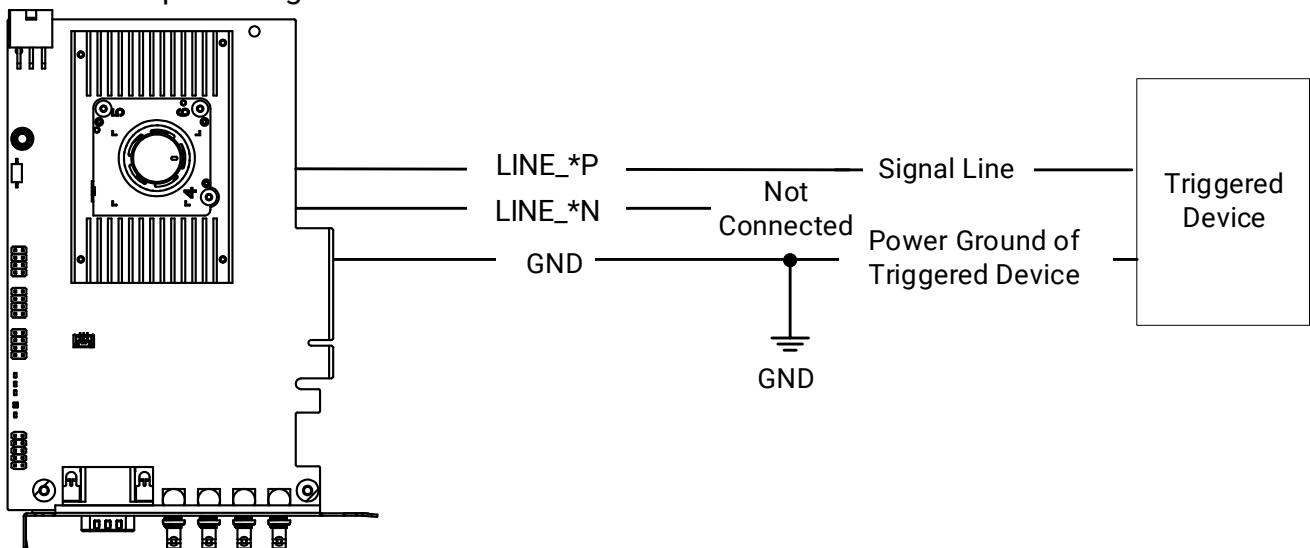


Figure 7-9 Single-Ended Output Wiring Without Pull-Up Resistor

Pull-up resistor is required if Line 0 to Line 6 are configured as the single-ended output, and the resistor ranges from 1 K Ω to 10 K Ω . With different input voltages (VCC) of single-ended signal, the corresponding resistor is different. Refer to the table for details.

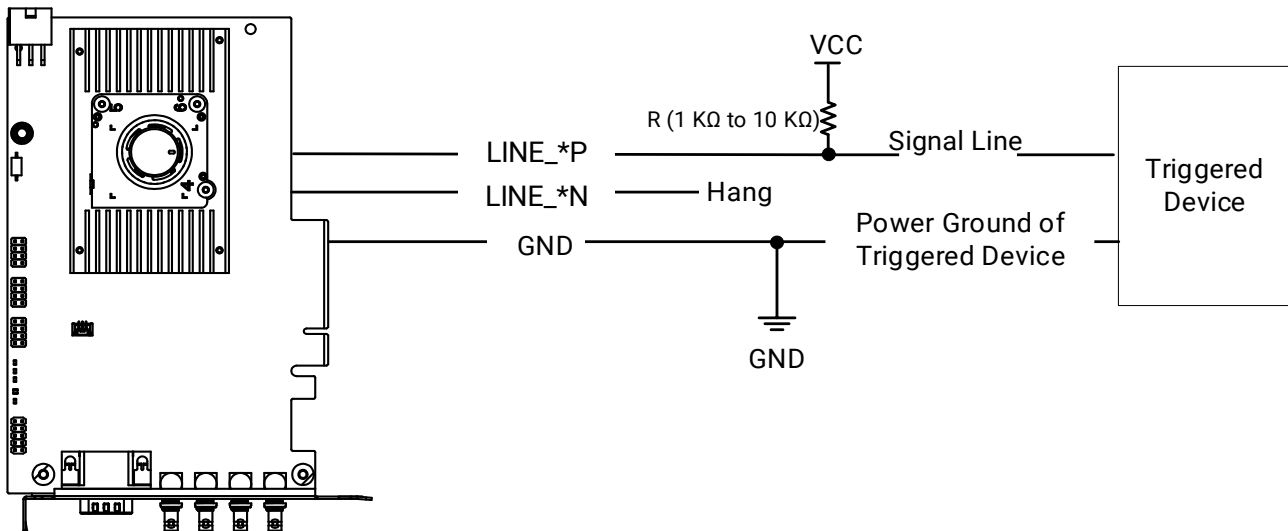


Figure 7-10 Single-Ended Output Wiring with Pull-Up Resistor (1 K Ω to 10 K Ω)

Table 7-2 Relation Between VCC and Resistor

Voltage Range	Resistor
5 V	1 k
12 V	2 k to 4.7 k
24 V	4.7 k to 10 k

7.3 Input and Output Signals

The frame grabber has 11 configurable differential input/output signals (D485 InOut 0 to D485 InOut 10), and you can go to **External Trigger** of the MVS client software to configure them according to actual demands.

7.3.1 Input Signal

The frame grabber can receive multiple input signals that can be used as the signal source of output signal, encoder, timer, and Link Trigger.

Steps

1. Go to **External Trigger**, and select **D485 InOut *** in the **Line Selector** according to actual demands.

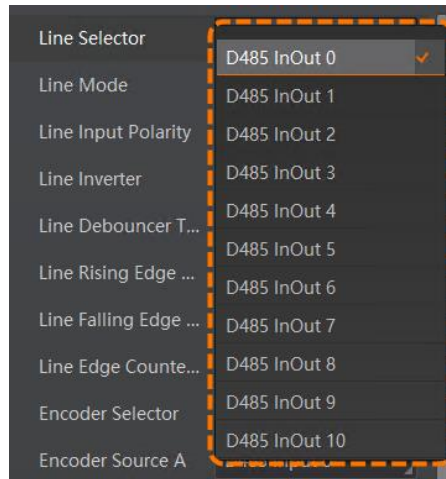


Figure 7-11 Line Selector

2. Select **Input** as **Line Mode**.
3. Set **Line Input Polarity** according to actual demands.
 - SingleEnded: It receives single-ended input signal.
 - Differential: It receives TTL & LVTTTL standard input signal.

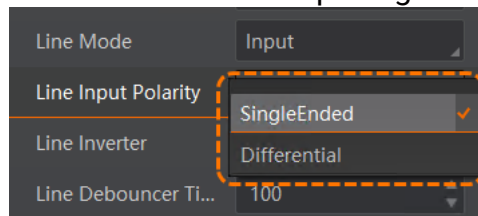


Figure 7-12 Line Input Polarity

Caution

You should set line input polarity according to connected external device type. Otherwise, the I/O may be damaged.

4. (Optional) Enable **Line Inverter** if you want to invert the electrical level of selected lines.

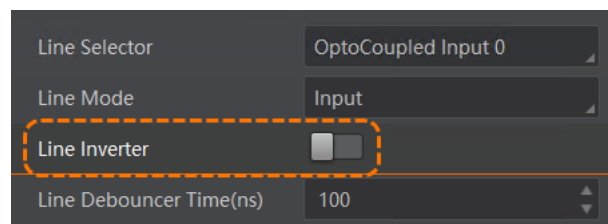


Figure 7-13 Enable Line Inverter

Note

The line inverter is disabled by default.

- Set **Line Debouncer Time (ns)** if the trigger signal sent by external devices to the frame grabber has signal bounce that may cause false trigger. Thus, it is necessary to debounce the trigger signal.

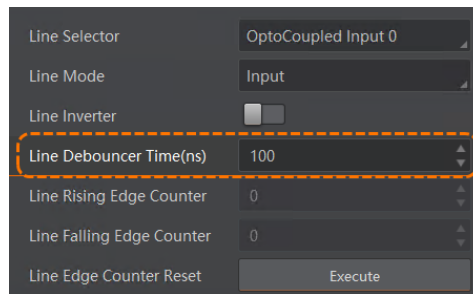


Figure 7-14 Set Line Debouncer Time

Note

The trigger signal will be ignored if the configured line debouncer time is greater than the time of trigger signal.

The sequence diagram is shown below.

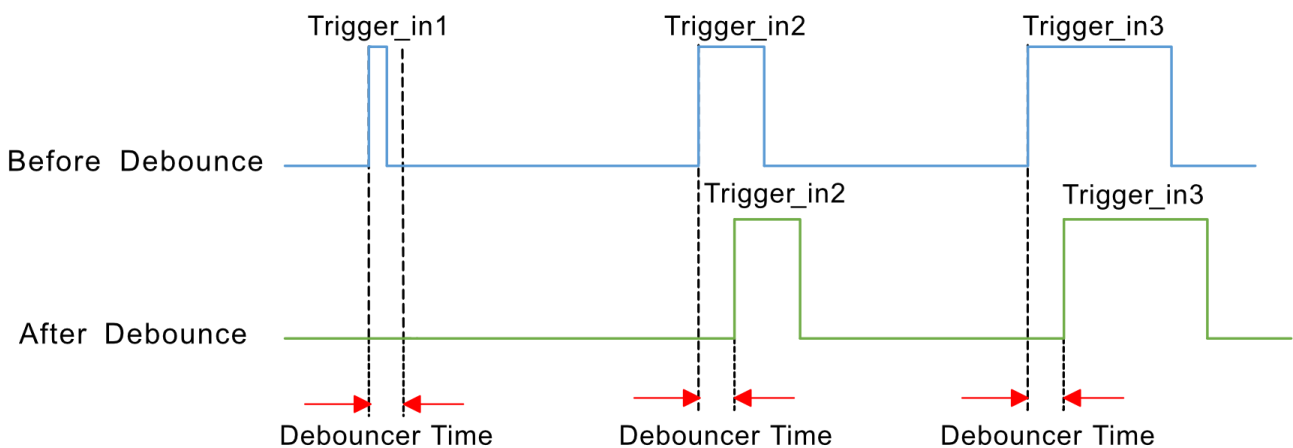


Figure 7-15 Sequence Diagram

Taking **D485 Input 0** as **Line Selector** as an example, the principle of trigger debouncer and line inverter is shown below.

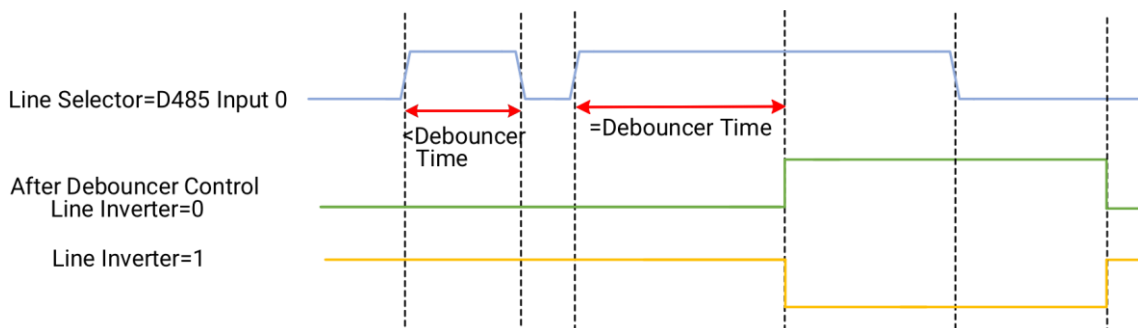


Figure 7-16 Principle

7.3.2 Encoder Control

The encoder control is used to select encoder sources and set trigger signal mode sent by signal source A and B. It can also count the output signal quantity.

The camera receives two signal sources (A and B) with phase difference, and outputs corresponding signals by configuring the trigger signal mode of the frame grabber.

Steps

1. Select **Encoder 0** or **Encoder 1** as **Encoder Selector**.
2. Select corresponding signal sources or **Off** as **Encoder Source A** and **Encoder Source B**.
3. Set **Encoder Trigger Mode**.

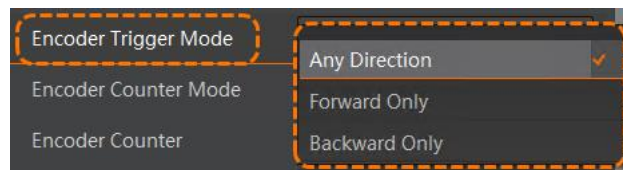


Figure 7-17 Select Encoder Trigger Mode

- **Any Direction** means that the frame grabber will output forward and backward signals.
- **Forward Only** means that the frame grabber will output forward signal only.
- **Backward Only** means that the frame grabber will output backward signal only.

The forward and backward signals of the encoder are judged according to the signals of Encoder A and Encoder B, and the principle is shown below.

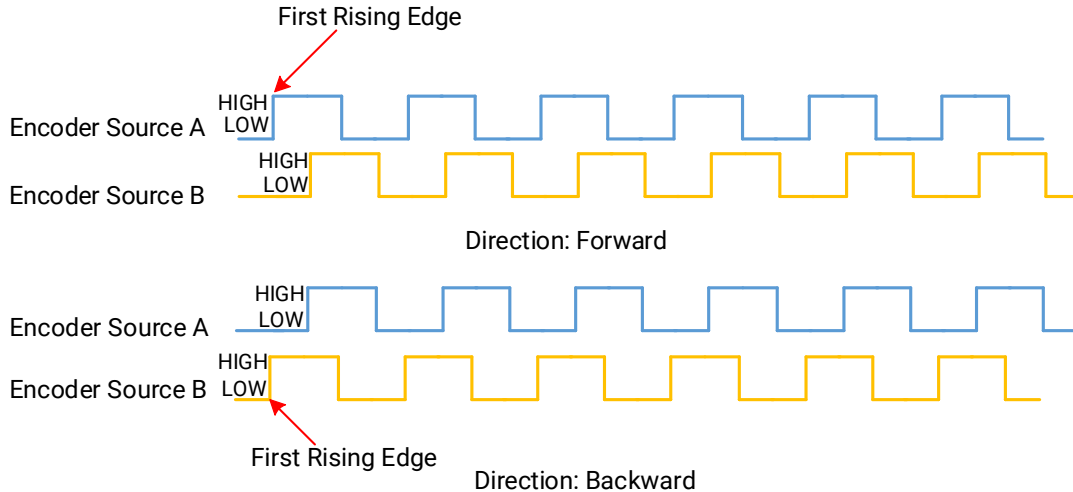


Figure 7-18 Principle

The output signal of the encoder is different if various trigger modes are selected, and the

principle is shown below.

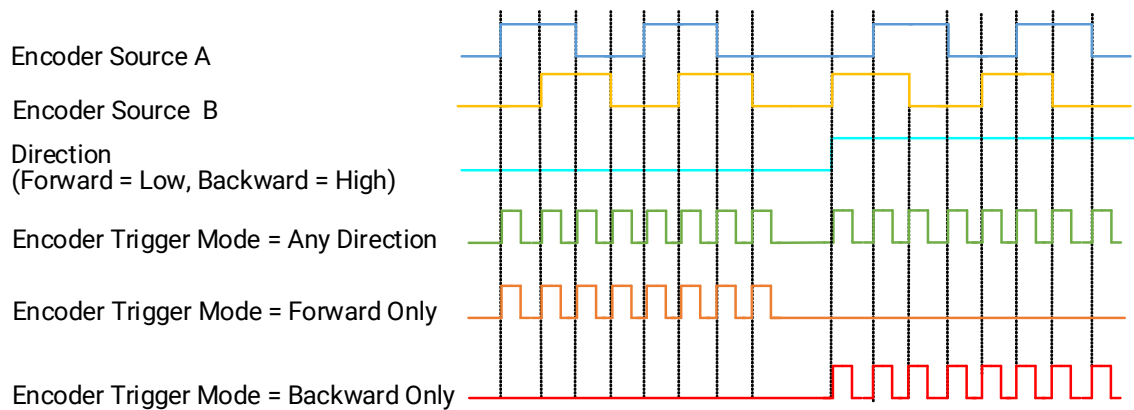


Figure 7-19 Encoder Trigger Signal Mode Principle

4. Set Encoder Counter Mode.

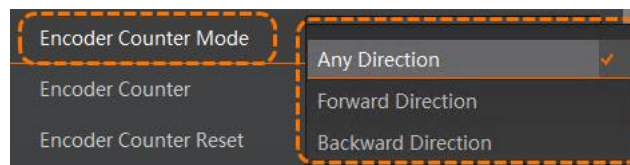


Figure 7-20 Set Encoder Counter Mode

- **Any Direction** means that both forward and backward signals will count.
- **Forward Direction** means that count increases with the forward signals and decreases with the backward signals.
- **Backward Direction** means that the count increases with the backward signals and decreases with the forward signals. When the count decreases with the forward signals, it starts from the max. set counter value.

If the encoder selects different counter modes, and its principle is shown below.

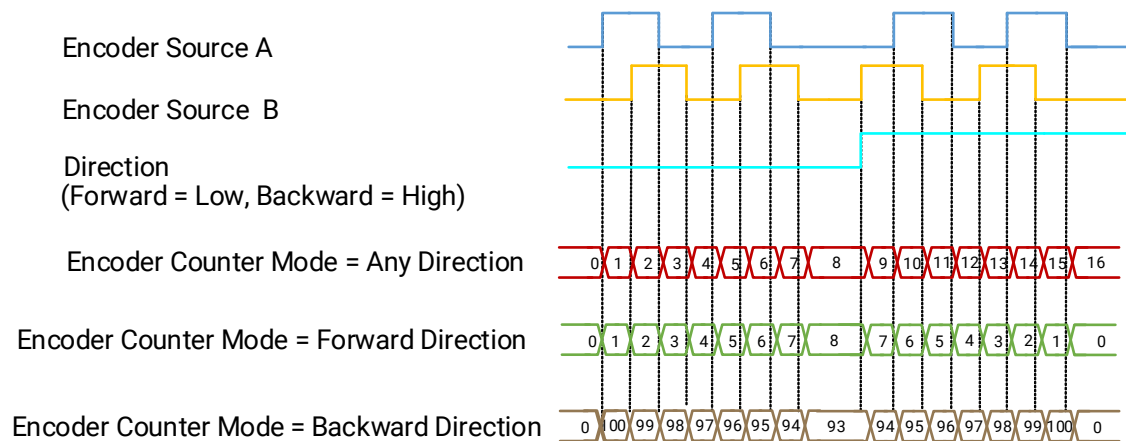


Figure 7-21 Encoder Counter Mode Principle

5. View counter value in Encoder Counter.

6. (Optional) Click **Execute** in Encoder Counter Reset to reset the counter.

7. (Optional) Set **Encoder Max Reverse Counter** to avoid outputting images if the object moves backward accidentally, and click **Execute** in **Encoder Reverse Counter Reset** to let the camera output images again.

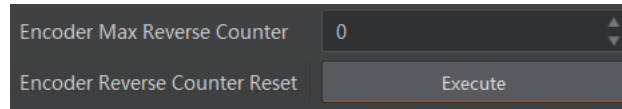


Figure 7-22 Set Encoder Max Reverse Counter

The maximum value for handling encoder reverse can be determined by setting the **Encoder Max Reverse Counter**. By default, the reverse is not handled that is **Encoder Max Reverse Counter = 0**. Taking the **Encoder Max Reverse Counter = 4** as an example, the output of the encoder under different trigger signal modes is introduced.

- If **Encoder Trigger Mode** selects **Forward Only**, the principle is shown below.

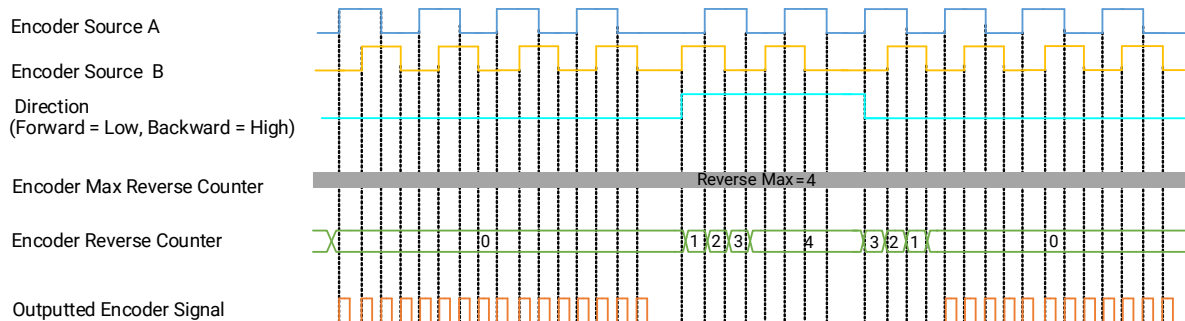


Figure 7-23 Forward Principle

- If **Encoder Trigger Mode** selects **Backward Only**, the principle is shown below.

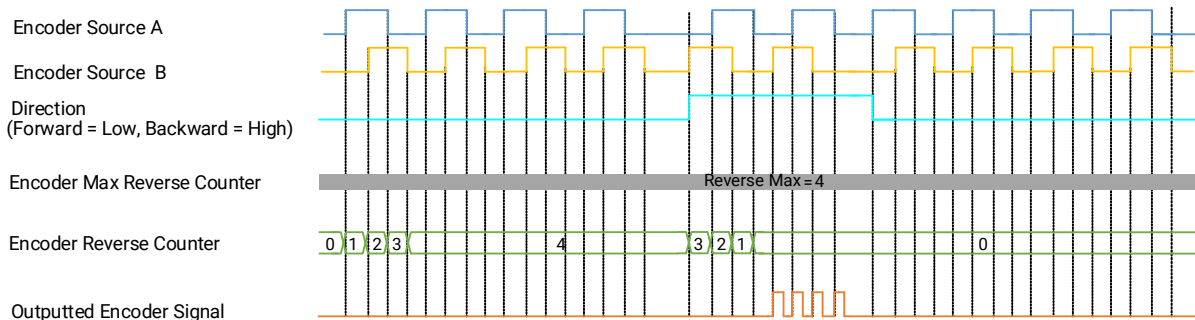


Figure 7-24 Backward Principle

- If **Encoder Trigger Mode** selects **Any Direction**, the principle is shown below.

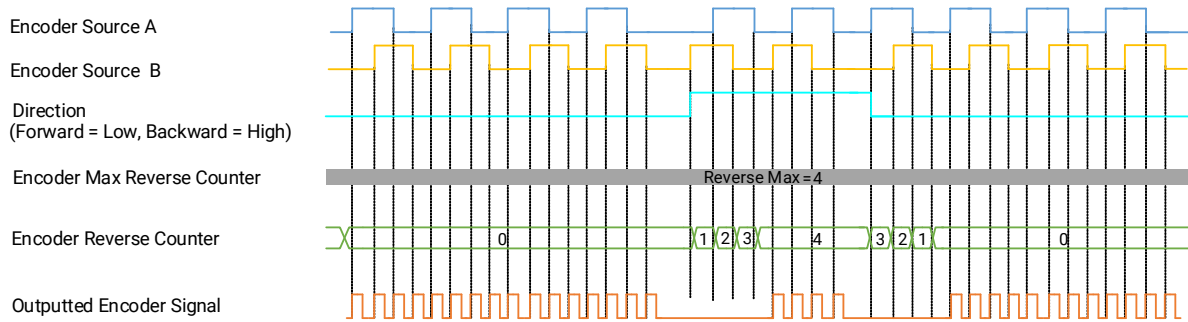


Figure 7-25 Any Direction Principle

8. Set **Encoder Trigger Line Rate (Hz)** to display the line rate of the encoder.
9. Set **Resulting Trigger Line Rate (Hz)** to display the actual line rate.
10. The encoder can count the amount of edge trigger received in real time, as shown below.
 - **Encoder Rising Edge Counter** returns the rising edge counter value of selected encoder.
 - **Encoder Edge Counter Reset:** Click **Execute** to reset edge counter of selected encoder.

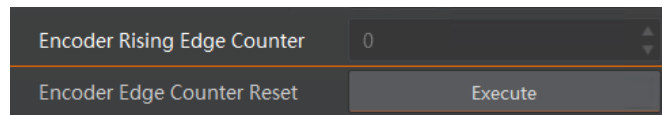


Figure 7-26 Encoder Edge Counter

7.3.3 Encoder Frequency Converter Control

The encoder frequency converter can convert the encoder's signal frequency into the frame trigger signal frequency that the camera needs through the frame grabber's frequency conversion module, thus triggering the camera. The frequency conversion module includes PreDivider, Multiplier and PostDivider.

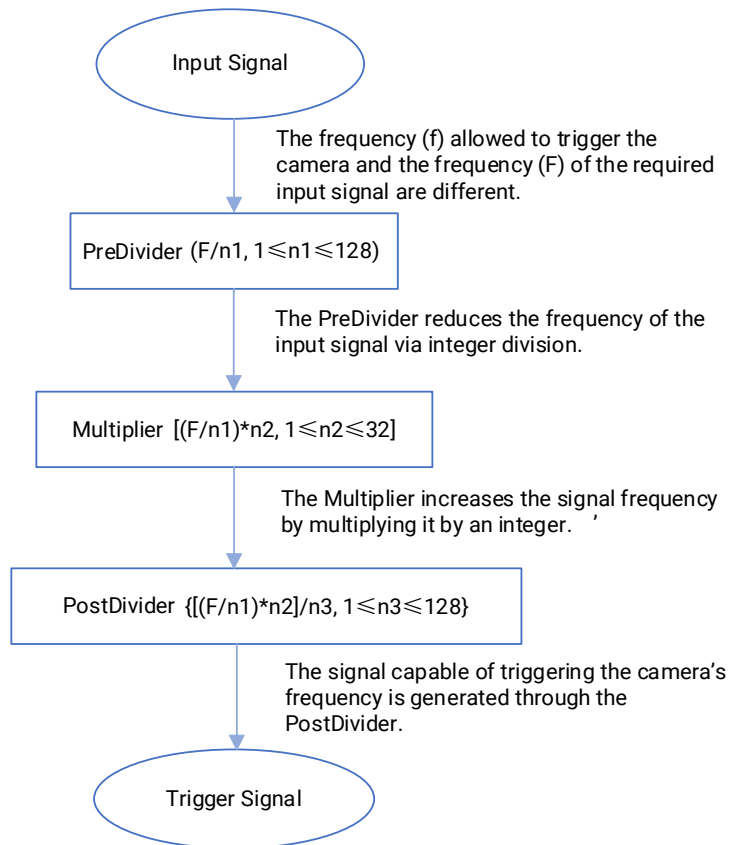


Figure 7-27 Encoder Frequency Converter Control

PreDivider

The input signal first enters the PreDivider module, which reduces source signal frequency via integer division, and then the signal is sent to the Multiplier module.

The PreDivider module reduces periodic jitter on the input signal, and signals above 100 kHz must go through the PreDivider module to reduce the frequency for the Multiplier can only receive signals in the range of 10 Hz to 100 kHz frequency range. The periodic jitter of shaft encoder signal is accepted.

Multiplier

After the signal is processed by the PreDivider, it is sent to the Multiplier. The Multiplier multiplies the signal by an integer to increase its signal frequency, and then the signal is sent to the PostDivider.

PostDivider

PostDivider reduces signal frequency via an integer factor, and uses the newly generated

frequency signal as the device's trigger signal.
The principle of encoder frequency converter is shown below.

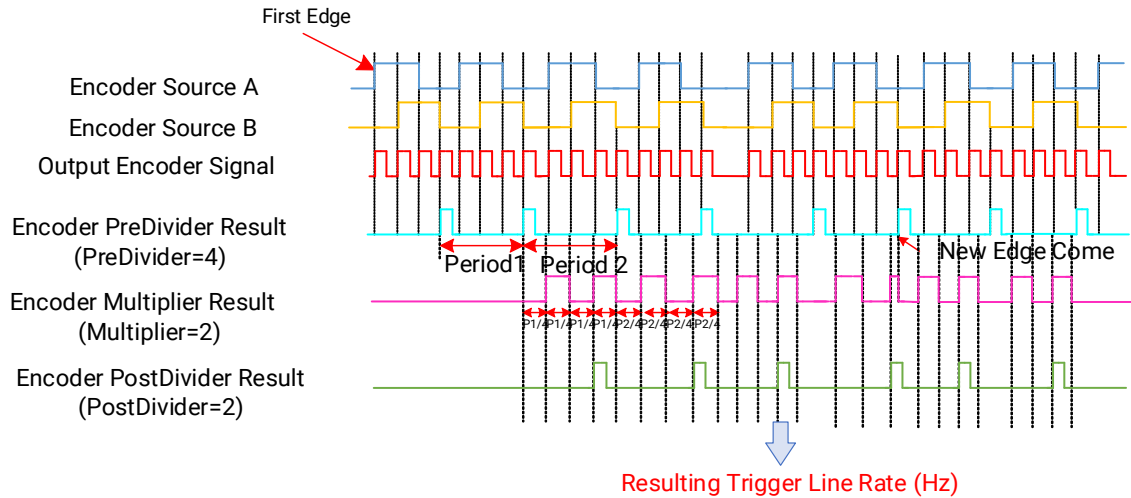


Figure 7-28 Principle of Encoder Frequency Converter

Steps

1. Go to **External Trigger**, and find encoder frequency converter related parameters.
2. Enter **Encoder PreDivider**, **Encoder Multiplier**, and **Encoder PostDivider** according to actual demands.

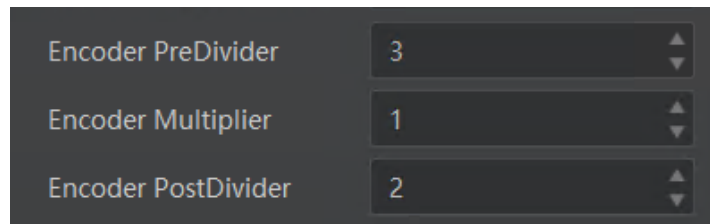


Figure 7-29 Encoder Frequency Converter Control

7.3.4 Timer Control

The timer control can output the corresponding signal by setting the high level and low level duration of the timer signal under the condition of setting corresponding trigger source and trigger activation.

Steps

1. Go to **Advanced Setting**, and select one timer from **Timer 0** to **Timer 3** as **Timer Selector**.
2. Set **Timer Duration(μs)** and **Timer Delay(μs)** according to actual demands. The principle of timer output is shown below.

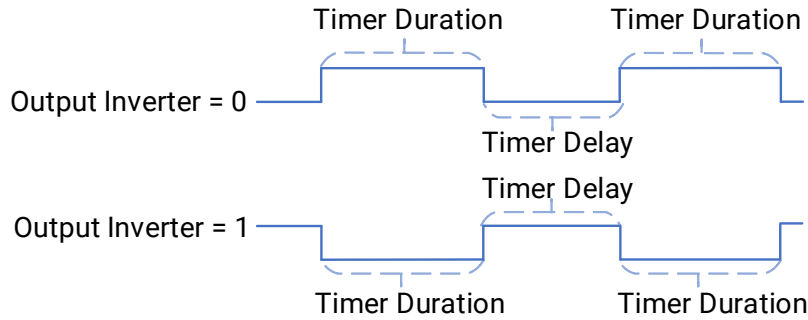


Figure 7-30 Principle of Timer Output

Note

The output signal of the timer is related to the settings of level inversion. Please set according to the demands.

3. Set **Timer Frequency(HZ)** according to actual demands. The timer signal will be output in cycles according to the frequency.
4. Select trigger source from **Timer Trigger Source**.

Note

- The supported timer trigger source may differ by different models of frame grabbers you use.
- If **Continuous** is selected as **Timer Trigger Source**, the frame grabber will output signal continuously according to configured duration. The trigger activation will not impact this process.

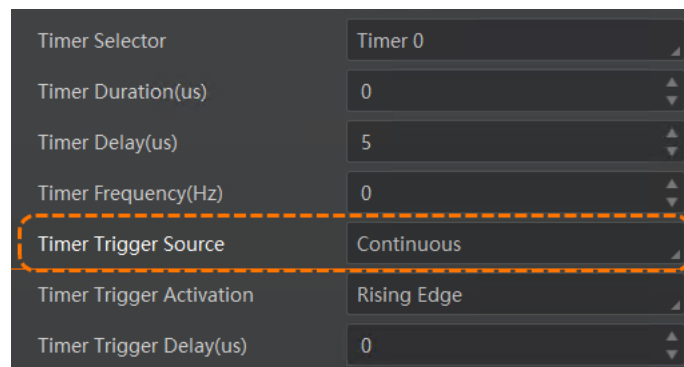


Figure 7-31 Continuous

- If other trigger sources are selected as **Timer Trigger Source**, the frame grabber will output signal when receiving the trigger signal.

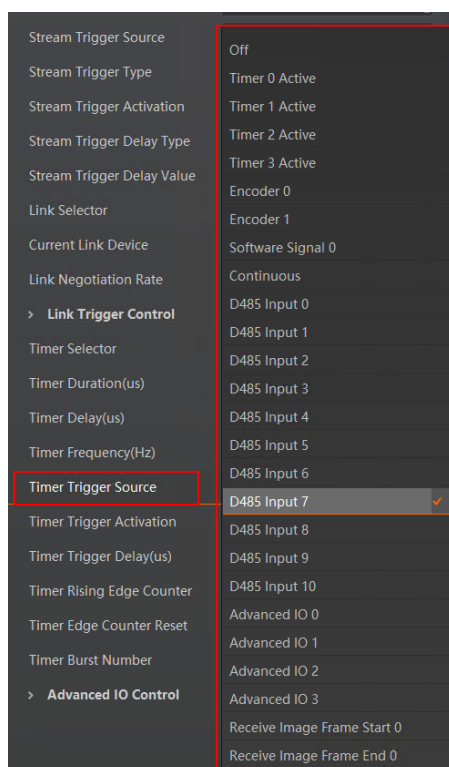


Figure 7-32 Timer Trigger Source

5. Set **Timer Trigger Activation** according to actual demands.

Table 7-3 Timer Trigger Activation Parameter

Timer Trigger Activation	Description
Rising Edge	When the electrical level signal given by external devices is in rising edge, the frame grabber receives the trigger source and starts to output configured timer signal.
Falling Edge	When the electrical level signal given by external devices is in falling edge, the frame grabber receives the trigger source and starts to output configured timer signal.
Any Edge	When the electrical level signal given by external devices is in rising or falling edge, the frame grabber receives the trigger source and starts to output configured timer signal.
High Level	When the electrical level signal given by external devices is in high level, the frame grabber receives the trigger source and starts to output configured timer signal.
Low Level	When the electrical level signal given by external devices is in low level, the frame grabber receives the trigger source and starts to output configured timer signal.

Take **D485 Input *** as **Timer Trigger Source** and **Any Edge** as **Timer Trigger Activation** as an example, when the hardware trigger signal given by the external device is on the rising edge or falling edge, the frame grabber receives the trigger signal and outputs the corresponding timer signal. The principle is shown below.

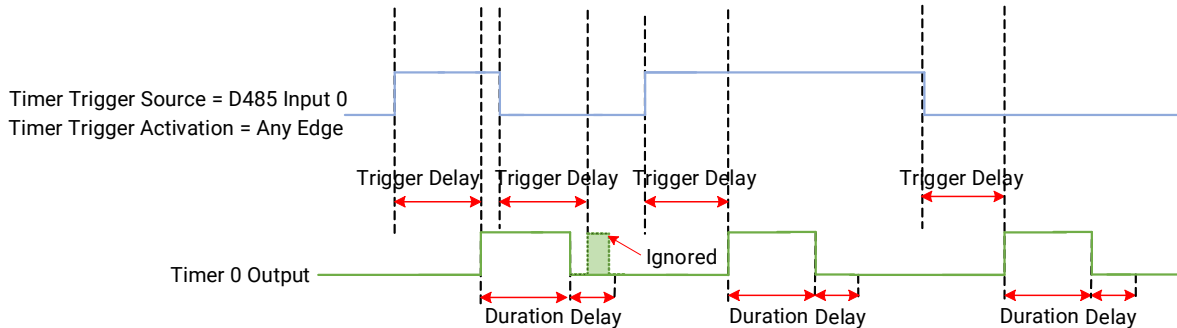


Figure 7-33 Principle

6. (Optional) Set **Timer Trigger Delay(us)** if you want to have a delay time of selected timer.

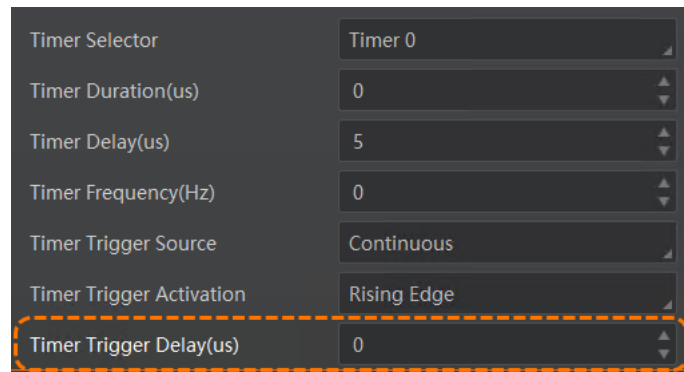


Figure 7-34 Timer Trigger Delay

7 The timer can count the amount of edge trigger received in real time, as shown below.

- **Timer Rising Edge Counter** returns the rising edge counter value of selected timer.
- **Timer Edge Counter Reset**: Click **Execute** to reset edge counter of selected timer.

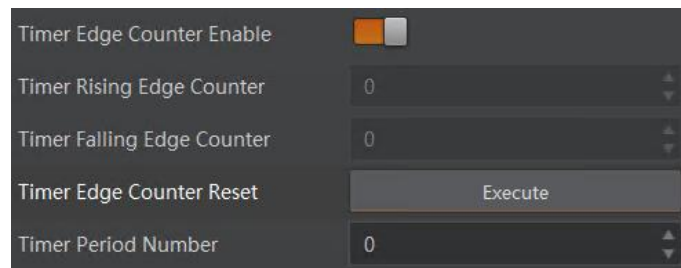


Figure 7-35 Timer Edge Counter

8. (Optional) If it is necessary to set the period of the output timer signal (one rising edge and one falling edge are one period), the number of timer periods can be set via the **Timer Burst Number**, and the **Timer** of n periods can be continuously output once triggered.

7.3.5 Signal Countering

The signal counting function is to count the edge of selected lines (input or output signals).

Steps

1. View the number of rising edges and falling edges in real time via **Line Rising Edge Counter** and **Line Falling Edge Counter**.

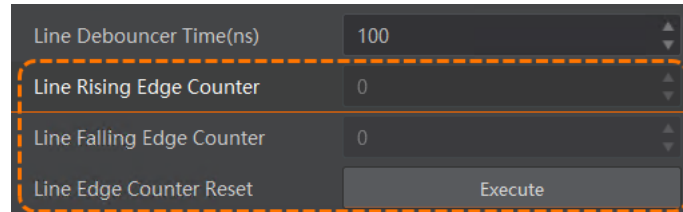


Figure 7-36 View Signal Amount

2. (Optional) Click **Execute** in **Line Edge Counter Reset** to reset counting.

7.3.6 Output Signal

The frame grabber supports setting multiple output signals (D485 InOut 0 to D485 InOut 10) that can be sent to external devices via the frame grabber.

Steps

1. Go to **External Trigger**, and select **D485 InOut *** in the **Line Selector** according to actual demands.
2. Select **Output** as **Line Mode**.

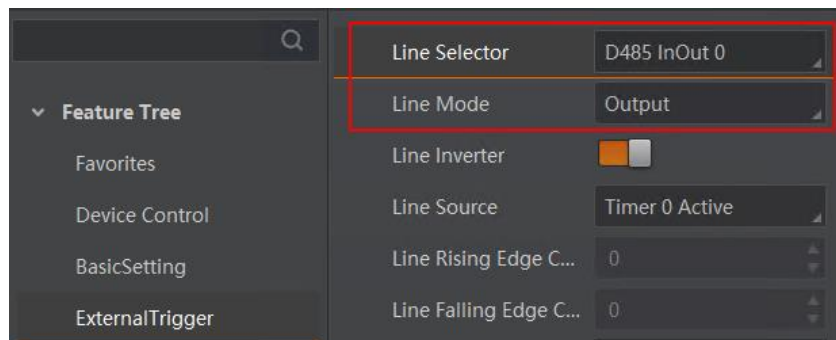


Figure 7-37 Set Output Signal

3. (Optional) Enable **Line Inverter** to invert the electrical level of selected lines.

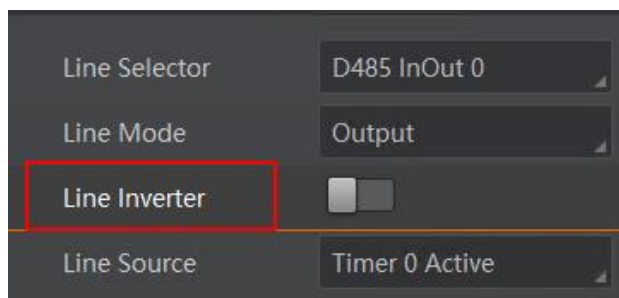


Figure 7-38 Enable Line Inverter

 Note

The line inverter is disabled by default.

Take **Timer 0** as **Line Source** as an example and the principle of line inverter is shown below.

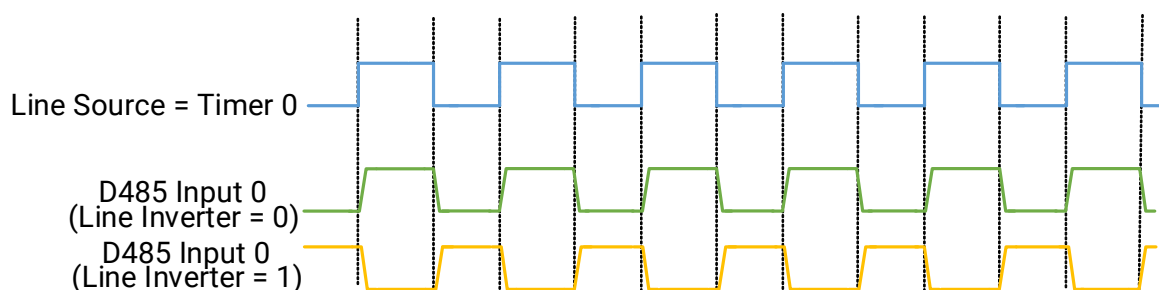


Figure 7-39 Principle

4. The frame grabber can select multiple output signal sources sent by external devices.

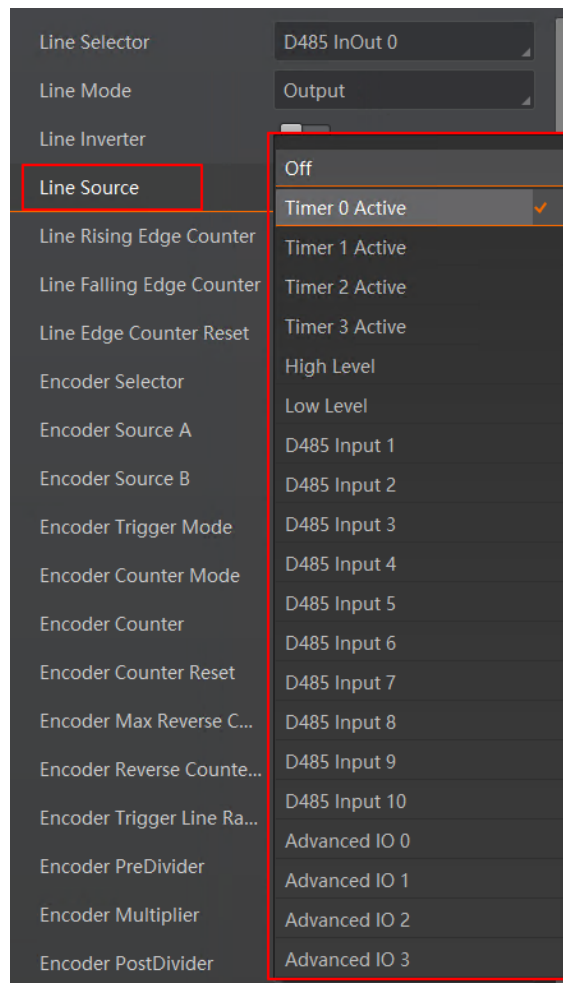


Figure 7-40 Select Line Source

Note

- The supported output signal source may differ by different models of frame grabbers you use.
 - If the I/O's line mode is output, it cannot be selected as line source. For example, **D485 InOut1** is selected as **Line Selector** and its **Line Mode** is **Output**, and you cannot select it in **Line Source**.
-

7.3.7 Advanced I/O

The advanced I/O control function provides more flexible I/O logic operations based on timer control. It can control multiple advanced IO signals by logical operations such as AND or NOT of different signal sources, and output the operation result. Advanced I/O control can provide free and flexible I/O configuration for frame grabbers by configuring the A and B signal sources of I/O signals, perform AND or NOT operations on them, and output

corresponding I/O control signals according to operation logic.

Steps

1. Go to **Advanced Setting > Advanced IO Control**.
2. Select **Advanced IO Selector** according to actual demands.

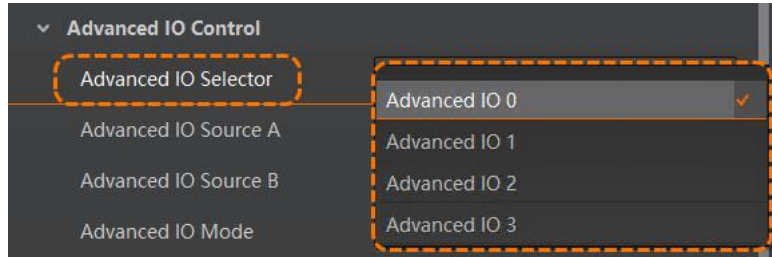


Figure 7-41 Advanced IO Selector

3. Set **Advanced IO Source A** and **Advanced IO Source B** according to actual demands.
4. Set **Advanced IO Mode** according to actual demands.

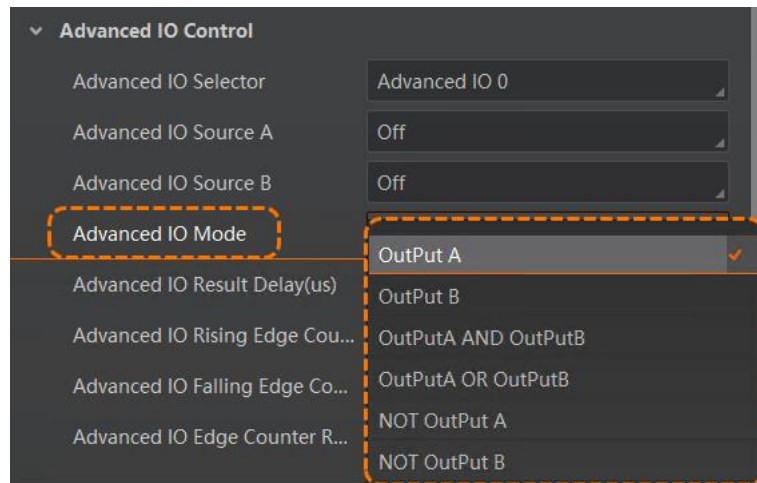


Figure 7-42 Advanced IO Mode

Table 7-4 Advanced IO Mode

Parameter Value	Description
OutPut A	Direct output of signals from Advanced IO Source A .
OutPut B	Direct output of signals from Advanced IO Source B .
OutPutA AND OutPutB	The signal source selected by Advanced IO Source A and Advanced IO Source B to perform AND operation, and then output the signal. For example, if both A and B are at high level, the output is high level.
OutPutA OR OutPutB	The signal source selected by Advanced IO Source A and Advanced IO Source B to perform OR operation, and then output the signal. For example, if one of A and B is at high level, the output is high level.

Parameter Value	Description
NOT OutPut A	The signal selected by Advanced IO Source A is output after being inverted.
NOT OutPut B	The signal selected by Advanced IO Source B is output after being inverted.

The principle of advanced IO mode is shown below.

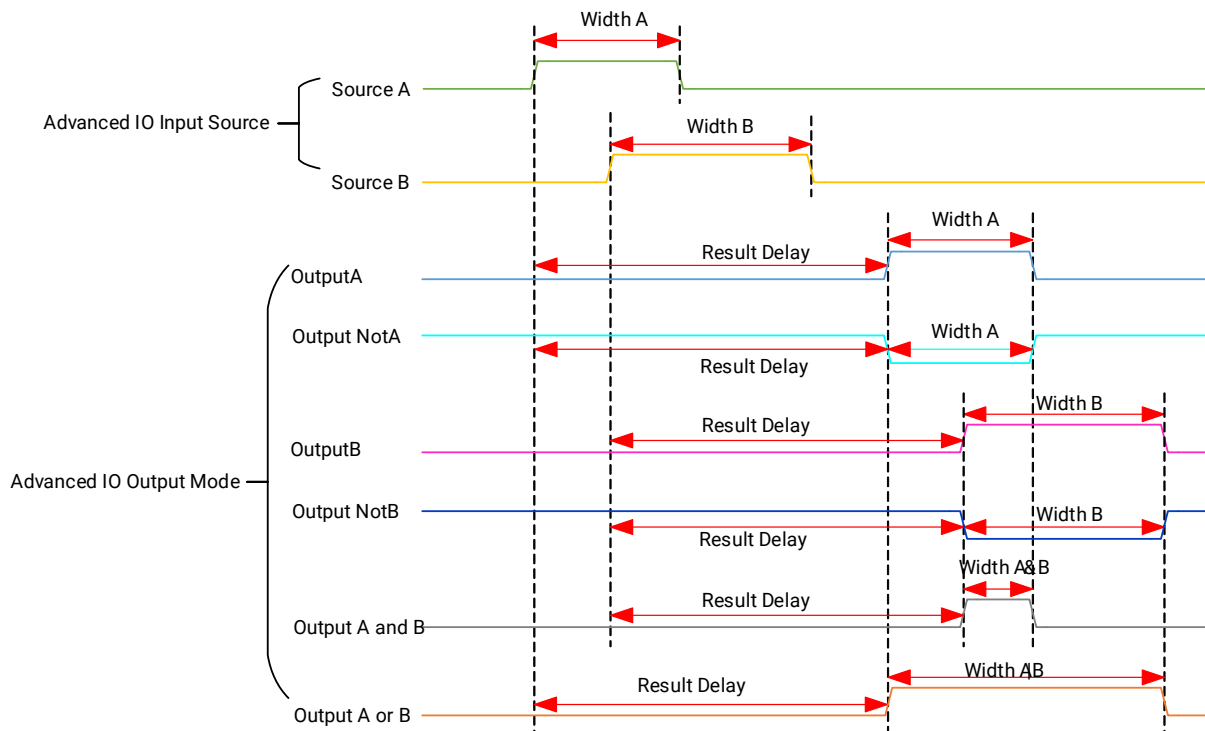


Figure 7-43 Principle of Advanced IO Mode

5. (Optional) Set **Advanced IO Result Delay(us)** if you want to delay for some time.

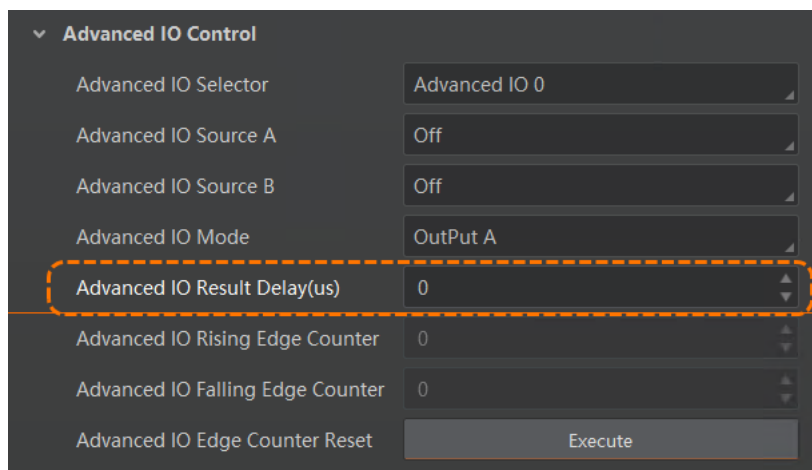


Figure 7-44 Set Advanced IO Result Delay

6. View the signal amount of rising edge and falling edge in real time via **Advanced IO Rising Edge Counter** and **Advanced IO Falling Edge Counter**.

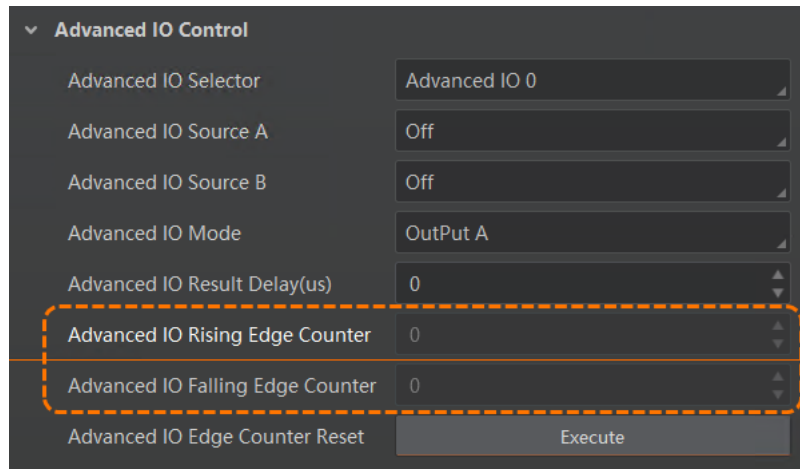


Figure 7-45 View Signal Amount

7. (Optional) Click **Execute** in **Advanced IO Edge Counter Reset** to reset counting.

Chapter 8 Link Trigger

The frame grabber uses the link trigger function to let the camera acquire images. The frame grabber has 4 HD-BNC CoaXPress connectors, and you can select and set the corresponding connectors according to actual demands.

Take **Timer 0** as **Link Trigger** as an example and the principle of the Link Trigger is shown below.

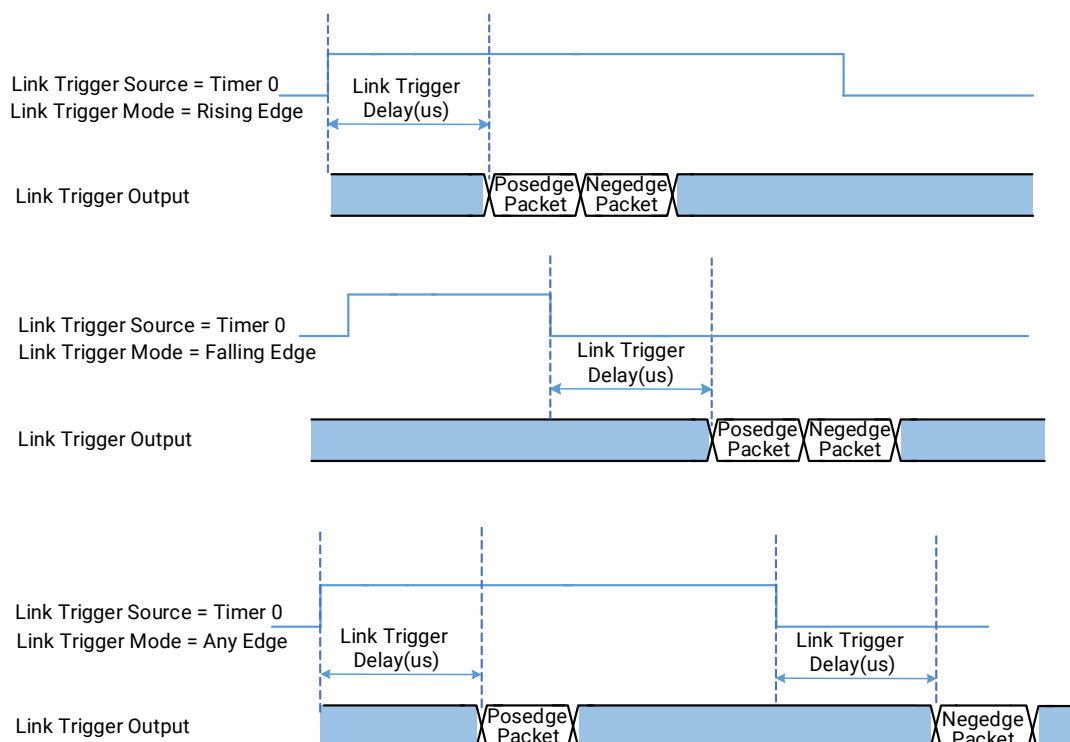


Figure 8-1 Principle of Link Trigger

Note

- For the camera with HD-BNC CoaXPress connector, you should select **Link Trigger 0** as **Trigger Source** and enable the trigger source. Refer to the *CoaXPress Area Scan Camera User Manual* for details.
- As the edge signal of frame grabber input source, Link Trigger sends the edge signal data packet to the camera. Only the main Link (CXP-1 connector) of the camera can receive the Link Trigger.

8.1 Link

Steps

- Go to **Advanced Setting** and select **Link Selector** according to actual demands.

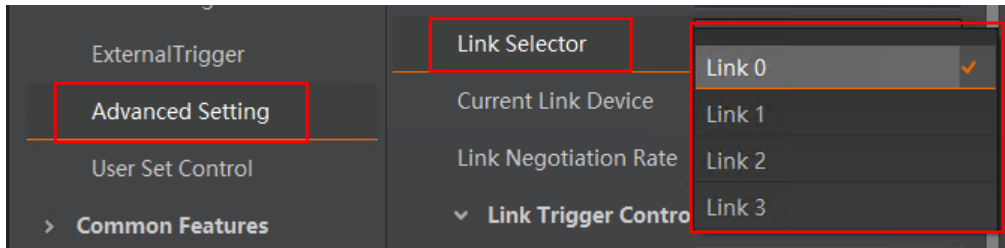


Figure 8-2 Link Selector

Note

Link 0 to **Link 3** correspond to CH0 to CH3 connectors respectively.

2. View **Current Link Device** that displays the connected camera via **Link Selector** you selected.
3. View link status and negotiation rate via **Link Status** and **Link Negotiation Rate**.

8.2 Link Trigger

Steps

1. Go to **Advanced Setting > Link Trigger Control**.
2. Select **Link Trigger Selector** according to actual demands.

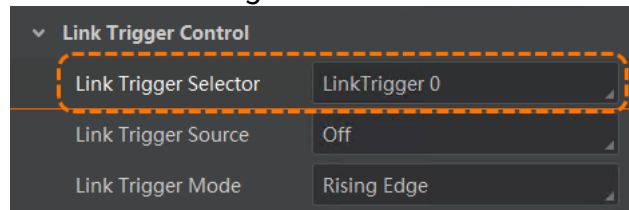


Figure 8-3 Link Trigger Selector

Note

Only **LinkTrigger 0** can be selected.

The code below shows the process of link trigger.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "LinkTriggerSelector", "LinkTrigger0");
```

```
MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

8.3 Trigger Source

The trigger source includes software trigger, hardware trigger, encoder trigger, timer trigger, and advanced I/O control.

Steps

1. Go to **Advanced Setting > Link Trigger Control**.
2. Select **Link Trigger Source** according to actual demands.

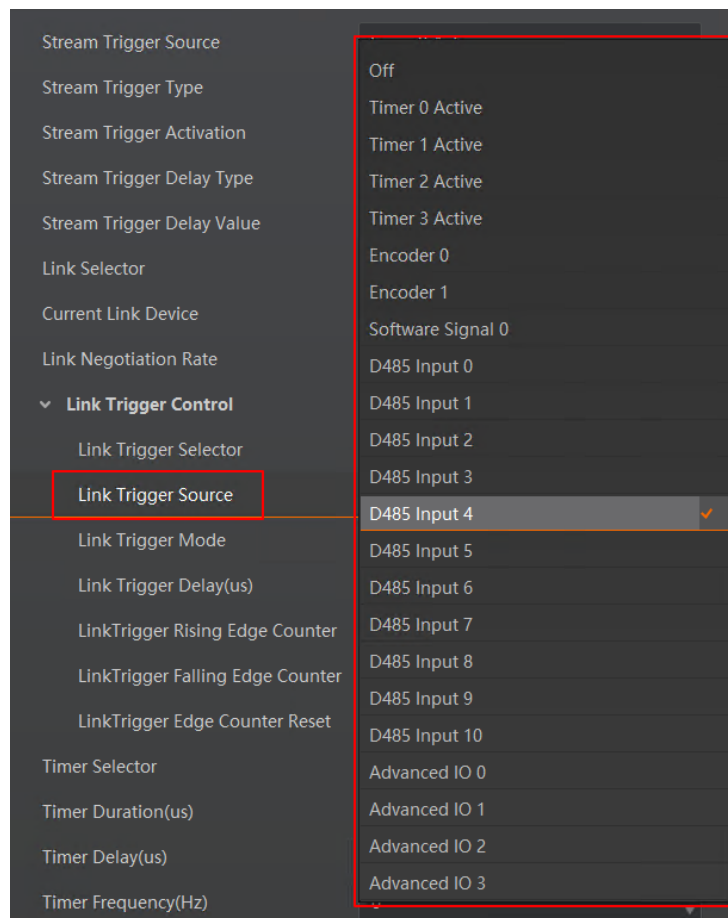


Figure 8-4 Link Trigger Source

Table 8-1 Link Trigger Source Description

Trigger Source	Parameter Value	Principle
Software Trigger	Software Signal 0	The frame grabber sends data packet to the camera to acquire images by

Trigger Source	Parameter Value	Principle
		manual executing.
Hardware Trigger	D485 Input 0 to D485 Input 10	The trigger source created by the frame grabber sends data packet to camera to acquire images.
Encoder Trigger	Encoder 0/1	The frame grabber sends data packet to camera via the encoder to acquire images.
Timer Trigger	Timer 0/1/2/3 Active	The frame grabber sends data packet to camera via the timer to acquire images.
Advanced I/O Control	Advanced IO 0/1/2/3	The frame grabber sends data packet to camera or external I/O via the advanced I/O control to acquire images.
None	Off	Close the frame grabber's external trigger.

Note

You can refer to section [Trigger Related Parameters](#) to set trigger activation and trigger delay after you select the link trigger.

8.3.1 Software Trigger

1. Go to **Link Trigger Control**.
2. Select **Software Signal 0** as **Link Trigger Source**, and click **Execute** in **Link Trigger Software** to send trigger commands.

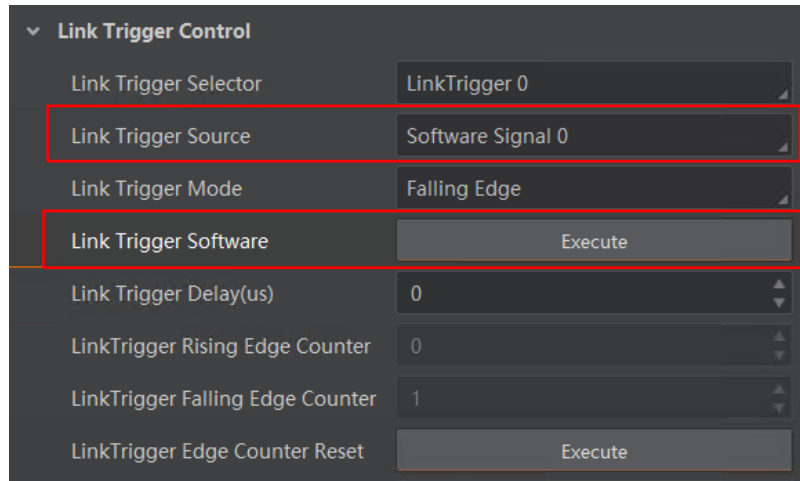


Figure 8-5 Software Trigger

The code below shows the process of setting software trigger as link trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "LinkTriggerSource", "SoftwareSignal0");
MV_CC_SetCommandValue(hInterface, "LinkTriggerSoftware");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

8.3.2 Hardware Trigger

The frame grabber provides 11 configurable differential input/output signals (D485 InOut 0 to D485 InOut 10) as the trigger signal source.

Steps



Note

Here we take **D485 Input 0** as the trigger source as an example to set hardware trigger.

1. Go to **Link Trigger Control**.
2. Select **D485 Input 0** as **Link Trigger Source**.

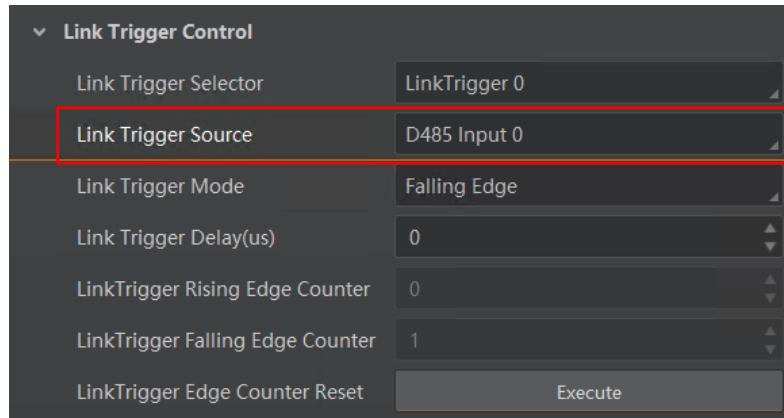


Figure 8-6 Hardware Trigger

The code below shows the process of setting hardware trigger as link trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface,"LinkTriggerSource","D485Input0");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

8.3.3 Encoder Trigger

When the frame grabber uses encoder trigger, the external device sends trigger signal to the frame grabber, and the frame grabber sends the signal to the camera after processing according to the configuration of the encoder. Finally, the camera receives trigger commands to acquire images.

Steps

1. Go to **Link Trigger Control**.
2. Select **Encoder 0/1** as **Link Trigger Source**.

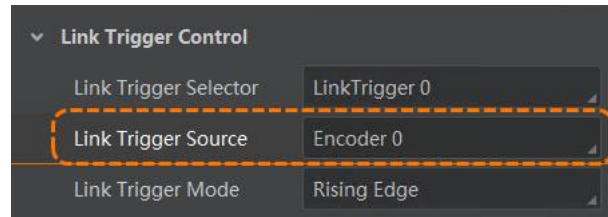


Figure 8-7 Encoder Trigger

The code below shows the process of setting encoder trigger as link trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "LinkTriggerSource", "Encoder0");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

8.3.4 Timer Trigger

When the frame grabber uses timer trigger, the frame grabber sends the signal to the camera after processing according to the configuration of the timer. Finally, the camera receives trigger commands to acquire images.

Steps

1. Go to **Link Trigger Control**.
2. Select **Timer 0/1/2/3 Active** as **Link Trigger Source**.

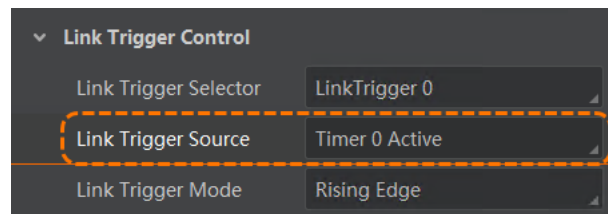


Figure 8-8 Timer Trigger

The code below shows the process of setting timer trigger as link trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
```

```
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);

unsigned int nInterfaceIndex = 0;

void* hInterface = NULL;

MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);

MV_CC_OpenInterface(hInterface, NULL);


MV_CC_SetEnumValueByString(hInterface,"LinkTriggerSource","Timer0Active");


MV_CC_CloseInterface(hInterface);

MV_CC_DestroyInterface(hInterface);
```

8.3.5 Advanced I/O Control

When the frame grabber uses advanced I/O control, the frame grabber sends the signal to the camera after processing according to the configuration of the advanced I/O. Finally, the camera receives trigger commands to acquire images.

Steps

1. Go to **Link Trigger Control**.
2. Select **Advanced IO 0/1/2/3** as **Link Trigger Source**.

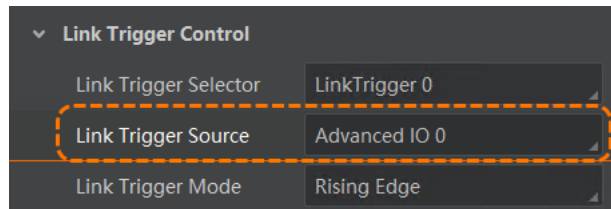


Figure 8-9 Advanced I/O Control

The code below shows the process of setting advanced I/O as link trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};

MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);

unsigned int nInterfaceIndex = 0;

void* hInterface = NULL;

MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);

MV_CC_OpenInterface(hInterface, NULL);


MV_CC_SetEnumValueByString(hInterface,"LinkTriggerSource","AdvancedIO0");
```

```
MV_CC_CloseInterface(hInterface);  
MV_CC_DestroyInterface(hInterface);
```

8.4 Trigger Related Parameters

You can set trigger activation and trigger delay after enabling and selecting specific link trigger source. All trigger sources support setting trigger delay and trigger activation.

8.4.1 Trigger Activation

The frame grabber supports setting the trigger activation of the trigger source. When the electrical level signal given by external devices is in selected edge, the frame grabber sends the corresponding edge trigger packet to camera to acquire images.

Steps

1. Go to **Link Trigger Control**.
2. Select **Link Trigger Mode** according to actual demands.

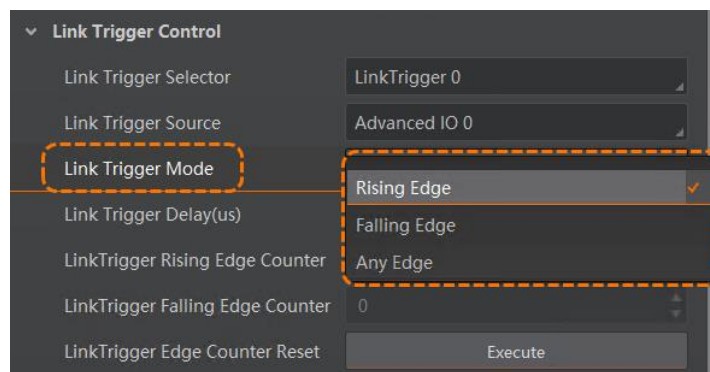


Figure 8-10 Trigger Activation

Table 8-2 Trigger Activation Parameter

Trigger Activation	Description
Rising Edge	When the electrical level signal given by external devices is in rising edge, the frame grabber sends rising edge trigger packet to camera to acquire images.
Falling Edge	When the electrical level signal given by external devices is in falling edge, the frame grabber sends falling edge trigger packet to camera to acquire images.
Any Edge	When the electrical level signal given by external devices is in rising or falling edge, the frame grabber sends rising or falling edge trigger packet to camera to acquire images.

Note

Software trigger and quick software trigger support rising edge and falling edge only, and other trigger sources support these three trigger activation types.

3. (Optional) The frame grabber can execute edge counter of the selected link.
- **Link Trigger Rising Edge Counter** returns the rising edge counter value of the selected link.
 - **Link Trigger Falling Edge Counter** returns falling edge counter value of the selected link.
 - **Link Trigger Edge Counter Reset**: Click **Execute** to reset edge counter of selected link.

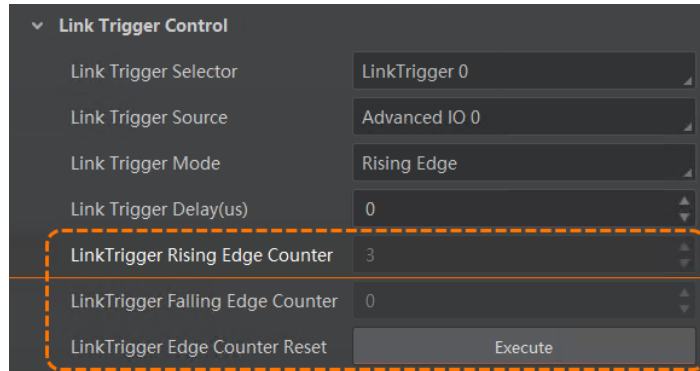


Figure 8-11 Link Trigger Edge Counter

The code below shows the process of setting trigger activation.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "LinkTriggerMode", "RisingEdge");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

8.4.2 Trigger Delay

Trigger delay means that the frame grabber receives the trigger source, and then sends the trigger signal to the camera after configured trigger delay time.

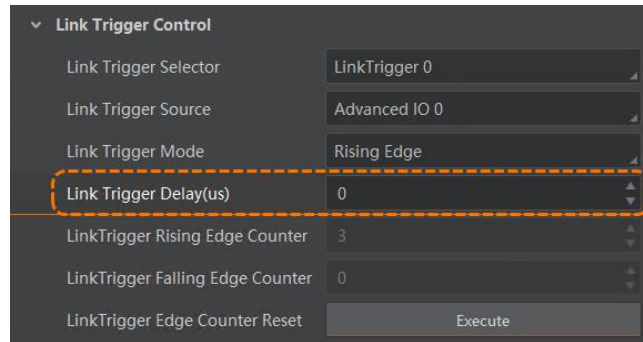


Figure 8-12 Trigger Delay

The code below shows the process of setting trigger delay.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetIntValueEx(hInterface, "LinkTriggerDelay", 100);

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

Chapter 9 Frame Grabber Trigger

9.1 Stream

The frame grabber can send a trigger command to the camera for acquiring images. It is necessary to configure the relevant parameters of the frame grabber's trigger function.

Steps

1. Go to **BasicSetting > Stream Selector**, and select the corresponding stream.

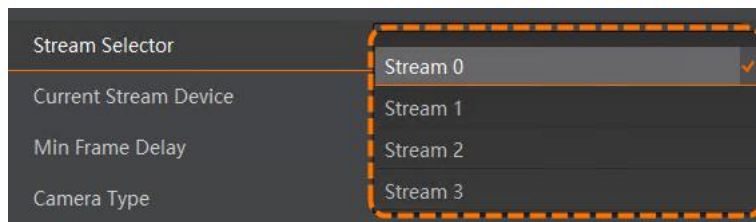


Figure 9-1 Stream Selector

Note

Stream 0 to Stream 3 correspond to cameras that are connected to CH0 to CH3 connectors respectively.

2. (Optional) Enable or disable **Min. Frame Delay** according to actual demands.
 - If **Min. Frame Delay** is enabled, the client software will always cache the new image data in the image space to be sent, and discard the unsent image data directly.
 - If **Min. Frame Delay** is disabled, and the latest image data will be cached in the unsent buffer space. If the cached data in the buffer space reaches the upper limit, the old unsent images will be discarded and new images will be cached.

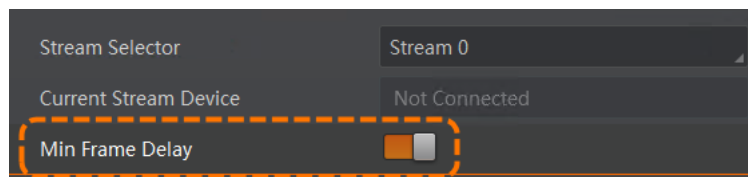


Figure 9-2 Min. Frame Delay

3. Select **Frame Scan** or **Line Scan** in the **Camera Type** according to actual demands.

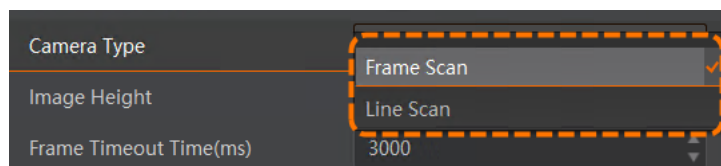


Figure 9-3 Set Camera Type

- **Frame Scan:** The frame grabber acquires images according to the valid frame signal sent by the camera. This function is suitable for industrial area cameras, and industrial line cameras with **Frame Scan**.
- **Line Scan:** The frame grabber acquires images according to the valid line signal sent by the camera. This function is suitable for industrial line cameras with **Line Scan**.

Note

Regarding the line camera, you can set its scan mode to acquire images. Some models of line cameras support frame scan only.

- (Optional) If you select **Line Scan** as **Camera Type**, set **Image Height** to configure the height of output images.

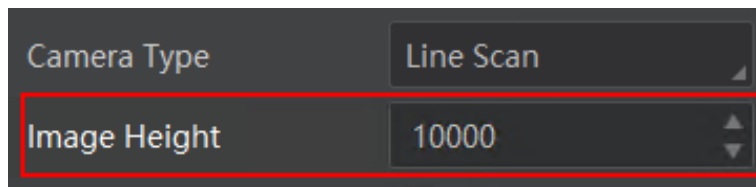


Figure 9-4 Set Image Height

- Enter **Frame Timeout Time(ms)** according to actual demands. If the camera's image height is received fully within the configured **Frame Timeout Time**, the frame is output normally. Otherwise, the actual frame received will be output.

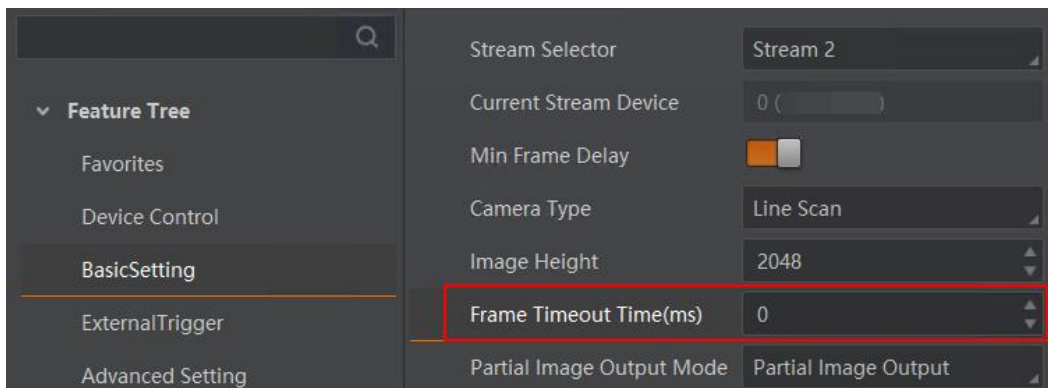


Figure 9-5 Frame Timeout Time

- (Optional) Set **Frame Cache Number Max** to configure frame cache number according to actual demands, and you can view the actual effect in **Actual Cache Frame Number**.

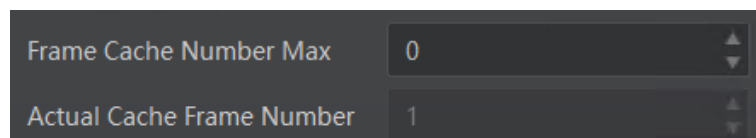


Figure 9-6 Frame Cache Number Max and Actual Cache Frame Number

Note

The default value of **Frame Cache Number Max** is 3.

7. Set **Partial Image Output Mode** according to actual demands.

Note

The **Partial Image Output Mode** is supported when **Line Scan** is selected as **Camera Type**.



Figure 9-7 Partial Image Output Mode

Table 9-1 Partial Image Output Mode Description

Parameter	Description
Partial Image Output	• If the number of lines output by the device reaches the configured image height (Image Height) within the frame timeout period, one frame of image will be output. • If the number of lines output by the device does not reach the configured image height (Image Height) within the frame timeout period, the SDK will output the image according to the actual height.
Partial Image Discard	• If the number of lines output by the device reaches the configured image height (Image Height) within the frame timeout period, one frame of image will be output. • If the number of lines output by the device does not reach the configured image height (Image Height) within the frame timeout period, the SDK discards the image.
Partial Image Filled	• If the number of lines output by the device reaches the configured image height (Image Height) within the frame timeout period, one frame of image will be output. • If the number of lines output by the device does not reach the configured image height (Image Height) within the frame timeout period, the SDK will output the image after filling the black according to the height parameter for the remaining part.

9.2 Stream Trigger

Go to **Advanced Setting > Stream Trigger Selector**, and select the stream (**Stream 0** to **Stream 3**) to be configured.

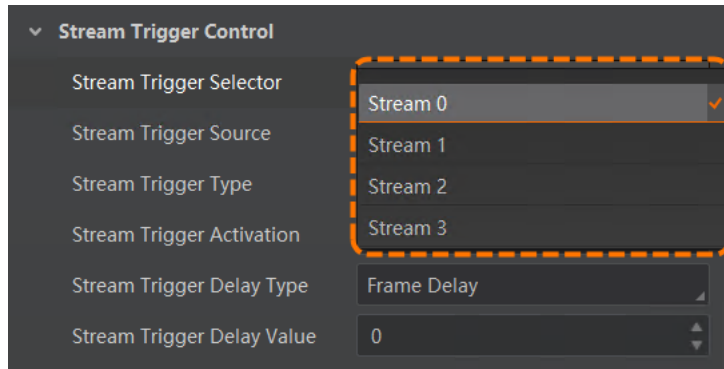


Figure 9-8 Stream Trigger Selector

9.3 Trigger Source

The trigger source includes software trigger, hardware trigger, encoder trigger, timer trigger, and advanced I/O control.

Steps

1. Go to **Advanced Setting > Stream Trigger Source**.
2. Select **Stream Trigger Source** according to actual demands.

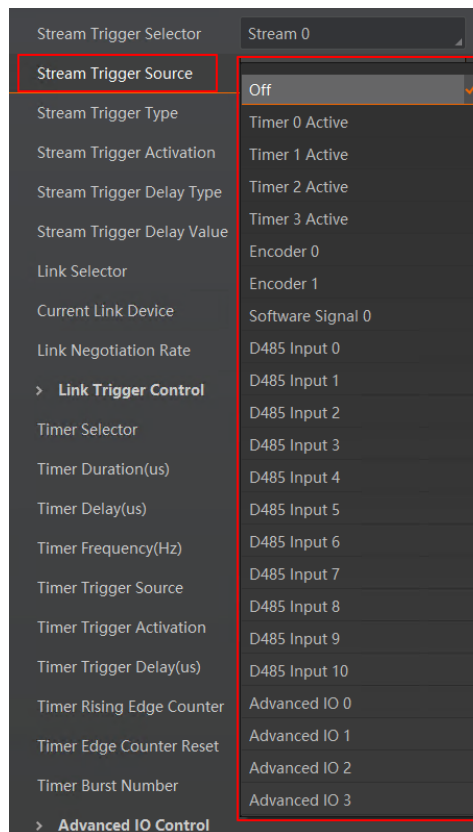


Figure 9-9 Stream Trigger Source

Table 9-2 Stream Trigger Source Description

Trigger Source	Parameter Value	Principle
Software Trigger	Software Signal 0	The frame grabber sends data packet to the camera to acquire images by manual executing.
Hardware Trigger	D485 Input 0 to D485 Input 10	The trigger source created by the frame grabber sends data packet to the camera to acquire images.
Encoder Trigger	Encoder 0/1	The frame grabber sends data packet to the camera via the encoder to acquire images.
Timer Trigger	Timer 0/1/2/3 Active	The frame grabber sends data packet to the camera via the timer to acquire images.
Advanced I/O Control	Advanced IO 0/1/2/3	The frame grabber sends data packet to the camera or external I/O via advanced I/O control to acquire images.
None	Off	Close the frame grabber's external trigger.

3. Select **Stream Trigger Type** according to actual demands.

- **Fixed Line:** If the frame grabber receives an edge trigger signal, it outputs image data according to the configured line height (**Image Height**). The stream trigger activation supports **Low Level**, **High Level**, **Rising Edge**, and **Falling Edge**.
- **Variable Line:** If the frame grabber receives a level trigger, it outputs image data according to the actual number of lines of the level signal. The stream trigger activation supports **Low Level**, **High Level**, **Rising Edge**, and **Falling Edge**.

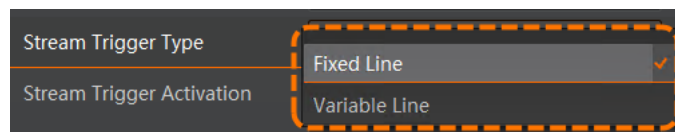


Figure 9-10 Set Stream Trigger Type

Note

You can refer to section [Trigger Related Parameters](#) to set trigger activation and trigger delay after you select the trigger source.

9.3.1 Software Trigger

Steps

1. Go to **Advanced Setting > Stream Trigger Source**.
2. Select **Software Signal 0** as **Stream Trigger Source**, and click **Execute** in **Stream Software Trigger** to send trigger commands.

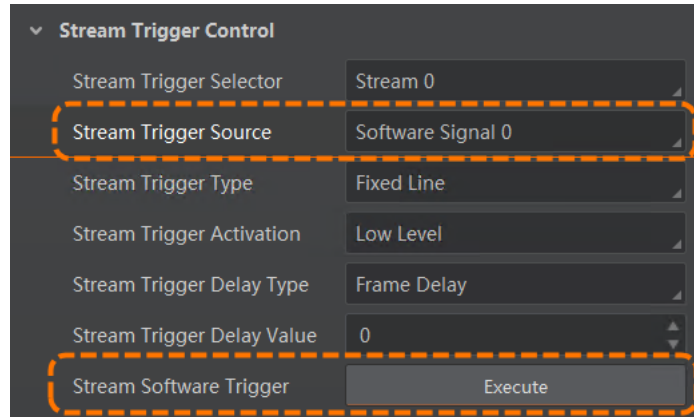


Figure 9-11 Software Trigger

The code below shows the process of selecting software as trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "StreamTriggerSource", "SoftwareSignal0");
MV_CC_SetCommandValue(hInterface, "StreamSoftwareTrigger");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

9.3.2 Hardware Trigger

The frame grabber provides 11 configurable differential input/output signals (D485 InOut 0

to D485 InOut 10) that can be used as the trigger signal source of the frame grabber.

Steps

Note

Here we take **D485 Input 0** as the trigger source as an example to set hardware trigger.

1. Go to **Advanced Setting > Stream Trigger Source**.
2. Select **D485 Input 0** as **Stream Trigger Source**.

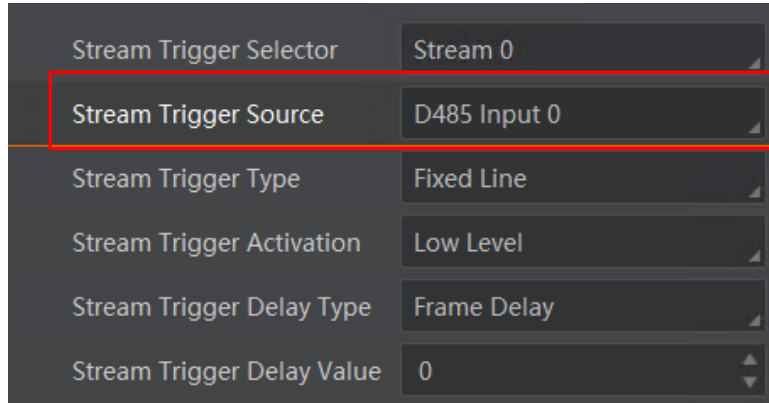


Figure 9-12 Hardware Trigger

The code below shows the process of selecting hardware as trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "StreamTriggerSource", "D485Input0");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

9.3.3 Encoder Trigger

When the frame grabber uses encoder trigger, the external device sends trigger signal to the frame grabber, and the frame grabber sends the signal to the camera after processing according to the configuration of the encoder. Finally, the camera receives trigger

commands to acquire images.

Steps

1. Go to **Advanced Setting > Stream Trigger Source**.
2. Select **Encoder 0/1** as **Stream Trigger Source**.

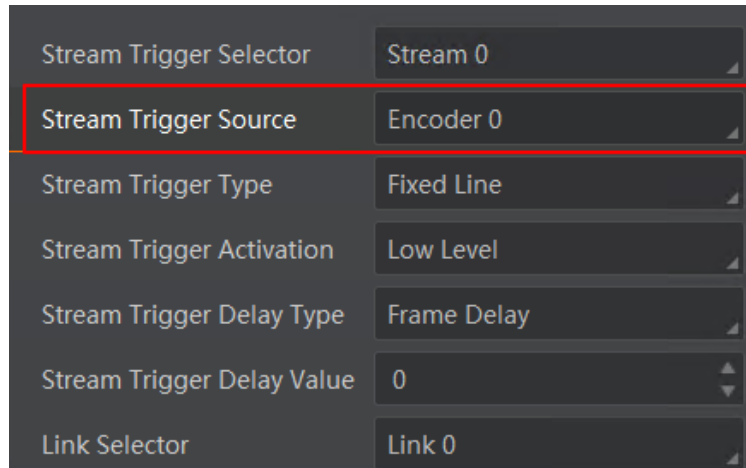


Figure 9-13 Encoder Trigger

The code below shows the process of selecting encoder as trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "StreamTriggerSource", "Encoder0");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

9.3.4 Timer Trigger

When the frame grabber uses timer trigger, the frame grabber sends the signal to the camera after processing according to the configuration of the timer. Finally, the camera receives trigger commands to acquire images.

Steps

1. Go to **Advanced Setting > Stream Trigger Source**.

2. Select **Timer 0/1/2/3 Active** as **Stream Trigger Source**.

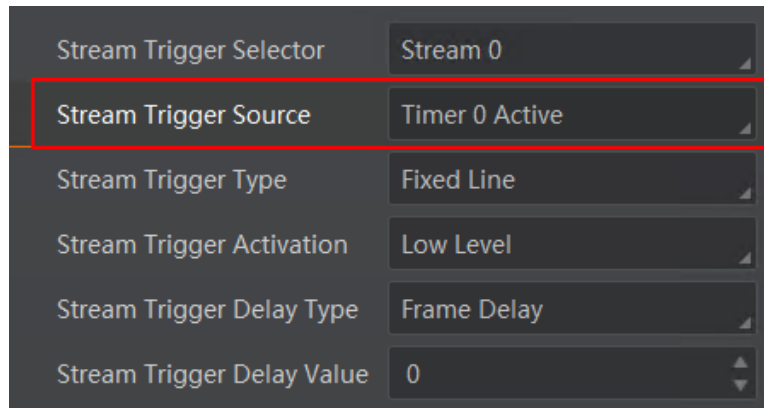


Figure 9-14 Timer Trigger

The code below shows the process of selecting timer as trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface,"StreamTriggerSource","Timer0Active");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

9.3.5 Advanced I/O Control

When the frame grabber uses advanced I/O control, the frame grabber sends the signal to the camera after processing according to the configuration of the advanced I/O. Finally, the camera receives trigger commands to acquire images.

Steps

1. Go to **Advanced Setting > Stream Trigger Source**.
2. Select **Advanced IO 0/1/2/3** as **Stream Trigger Source**.

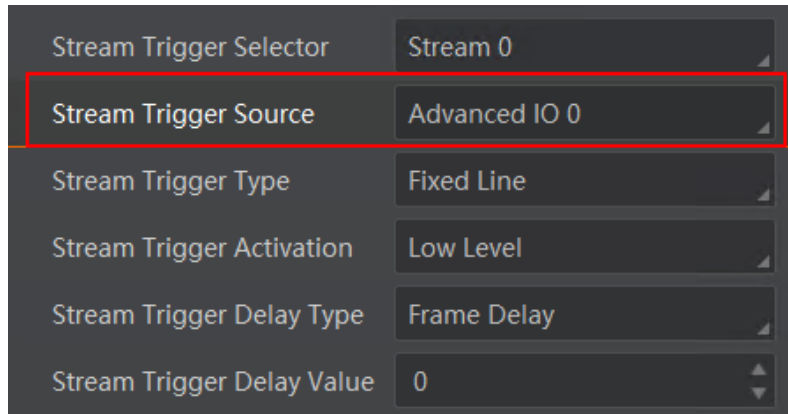


Figure 9-15 Advanced I/O Control

The code below shows the process of setting advanced I/O as link trigger source.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "LinkTriggerSource", "AdvancedIO0");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

9.4 Trigger Related Parameters

You can set trigger activation and trigger delay after enabling selecting specific stream trigger source. All trigger sources support setting trigger delay and trigger activation.

9.4.1 Set Trigger Activation

The frame grabber supports setting the trigger activation of the trigger source. When the electrical level signal given by external devices is triggered in selected trigger activation, the frame grabber sends the corresponding trigger packet to the camera to acquire images.

Steps

1. Go to **Advanced Setting > Stream Trigger Activation**.
2. Select **Stream Trigger Activation** according to actual demands.

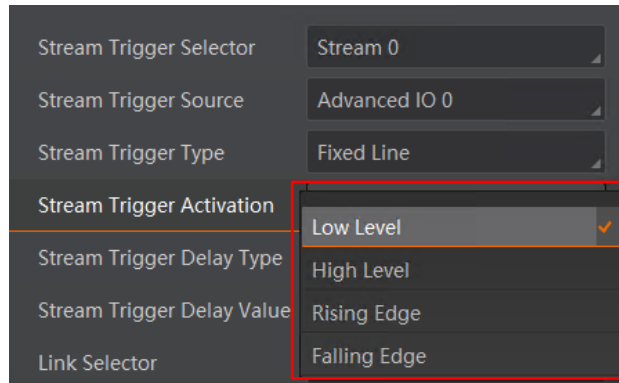


Figure 9-16 Trigger Activation

Table 9-3 Trigger Activation Parameter

Trigger Activation	Description
Rising Edge	When the electrical level signal given by external devices is in rising edge, the frame grabber receives the trigger source and starts to output configured counter signal.
Falling Edge	When the electrical level signal given by external devices is in falling edge, the frame grabber receives the trigger source and starts to output configured counter signal.
High Level	When the electrical level signal given by external devices is in high level, the frame grabber receives the trigger source and starts to output configured counter signal.
Low Level	When the electrical level signal given by external devices is in low level, the frame grabber receives the trigger source and starts to output configured counter signal.

The code below shows the process of setting trigger activation.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface, "StreamTriggerActivation", "RisingEdge");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

When **Rising Edge** and **Falling Edge** are selected as the **Stream Trigger Activation**, you can set **Stream Trigger Frame Burst** of the frame grabber. The code below shows the process of setting stream trigger frame burst.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};

MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);

unsigned int nInterfaceIndex = 0;

void* hInterface = NULL;

MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);

MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetIntValueEx(hInterface,"StreamTriggerFrameBurst",100);

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

9.4.2 Set Trigger Delay

Trigger delay means that the frame grabber receives the trigger source, and then sends the trigger signal to the camera after configured trigger delay time.

Steps

1. Go to **Advanced Setting**.
2. Select **Stream Trigger Delay Type** according to actual demands.
 - **Frame Delay**: The frame trigger signal is delayed by the configured number. That is, when the **Stream Trigger Delay Value** is set to n, the n+1 frame trigger signal can be received.
 - **Line Delay**: The line trigger signal is delayed by the configured number. That is, when the **Stream Trigger Delay Value** is set to n, the n+1 line trigger signal can be received.
 - **Time Delay (μs)**: The trigger signal is delay in the unit of μs.

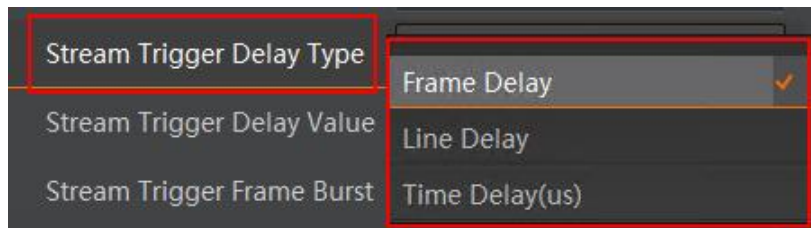


Figure 9-17 Stream Trigger Delay Type

3. Set **Stream Trigger Delay Value** according to actual demands.

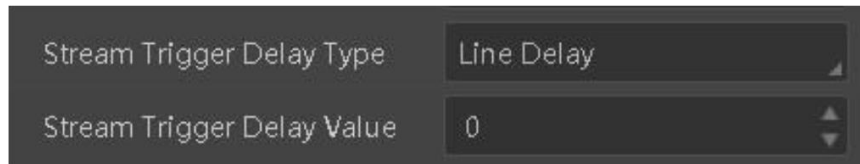


Figure 9-18 Set Stream Trigger Delay Value

The code below shows the process of setting trigger delay.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_SetEnumValueByString(hInterface,"StreamTriggerDelayType","LineDelay");
MV_CC_SetIntValueEx(hInterface,"StreamTriggerDelayValue",100);

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

Chapter 10 Other Functions

10.1 Image Parameters

The frame grabber supports ISP functions, such as Bayer interpolation and Gamma correction. You can go to **ISP Control** page to set the related parameters.

- **Bayer CFA Enable:** After the parameter is enabled, the RGB image can be outputted if the camera image is in the pixel formats of Bayer GR8/RG8/GB8/BG8, and the transmission bandwidth of the PCIe interface is three times the actual bandwidth transmitted from the camera to the frame grabber (but it cannot exceed the bandwidth limit of the PCIe 3.0 X8).

Note

Frame loss may occur after you enable the **Bayer CFA Enable**.

- **Gamma Enable:** You can enable the parameter, and enter the Gamma value. The value should be between 0 and 4.

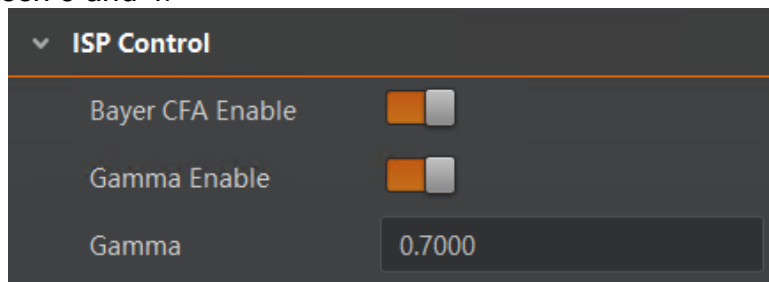


Figure 10-1 Image Parameter

10.2 Test Mode

The test mode detects whether cameras connected to the frame grabber can send data packet or not, and displays the number of error, received and transmitted data packets.

Steps

1. Go to **Device Control > Test Control**, and select **Mode 1** as **Test Mode** to start test mode.
 - **Test Error Count:** It displays the number of error data packets sent by the camera.
 - **Test Packet Count Tx:** It displays the number of data packets sent by the frame grabber.
 - **Test Packet Count Rx:** It displays the number of data packets sent by the camera.
2. Click **Execute** in **Test Error Count Reset**, **Test Packet Count Tx Reset**, or **Test Packet Count Rx Reset** to reset the count.

Note

Make sure to select **Off** as **Test Mode** first when change the connector to test.

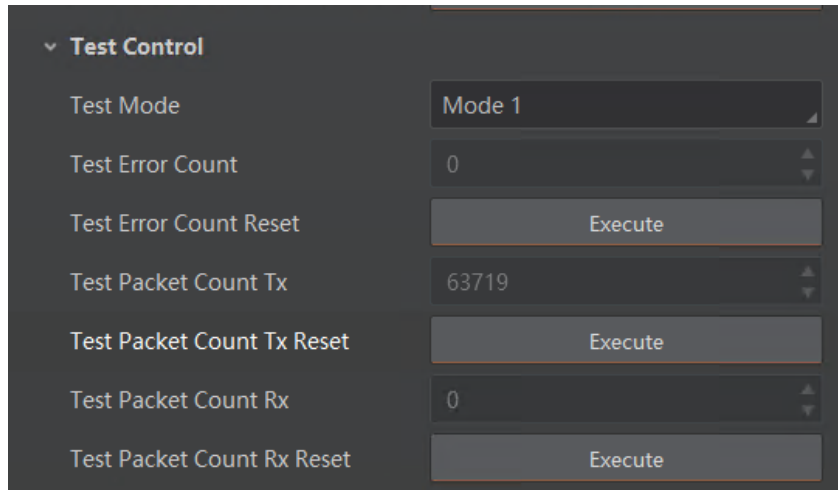


Figure 10-2 Test Mode

10.3 PoCXP

The PoCXP can control the power supply of cameras connected to the frame grabber, and display power consumption and voltage of connected cameras in real time.

Before You Start

Note

- Refer to section [Select Link](#) to set the HD-BNC CoaXPress connector.
 - Make sure that the cable of 6-pin ATX 12V is connected to the frame grabber's ATX power supply interface with the computer before using the PoCXP function.
-

Steps

1. Go to **Device Control** to enable **PoCxp Enable**.
2. Check if the camera has normal power supply via **PoCxp Status**.
 - **Auto** means that the camera is normally powered via PoCXP.
 - **Off** means that the PoCXP function is not used.
3. View the power consumption, voltage, and current via **PoCxp Power**, **PoCxp Voltage**, and **PoCxp Current** respectively.

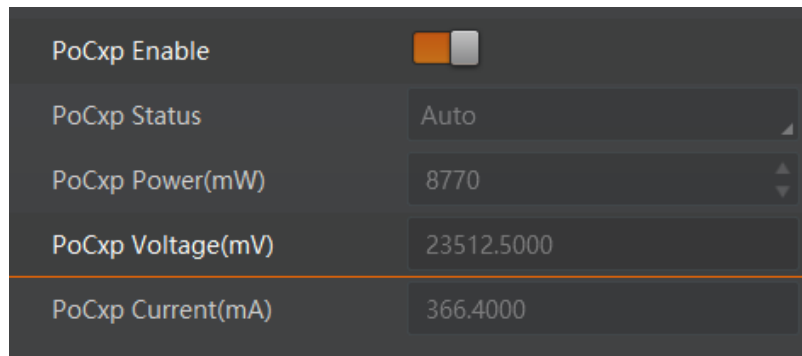


Figure 10-3 PoCXP

10.4 Device Control

In **Device Control**, you can view device information.

Table 10-1 Device Control Parameter Description

Parameter	Read/Write	Description
Firmware Version Type	Read Only	It is the type of firmware version.
Device Vendor Name	Read Only	It is the name of device manufacturer.
Device Model Name	Read Only	It is the device model.
Manufacture Info	Read Only	It is the manufacturer information.
Device Family Name	Read Only	It is the device name.
Device Firmware Version	Read Only	It is the device firmware version.
Device Serial Number	Read Only	It is the device serial number.
Device User ID	Read & Write	The device name is empty by default. You can set according to your preference. • If User ID is empty, the client software displays the device model. • If you set it, the client software displays the User ID you set.
Device Uptime (s)	Read Only	It is the period of time when device is powered up.
Board Device Type	Read Only	It is the device type.
Device Temperature	Read Only	It displays the real-time temperature of the device
PCIe Max Link Speed	Read Only	It is the max. link speed that PCIe supports.
PCIe Maximum Link Width	Read Only	It is the max. link width that PCIe supports.

Parameter	Read/Write	Description
Device Timestamp Tick Frequency (Hz)	Read Only	It is the device's timestamp tick frequency, unit: Hz.
Device Log Storage	Read & Write	It is the storage switch of device log.

10.5 Firmware Update

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

Note

The MVS Tool Kit is installed by default when you install the MVS client software.

Steps

1. Select **FrameGrabber** type after running MVS Tool Kit.

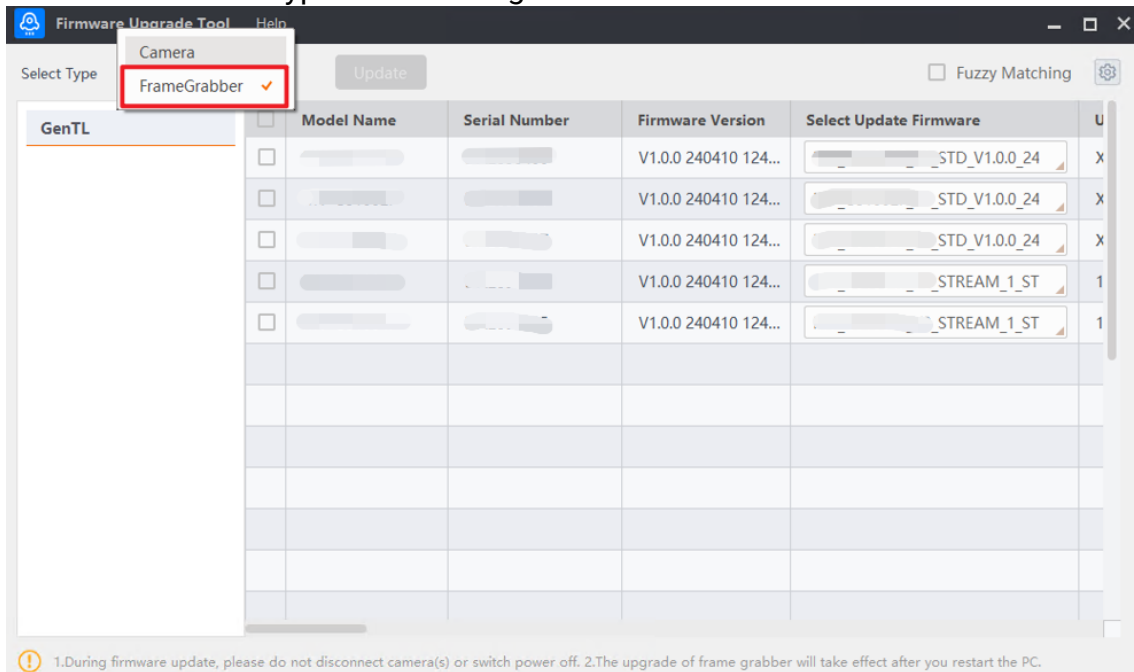


Figure 10-4 Select Frame Grabber

2. After you import the CTI file manually or the file is loaded automatically, the client software will enumerate the frame grabbers automatically.
3. Select the available frame grabber to update, and select the firmware version in the **Select Update Firmware**.

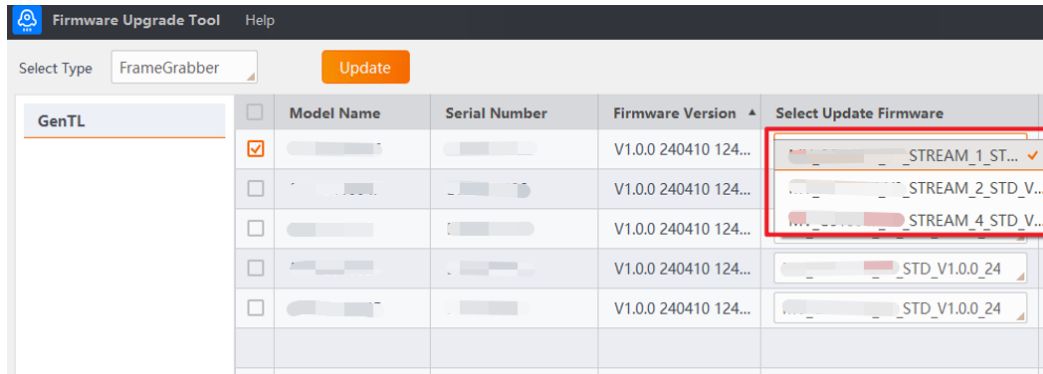


Figure 10-5 Update Firmware

4. Click **Update** to start updating.

Note

- Before updating, install the firmware drive package according to the frame grabber's model.
- Do not power off the frame grabber during updating.
- Restart the computer to check the frame grabber's function after updating.

10.6 User Set Control

This function allows loading or saving default or user-defined settings. The frame grabber supports four sets of parameters, including one default set and three user sets, and the relation among four sets of parameters is shown below.

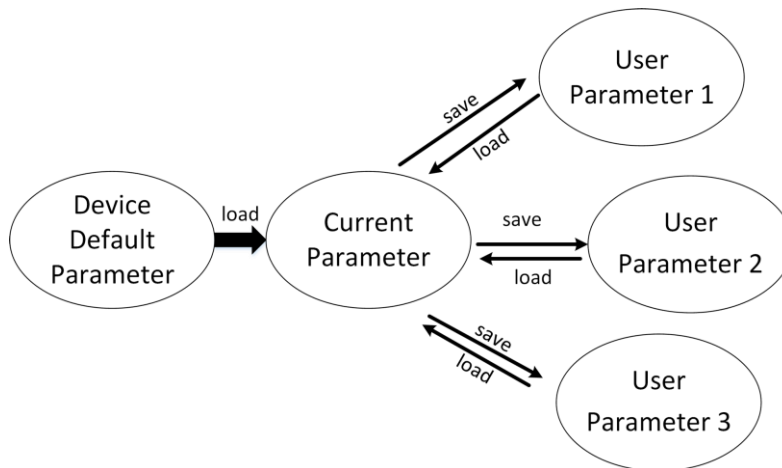


Figure 10-6 Parameter Relation

10.6.1 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.

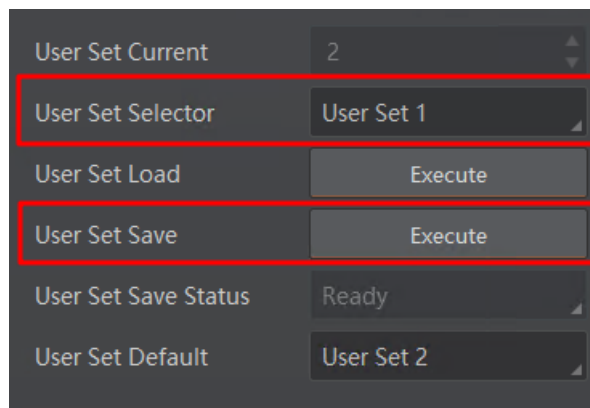


Figure 10-7 Save User Set

10.6.2 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.

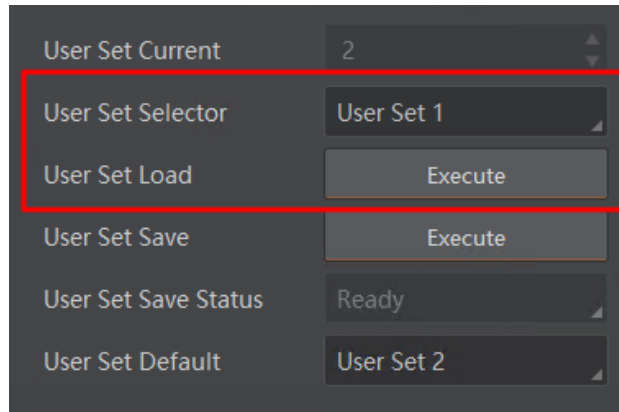


Figure 10-8 Load User Set

10.6.3 Set User Default

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

Note

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

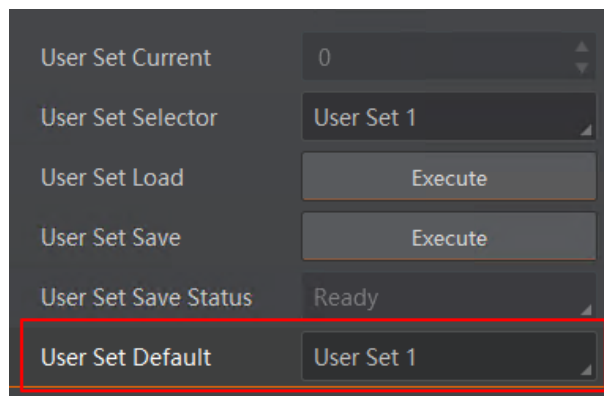


Figure 10-9 Set User Default

The code below shows the process of setting user parameters.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nIndex]);
MV_CC_OpenInterface(hInterface, NULL);
```

```
//Save User Set  
MV_CC_SetEnumValueByString(hInterface,"UserSetSelector","UserSet1");  
MV_CC_SetCommandValue(hInterface,"UserSetSave");  
  
//Load User Set  
MV_CC_SetCommandValue(hInterface,"UserSetLoad");  
MV_CC_SetEnumValueByString(hInterface,"UserSetDefault","UserSet1");  
  
MV_CC_CloseInterface(hInterface);  
MV_CC_DestroyInterface(hInterface);
```

10.7 File Access Control

The file access function can import or export the frame grabber's feature files of the frame grabber and save them in MFA format. Currently, only **User Set 1/2/3**, **License Notice**, and **Log file** are supported.

Note

For **License Notice** and **Log file**, only exporting is supported.

Steps

1. Go to the feature tree, and click  to open the file access dialogue box.

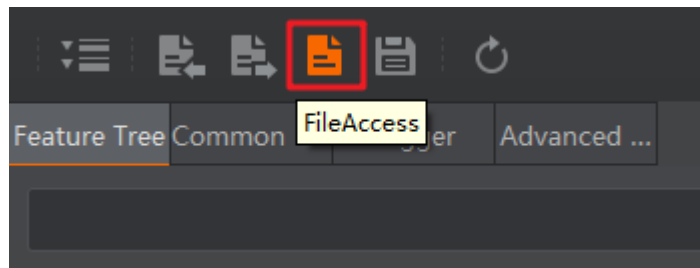


Figure 10-10File Access

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

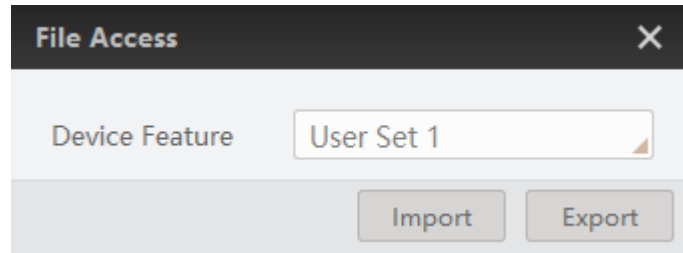


Figure 10-11 Import or Export

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. Refer to section **User Set Control** for details.
 - Importing and exporting the device feature among the same model of the frame grabbers are supported.
-

10.8 Event Control

You can view and set the frame grabber's event control related parameters to let the device generate an event and transmit a related event message to the computer.

Note

- The event control function may differ by device model.
 - The MVS Tool Kit is installed by default when you install the MVS client software.
 - For abnormal events, you should view the device's SDK file.
 - The specific event category and event selector may differ by device model.
-

Steps

1. Use the Event Configuration Tool of MVS Tool Kit to view and set frame grabber's events.

Note

Refer to the user manual of event configuration tool for detailed operation.

2. Right click the connected frame grabber and click **Event Monitor**.

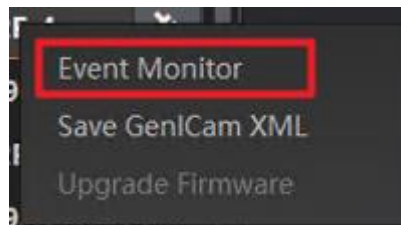


Figure 10-12 Select Event Monitor

3. Check **Messaging Channel Event**, and view specific events after the device operates.
4. (Optional) You can set save path, enable auto save, or clear log in monitor window.

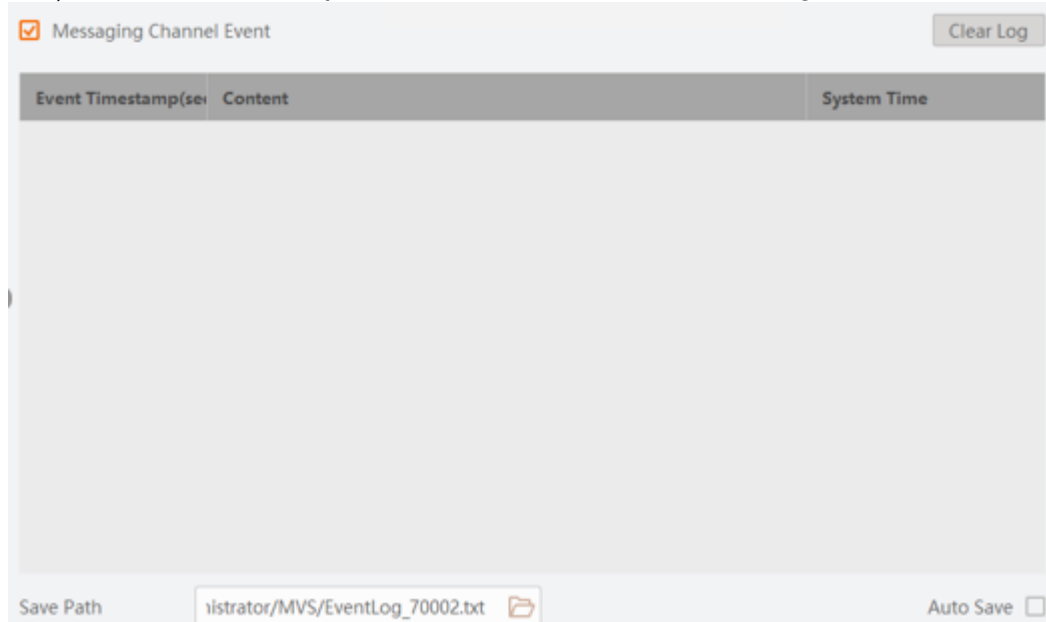


Figure 10-13 Event Monitor

The code below shows the process of event information recorded by the frame grabber.

```
void __stdcall EventCallBack(MV_EVENT_OUT_INFO * pEventInfo, void* pUser);

MV_CC_EnumInterfaces(MV_CXP_INTERFACE, &stInterfaceList);
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

MV_CC_RegisterEventCallBackEx(hInterface, "ReceiveImageFrameStart0", EventCallBack, NULL);
MV_CC_SetEnumValueByString(hInterface, "EventCategory", "StreamEvent");
MV_CC_SetEnumValueByString(hInterface, "ChannelSelector", "Channel0");
MV_CC_SetEnumValueByString(hInterface, "EventSelector", "ReceiveImageFrameStart0");
MV_CC_SetEnumValueByString(hInterface, "EventNotification", "On");

MV_CC_CloseInterface(hInterface);
MV_CC_DestroyInterface(hInterface);
```

Chapter 11 FAQ (Frequently Asked Questions)

11.1 Why the frame grabber cannot be enumerated?

Table 11-1 Reasons and Solutions

No.	Reason	Solution
1	The driver is not installed or is installed improperly.	Make sure the MVS 3.4.1 or later is installed properly, and PCIE-CXP in the installation interface is selected. If the client is installed correctly, uninstall and reinstall it, and ensure that the driver beginning with MVFG exists in the Device Manager. If the driver is not found, run the install.bat file as administrator in the path C:\Program Files (x86)\Common Files\MVS\Drivers\PCle\CXP to check if the driver takes effect. Anti-virus software or firewall may intercept the driver. You can disable the firewall and uninstall the anti-virus software. If it is required to enable the firewall and anti-virus software, make sure that the MVS client software is on the allowlist before uninstalling and reinstalling it.
2	The frame grabber is installed improperly.	After powering off the industrial PC, remove and reinsert the frame grabber. Make sure that the frame grabber is properly secured on the industrial PC with screws.
3	The firmware of frame grabber is updated without restarting the industrial PC afterward.	Restart the industrial PC.
4	The frame grabber firmware is abnormal.	Check the indicators on the frame grabber and refer to the section Indicators .
5	The PC configuration cannot meet the requirements.	• Check if the slot is normal. If any issues are detected, try a different slot or use another PC for cross-testing. • If the mainboard power supply is insufficient, use the chassis power supply.

11.2 Why the camera connected to the frame grabber cannot be enumerated?

Table 11-2 Reasons and Solutions

No.	Reason	Solution
1	The camera is not working normally.	Check if the camera is working normally and if the power supply is normal via indicators.
2	Improper wiring of the data cable.	• Check the wiring of the data cable. Ports 1 to 4 on frame grabber are recommended to connect with cameras 0 to 3. • Perform cross-test on the cable. Check if Link 0 to Link 3 are connected with cameras in CoaXPress in the feature tree, and you can view the connected camera model in CoaXPress > Current Link Device.

11.3 Why image output fails or streaming stops?

Table 11-3 Reasons and Solutions

No.	Reason	Solution
1	The Link Trigger function of the camera or the frame grabber is enabled.	Disable the Link Trigger function. Go to CoaXPress > Link Trigger Control , and disable Link Trigger Enable .
2	The camera or the cable is abnormal.	Check the wiring of the camera or the cable.
3	The firmware version and the MVS client version mismatch.	Contact the technical support to get the firmware and the installation package of the client software.

11.4 Why the camera's frame rate is not stable?

Table 11-4 Reasons and Solutions

No.	Reason	Solution
1	Insufficient PCIe bandwidth.	Replace the PCIe slot to ensure it provides PCIe 3.0 x8 bandwidth. It should be noted that the PCIe slot of some industrial is designed to share bandwidth across multiple slots, which may cause insufficient bandwidth, and you can check or set the bandwidth in the BIOS interface. If ROI meets application requirements, use the ROI function to increase the frame rate.
2	Low CPU performance.	Use high performance CPU.
3	The cable is too long or is aging.	Theoretically, the maximum transmission distance is 30 m with high-quality cables, but cables around 10 m in length are recommended.

Chapter 12 Revision History

Table 12-1 Revision History

Version	Date	Revision Details
V2.1.0	July 3, 2026	• Adjust the structure of section I/O Connector. • Edit the section Indicators. • Edit the section FAQ (Frequently Asked Questions). • Edit the Appendix Frame Grabber Accessories.
V2.0.0	Aug. 19, 2024	Edit the structure and the content of the whole user manual.
V1.0.0	June 1, 2022	Original version.

Appendix A Frame Grabber Accessories

When using the frame grabber, you need to prepare these cables: HD-BNC CoaXPress cable, I/O trigger cable, and I/O adapter cable. The appearance and pin definitions of accessories are shown below.

HD-BNC CoaXPress Cable

The HD-BNC CoaXPress cable is used to establish the data transmission between the frame grabber and the camera. It can provide three lengths of 3 m, 5 m, and 10 m, which can be selected as required.



Figure A-1 HD-BNC CoaXPress Cable

Note

Refer to the datasheet of the corresponding product for the specific size and parameter of the HD-BNC CoaXPress cable.

I/O Trigger Cable

The I/O trigger cable (DB15M to open) is used for I/O trigger signal wiring of DB15M connector of the frame grabber, as shown below. Refer to the following table for pin definition. The cable has shielding protection, providing four lengths of 3 m, 5 m, 7 m, and 10 m which can be selected as required.

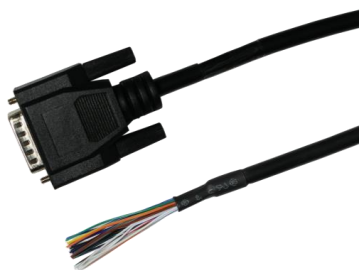


Figure A-2 I/O Trigger Cable

Note

Refer to the datasheet of the corresponding product for the specific size and parameter of the I/O trigger cable.

Table A-1 Pin Definition of I/O Trigger Cable

Pin No.	Cable Color	Signal	Pin No.	Cable Color	Signal
5	White/Green	LINE_0P	9	White/Red	LINE_4P
10	Green	LINE_0N	10	Red	LINE_4N
4	White/Orange	LINE_1P	11	White/Yellow	LINE_5P
9	Orange	LINE_1N	12	Yellow	LINE_5N
3	White/Brown	LINE_2P	13	White/Purple	LINE_6P
8	Brown	LINE_2N	14	Purple	LINE_6N
2	White/Blue	LINE_3P	15	Black	GND
7	Blue	LINE_3N	/	/	/

I/O Adapter Cable

The I/O adapter cable is used for the I/O trigger signal wiring of the 9-pin connector, as shown below.

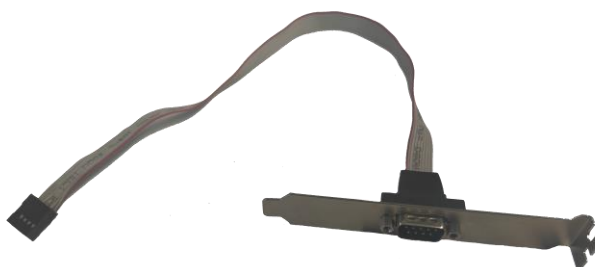


Figure A-3 I/O Adapter Cable

Appendix B Frame Grabber Fields

Table B-1 Event Fields

Field Name	Field Type	Enumerated Value	Value Name	Description
EventCategory	Enum	1	SoftEvent	Soft event
		2	LinkEvent	Link event
		3	StreamEvent	Stream event
		4	PCIEvent	PCI event
		5	IOEvent	I/O event
EventIOType	Enum	0	Timer	I/O type
		4	Encoder	
		5	D485	
		6	AdvancedIO	
EventChannelSelector	Integer	0~10	/	Select channel
EventSelector	Enum	/	/	Select event
EventNotification	Enum	0	Off	Enable event
		1	On	

Table B-2 Event Source Fields

Event Type	Enumerated Value	Value Name
Soft Event	140	CardPacketReceived0
	141	CardPacketReadDone0
	142	CardAckPacketReceived0
	143	CardAckPacketReadDone0
Link Event	100	Trigger0RisingEdge0
	101	Trigger0RisingEdge1
	102	Trigger0RisingEdge2
	103	Trigger0RisingEdge3
	104	Trigger0FallingEdge0
	105	Trigger0FallingEdge1
	106	Trigger0FallingEdge2

Event Type	Enumerated Value	Value Name
Link Event	107	Trigger0FallingEdge3
	108	LockedEvent0
	109	LockedEvent1
	110	LockedEvent2
	111	LockedEvent3
	112	UnlockedEvent0
	113	UnlockedEvent1
	114	UnlockedEvent2
	115	UnlockedEvent3
	116	ControlAckPacketReceived0
	117	ControlAckPacketReceived1
	118	ControlAckPacketReceived2
	119	ControlAckPacketReceived3
	120	ControlAckPacketTransmitted0
	121	ControlAckPacketTransmitted1
	122	ControlAckPacketTransmitted2
	123	ControlAckPacketTransmitted3
	124	ControlPacketReceived0
	125	ControlPacketReceived1
	126	ControlPacketReceived2
	127	ControlPacketReceived3
	128	ControlPacketTransmitted0
	129	ControlPacketTransmitted1
	130	ControlPacketTransmitted2
	131	ControlPacketTransmitted3
	132	LinkTriggerPacketTransmitted0
	133	LinkTriggerPacketTransmitted1

Event Type	Enumerated Value	Value Name
	134	LinkTriggerPacketTransmitted2
	135	LinkTriggerPacketTransmitted3
	136	LinkTriggerAckPacketReceived0
	137	LinkTriggerAckPacketReceived1
	138	LinkTriggerAckPacketReceived2
	139	LinkTriggerAckPacketReceived3
Stream Event	84	ReceiveImageFrameStart0
	85	ReceiveImageFrameStart1
	86	ReceiveImageFrameStart2
	87	ReceiveImageFrameStart3
	88	ReceiveImageFrameEnd0
	89	ReceiveImageFrameEnd1
	90	ReceiveImageFrameEnd2
	91	ReceiveImageFrameEnd3
	92	TransmitImageBlockStart0
	93	TransmitImageBlockStart1
	94	TransmitImageBlockStart2
	95	TransmitImageBlockStart3
	96	TransmitImageBlockEnd0
	97	TransmitImageBlockEnd1
	98	TransmitImageBlockEnd2
	99	TransmitImageBlockEnd3
	200	TheFirstLineInFrame0
	201	TheFirstLineInFrame1
	202	TheFirstLineInFrame2
	203	TheFirstLineInFrame3
	204	TheLastLineInFrame0

Event Type	Enumerated Value	Value Name
	205	TheLastLineInFrame1
	206	TheLastLineInFrame2
	207	TheLastLineInFrame3
PCIE Event	76	PCIEDMAStart0
	77	PCIEDMAStart1
	78	PCIEDMAStart2
	79	PCIEDMAStart3
	80	PCIEDMAEnd0
	81	PCIEDMAEnd1
	82	PCIEDMAEnd2
	83	PCIEDMAEnd3
IO Event	0	TimerRisingEdge0
	1	TimerRisingEdge1
	2	TimerRisingEdge2
	3	TimerRisingEdge3
	4	TimerFallingEdge0
	5	TimerFallingEdge1
	6	TimerFallingEdge2
	7	TimerFallingEdge3
	8	EncoderRisingEdge0
	9	EncoderRisingEdge1
	10	EncoderFallingEdge0
	11	EncoderFallingEdge1
	60	D485InRisingEdge0
	61	D485InRisingEdge1
	62	D485InRisingEdge2
	63	D485InRisingEdge3

Event Type	Enumerated Value	Value Name
	64	D485InRisingEdge4
	65	D485InRisingEdge5
	66	D485InRisingEdge6
	67	D485InRisingEdge7
	252	D485InRisingEdge8
	253	D485InRisingEdge9
	254	D485InRisingEdge10
	68	D485InFallingEdge0
	69	D485InFallingEdge1
	70	D485InFallingEdge2
	71	D485InFallingEdge3
	72	D485InFallingEdge4
	73	D485InFallingEdge5
	74	D485InFallingEdge6
	75	D485InFallingEdge7
	255	D485InFallingEdge8
	256	D485InFallingEdge9
	257	D485InFallingEdge10
	144	D485OutRisingEdge0
	145	D485OutRisingEdge1
	146	D485OutRisingEdge2
	147	D485OutRisingEdge3
	148	D485OutRisingEdge4
	149	D485OutRisingEdge5
	150	D485OutRisingEdge6
	151	D485OutRisingEdge7
	258	D485OutRisingEdge8

Event Type	Enumerated Value	Value Name
	259	D485OutRisingEdge9
	260	D485OutRisingEdge10
	152	D485OutFallingEdge0
	153	D485OutFallingEdge1
	154	D485OutFallingEdge2
	155	D485OutFallingEdge3
	156	D485OutFallingEdge4
	157	D485OutFallingEdge5
	158	D485OutFallingEdge6
	159	D485OutFallingEdge7
	261	D485OutFallingEdge8
	262	D485OutFallingEdge9
	263	D485OutFallingEdge10
	244	AdvancedIORisingEdge0
	245	AdvancedIORisingEdge1
	246	AdvancedIORisingEdge2
	247	AdvancedIORisingEdge3
	248	AdvancedIOFallingEdge0
	249	AdvancedIOFallingEdge1
	250	AdvancedIOFallingEdge2
	251	AdvancedIOFallingEdge3

Table B-3 Other Fields

Field Name	Field Type	Enumerated Value	Value Name	Description
Frame grabber trigger				
StreamSelector	Enum	0	Stream0	Stream selector
		1	Stream1	

		2	Stream2	
		3	Stream3	
CurrentStreamDevice	String	/	/	Current stream device
MinFrameDelay	Boolean	/	/	Minimum frame delay
CameraType	Enum	0	FrameScan	Scanning type
		1	LineScan	
ImageHeight	Integer	/	/	Image height; range: 1 to 4294967295
FrameTimeoutTime	Integer	/	/	Frame timeout; unit: ms; range: 0 to 40000
PartialImageOutputMode	Enum	1	PartialImageOutput	Partial image output
		2	PartialImageDiscard	
		3	PartialImageFilled	
StreamTriggerSource	Enum	255	Off	Trigger source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		64	Encoder0	
		65	Encoder1	
		80	SoftwareSignal0	
		96	D485Input0	
		97	D485Input1	
		98	D485Input2	
		99	D485Input3	
		100	D485Input4	
		101	D485Input5	
		102	D485Input6	
		103	D485Input7	
		104	D485Input8	
		105	D485Input9	
		106	D485Input10	
		112	AdvancedIO0	
		113	AdvancedIO1	
		114	AdvancedIO2	
		115	AdvancedIO3	
		128	QuickSoftwareTrigger0	
		129	QuickSoftwareTrigger1	

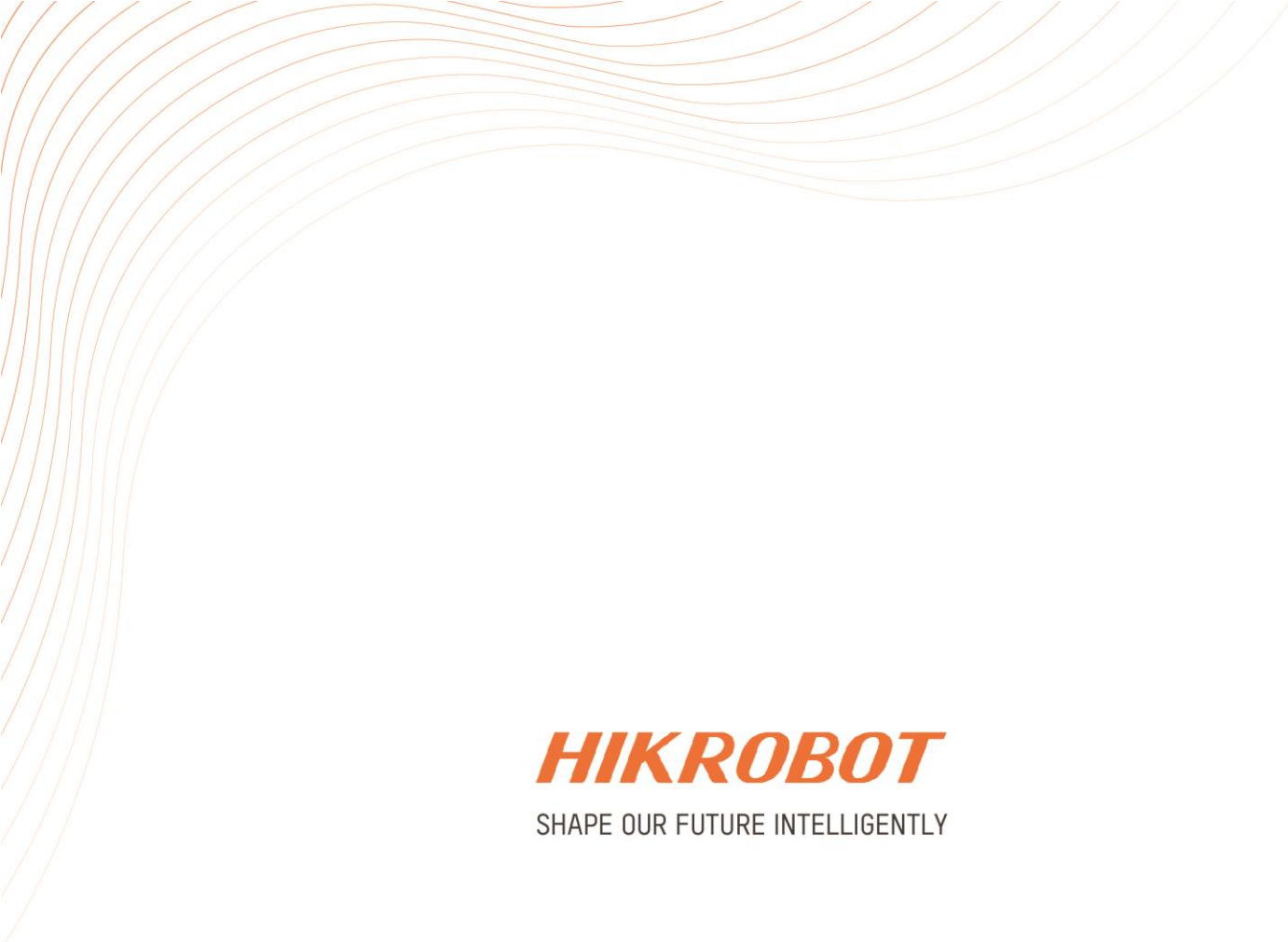
			er1	
		130	QuickSoftwareTrigg er2	
		131	QuickSoftwareTrigg er3	
StreamTriggerType	Enum	0	FixedLine	Triger type
		1	VariableLine	
StreamTriggerActivatio n	Enum	0	LowLevel	Trigger activation
		1	HighLevel	
		2	RisingEdge	
		3	FallingEdge	
StreamTriggerDelayTy pe	Enum	0	FrameDelay	Trigger delay type
		1	LineDelay	
		2	TimeDelay	
StreamTriggerDelayVal ue	Integer	/	/	Trigger delay value, range: 0 to 10000
Encoder control				
EncoderSelector	Enum	0	Encoder0	Select encoder
		1	Encoder1	
EncoderSourceA	Enum	48	D485Input0	Select encoder input source (PHASE_A)
		49	D485Input1	
		50	D485Input2	
		51	D485Input3	
		52	D485Input4	
		53	D485Input5	
		54	D485Input6	
		55	D485Input7	
		56	D485Input8	
		57	D485Input9	
		58	D485Input10	
		127	Off	
EncoderSourceB	Enum	48	D485Input0	Select encoder input source (PHASE_B)
		49	D485Input1	
		50	D485Input2	
		51	D485Input3	
		52	D485Input4	
		53	D485Input5	
		54	D485Input6	
		55	D485Input7	
		56	D485Input8	
		57	D485Input9	
		58	D485Input10	

		127	Off	
EncoderTriggerMode	Enum	0	AnyDirection	Encoder trigger mode
		1	ForwardOnly	
		2	BackwardOnly	
EncoderCounterMode	Enum	0	AnyDirection	Encoder counter mode
		1	ForwardDirection	
		2	BackwardDirection	
EncoderCounter	Integer	/	/	Encoder counter; range: 0 to 4294967295
EncoderCounterReset	Command	/	/	Encoder counter reset
EncoderMaxReverseCounter	Integer	/	/	Encoder reverse counter; range: 0 to 65535
EncoderReverseCounterReset	Command	/	/	Encoder reverse counter reset
EncoderTriggerLineRate	Integer	/	/	Encoder trigger line rate; unit: Hz; range: 0 to 4294967295
EncoderPreDivider	Integer	/	/	Encoder pre-divider; range: 1 to 128
EncoderMultiplier	Integer	/	/	Encoder multiplier; range: 1 to 32
EncoderPostDivider	Integer	/	/	Encoder post divider; range: 1 to 128
ResultingTriggerLineRate	Integer	/	/	Resulting trigger line rate; unit: Hz; range: 0 to 4294967295
Input/output signal				
LineSelector	Enum	24	D485InOut0	Select line
		25	D485InOut1	
		26	D485InOut2	
		27	D485InOut3	
		28	D485InOut4	
		30	D485InOut6	
		31	D485InOut7	

		32	D485InOut8	
		33	D485InOut9	
		34	D485InOut10	
LineMode	Enum	0	Input	Line mode
		1	Output	
LineInputPolarity	Enum	0	SingleEnded	Line input polarity
		1	Differential	
LineInverter	Boolean	/	/	Line inverter
LineDebouncerTimeNs	Integer	/	/	Line debouncer time; unit: ns; range: 0 to 400000000
LineSource	Enum	255	Off	Line source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		64	HighLevel	
		65	LowLevel	
		81	D485Input1	
		82	D485Input2	
		83	D485Input3	
		84	D485Input4	
		85	D485Input5	
		86	D485Input6	
		87	D485Input7	
		88	D485Input8	
		89	D485Input9	
		90	D485Input10	
		96	AdvancedIO0	
		97	AdvancedIO1	
		98	AdvancedIO2	
		99	AdvancedIO3	
		112	Fval_0	
		113	Fval_0	
Timer control				
Timer Selector	Enum	0	Timer0	Select timer
		1	Timer1	
		2	Timer2	
		3	Timer3	
TimerDuration	Integer	/	/	Timer duration; range: 0 to 34000000

TimerDelay	Integer	/	/	Timer delay; range: 0 to 34000000
TimerFrequency	Integer	/	/	Timer frequency; range: 0 to 1000000
TimerTriggerSource	Enum	255	Off	Timer trigger source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		64	Encoder0	
		65	Encoder1	
		80	SoftwareSignal0	
		81	Continuous	
		96	D485Input0	
		97	D485Input1	
		98	D485Input2	
		99	D485Input3	
		100	D485Input4	
		101	D485Input5	
		102	D485Input6	
		103	D485Input7	
		104	D485Input8	
		105	D485Input9	
		106	D485Input10	
		112	AdvancedIO0	
		113	AdvancedIO1	
		114	AdvancedIO2	
		115	AdvancedIO3	
		128	ReceiveImageFrame Start0	
		129	ReceiveImageFrame Start1	
		130	ReceiveImageFrame Start2	
		131	ReceiveImageFrame Start3	
		144	ReceiveImageFrame End0	
		145	ReceiveImageFrame End1	

		146	ReceiveImageFrameEnd2	
		147	ReceiveImageFrameEnd3	
		192	QuickSoftwareTrigger0	
		193	QuickSoftwareTrigger1	
		194	QuickSoftwareTrigger2	
		195	QuickSoftwareTrigger3	
Timer Trigger Activation	Enum	0	RisingEdge	Timer trigger activation
		1	FallingEdge	
		2	AnyEdge	
		3	LevelHigh	
		4	LevelLow	
TimerTriggerDelay	Integer	/	/	Timer trigger delay; range: 0 to 34000000
User set control				
UserSetCurrent	Integer	/	/	Current user set; range: 0 to 4294967295
UserSetSelector	Enum	0	Default	Select user set
		1	UserSet1	
		2	UserSet2	
		3	UserSet3	
UserSetLoad	Command	/	/	Load user set
UserSetSave	Command	/	/	Save user set
UserSetDefault	Enum	0	Default	Default user set
		1	UserSet1	
		2	UserSet2	
		3	UserSet3	



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