

Hikrobot Co., Ltd.

10 Gbps Fiber Port Frame Grabber

User Manual

HIKROBOT

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Symbol Conventions

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

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

Available Model

This manual is applicable to the 10 Gbps Fiber Port 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, incorrect model, 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 10 Gbps fiber port frame grabber adopts XoFLink protocol, and its SFP+ interfaces can be connected to 4 cameras at most via its pluggable SFP+ modules. According to different SFP+ modules, the frame grabber is applicable to XoFLink line scan camera.

2.2 Key Feature

- Provides multiple fiber ports to transmit data with max. bandwidth of 20 Gbps.
- 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.
- The on-board indicator includes loading indicator, power indicator, bus indicator, debug indicator, and status indicator.

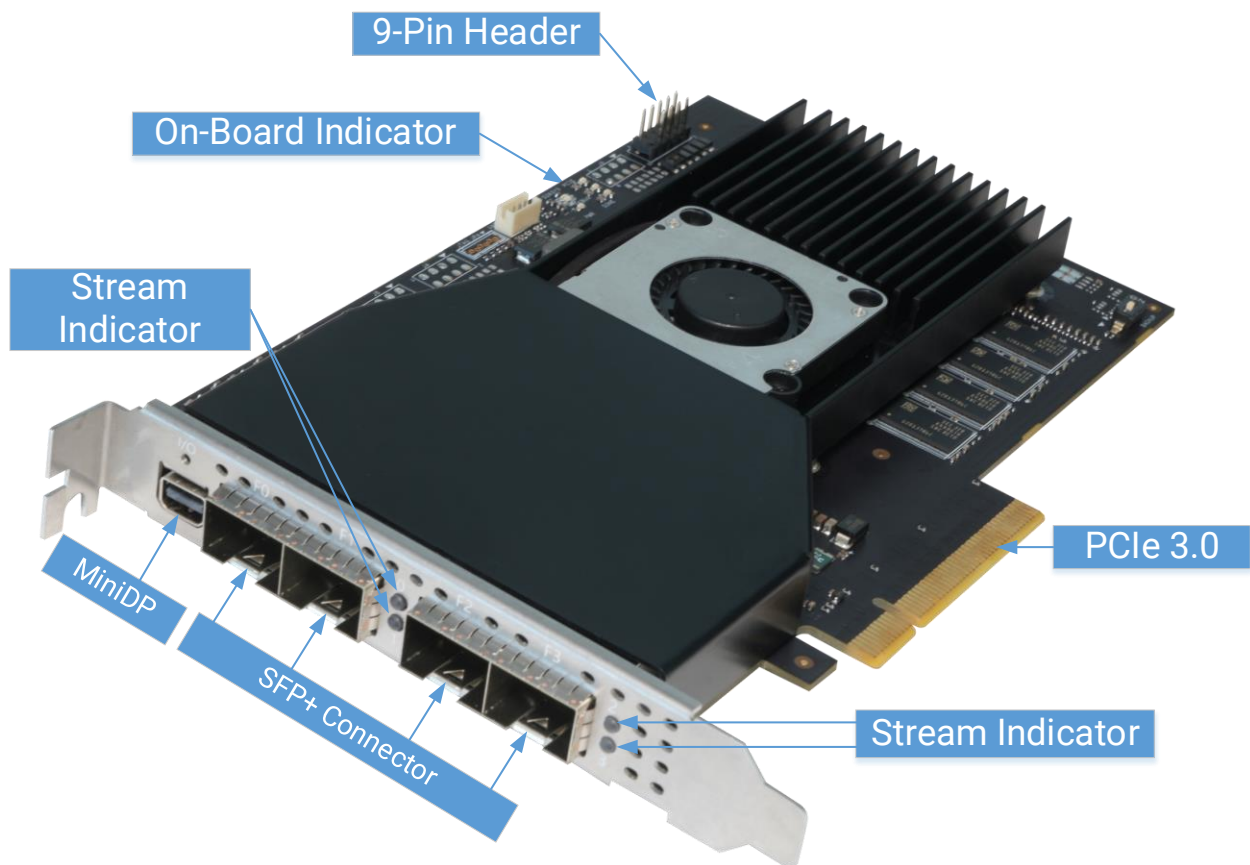


Figure 3-1 Appearance

3.2 I/O Connector

The frame grabber has multiple I/O connectors that provide input and output signals. It

adopts MiniDP connector and 9-pin header, and you can use I/O trigger cable and I/O adapter cable to wire the device.

9-Pin Header

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

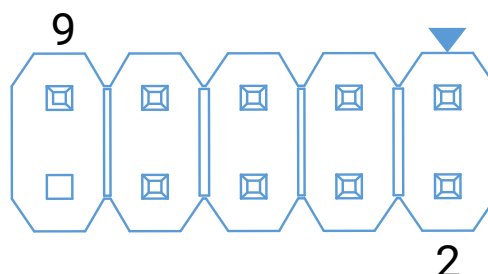


Figure 3-2 9-Pin Header

Table 3-1 Pin Definition of 9-Pin Header

No.	Signal	Description	No.	Signal	Description
1	/	/	6	LINE_9P	Differential input/output IO9 positive
2	/	/	7	LINE_9N	Differential input/output IO9 negative
3	LINE_8P	Differential input/output IO8 positive	8	LINE_10 P	Differential input/output IO10 positive
4	LINE_8N	Differential input/output IO8 negative	9	LINE_10 N	Differential input/output IO10 negative
5	GND	Non-isolated I/O ground	/	/	/

I/O Adapter Cable with Bracket

The I/O adapter cable with bracket 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 three input and output signals.

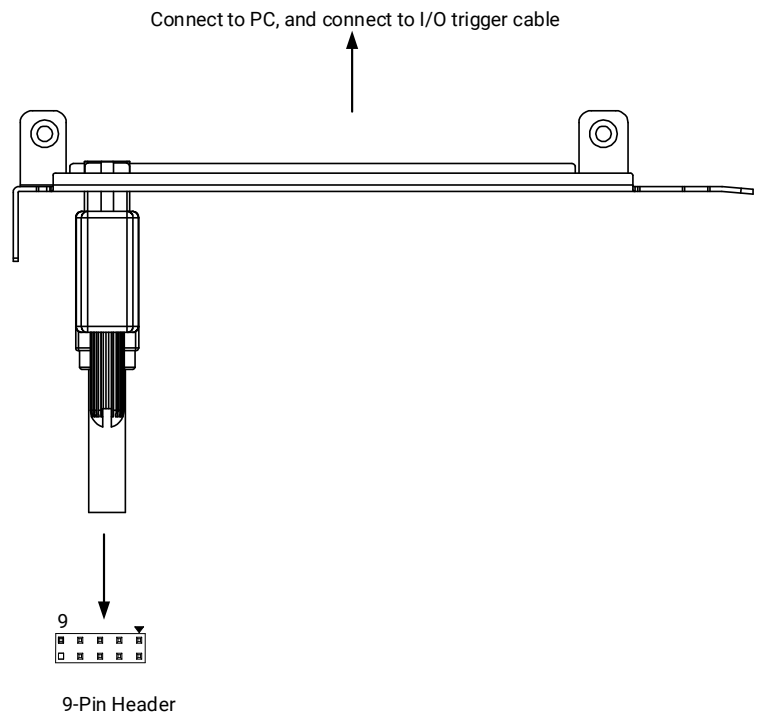


Figure 3-3 I/O Adapter Cable with Bracket

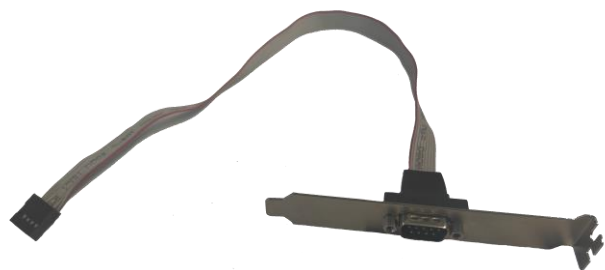


Figure 3-4 Appearance of I/O Adapter Cable with Bracket

I/O Trigger Cable

The two ends of the I/O trigger cable is MiniDP and open to have 8 input and output signals. The MiniDP is connected to the MiniDP on the frame grabber.

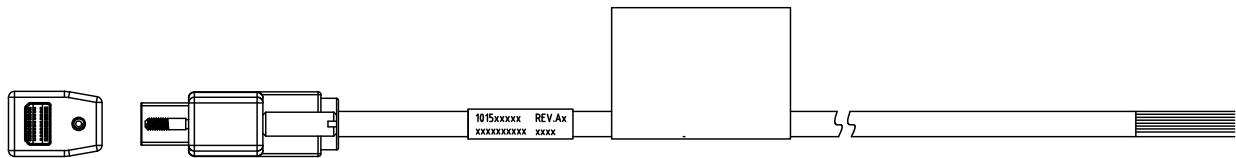


Figure 3-5 I/O Trigger Cable



Figure 3-6 Appearance of I/O Trigger Cable

Note

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

3.3 SFP+ Connector

The frame grabber has 2/4 SFP+ connectors, namely 0 to 3. To establish connections, you need to insert an SFP+ module and then connect the module to the device using an optical fiber patch cord.

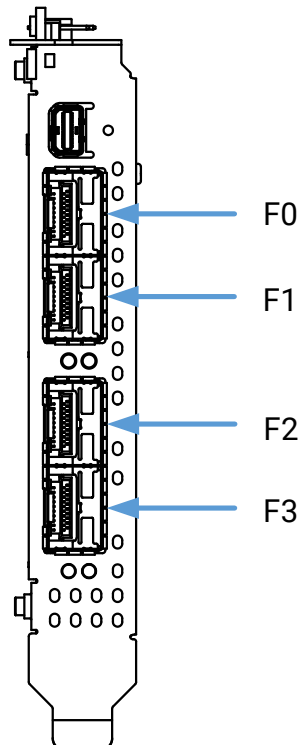


Figure 3-7 SFP+ Connector

Note

The number of SFP+ connectors may differ by different models of frame grabbers you use.

3.4 PCIe3.0 Interface

The frame grabber has a PCIe3.0 interface in x4 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.

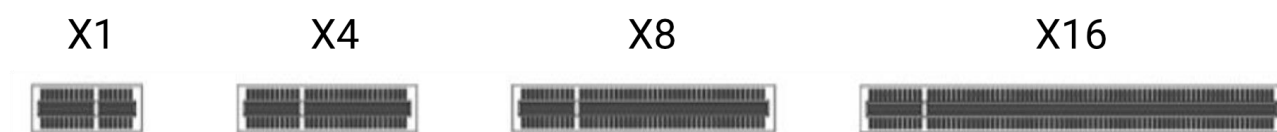


Figure 3-8 PCIe3.0 Slot

3.5 Indicator

The frame grabber has 2 types of indicators, including stream indicator and on-board indicator.

Note

- The indicator status may differ by device models, and actual devices you purchased shall prevail.
 - When the indicator is flashing rapidly and flashing slowly, its unlit interval is 0.2 sec and 1 sec respectively.
-

3.5.1 Stream Indicator

There are 2 to 4 stream indicators used to indicate the status of SFP+ connectors. Refer to the tables below for details.

Table 3-2 Indicator Description

No.	Indicator Color	Status	Device Status Description
1	Red	Flashing slowly	The frame grabber and the device are not connected.
2	Green	Solid	The frame grabber and the device are connected.
3	Green	Flashing rapidly	The frame grabber and the device are connected, and there is data being transmitted.

3.5.2 On-Board Indicator

The on-board indicator includes loading indicator, power indicator, bus indicator, debug indicator, and status indicator.

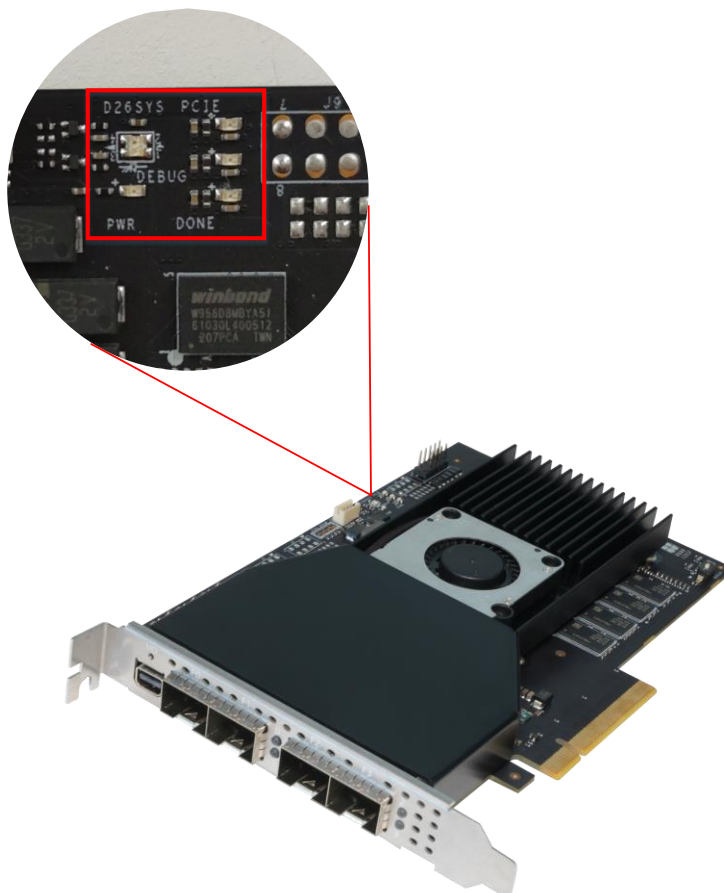


Figure 3-9 On-Board Indicator

Loading Indicator

Loading indicator (DONE) is used to indicate whether the frame grabber is loaded normally.

Table 3-3 Loading Indicator Definition

Status	Description
Solid Green	The frame grabber is loaded.
Unlit	The frame grabber is not loaded.

Power Indicator

Power indicator (PWR) is used to indicate whether the frame grabber is powered on.

Table 3-4 Power Indicator Definition

Status	Description
Solid Green	The frame grabber is powered on.
Unlit	The frame grabber is powered off.

Bus Indicator

Bus indicator (PCIE) is used to indicate whether the host's PCIe identifies the frame grabber.

Table 3-5 Bus Indicator Definition

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

Debug Indicator

Debug indicator (DEBUG) is used to indicate whether the frame grabber is initialized.

Table 3-6 Debug Indicator Definition

Status	Description
Solid Green	The frame grabber is initialized.
Unlit	The frame grabber is not initialized.

Status Indicator

Status indicator (SYS) is used to indicate whether the frame grabber is operated normally. The indicator is solid green or flashing red means that the frame grabber is operated normally.

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	Optical Fiber Patch Cord	They are used to connect the frame grabber and cameras.
	SFP+ Module	
	I/O Trigger Cable	They are used to connect the frame grabber via I/O connector (MiniDP connector or 9-pin header) to other external devices.
	I/O Adapter Cable with Bracket	
API Function Library	SDK	It is used for the secondary development.
Drive Package	MVFG_DRIVER_...._GS1104F_.... .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 1 camera at most, and support 1, 2, or 4 links. • 2-stream version: It can connect 2 cameras at most, and support 1 or 2 links. • 4-stream version: It can connect 4 cameras at most, and support 1 link.

4.2 Install Frame Grabber

Before You Start

Make sure that the host is powered off before installing the frame grabber.

Steps

1. Insert the frame grabber into the host's PCIe3.0 × 8 or × 4 slot or above.

2. Use screws to fix the frame grabber with the host.

Note

The configuration requirements of the host are shown below.

- CPU: i5-8500@3 GHz (6 cores 6 threads)
 - Mainboard: C236
 - Memory: 1*16 G 3200 MHz
 - System: Win10 64bit (21H2)
-

3. Use optical fiber patch cord to connect the SFP+ module, and then connect to the SFP+ connector of the frame grabber.

4. Use optical fiber patch cord to connect the camera.

4.3 Install MVS Client Software

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 V4.3.2 and above is applicable for the frame grabber.
 - 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**.

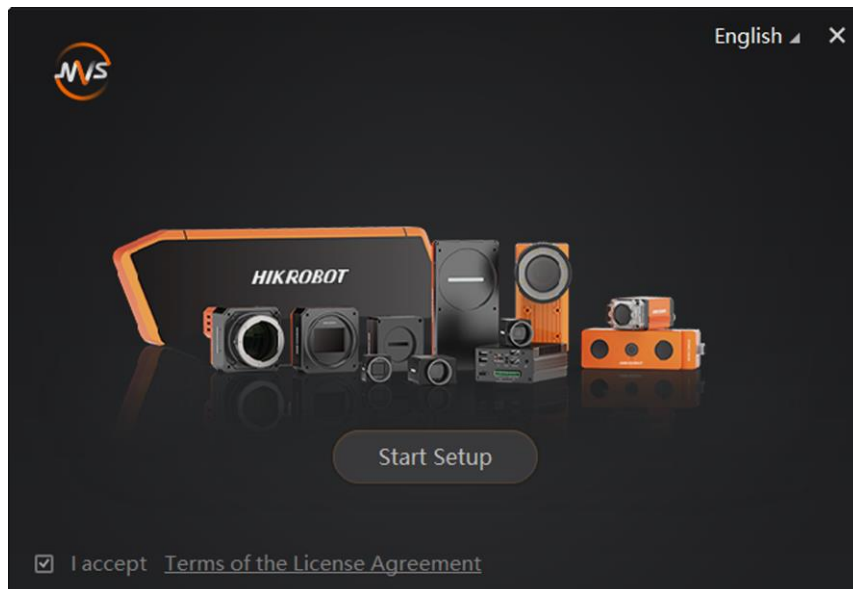


Figure 4-1 Installation Interface

4. Click **Start Setup**.
5. Keep default settings, and click **Next**.

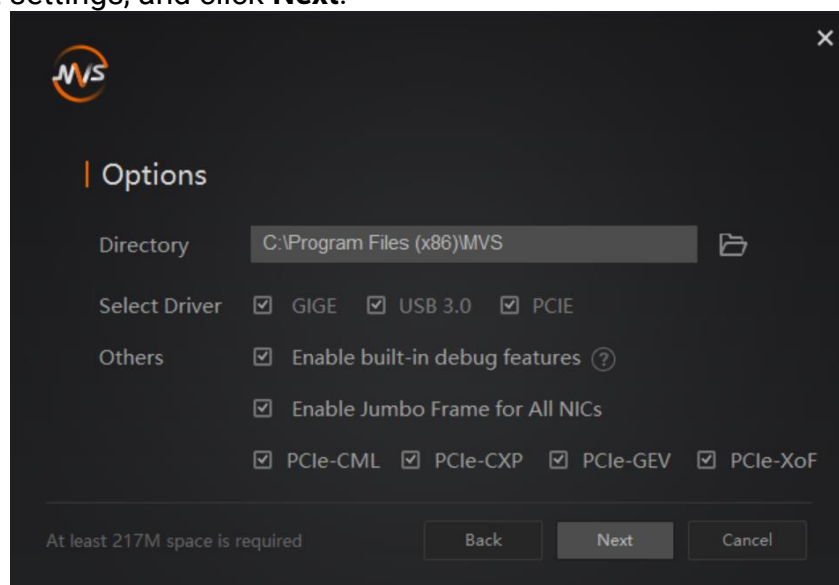


Figure 4-2 Installation Interface

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 PCIe 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. Click  in the PCIe, and the client software will enumerate the frame grabber automatically.
3. Click  in the specific frame grabber name to connect it.

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.

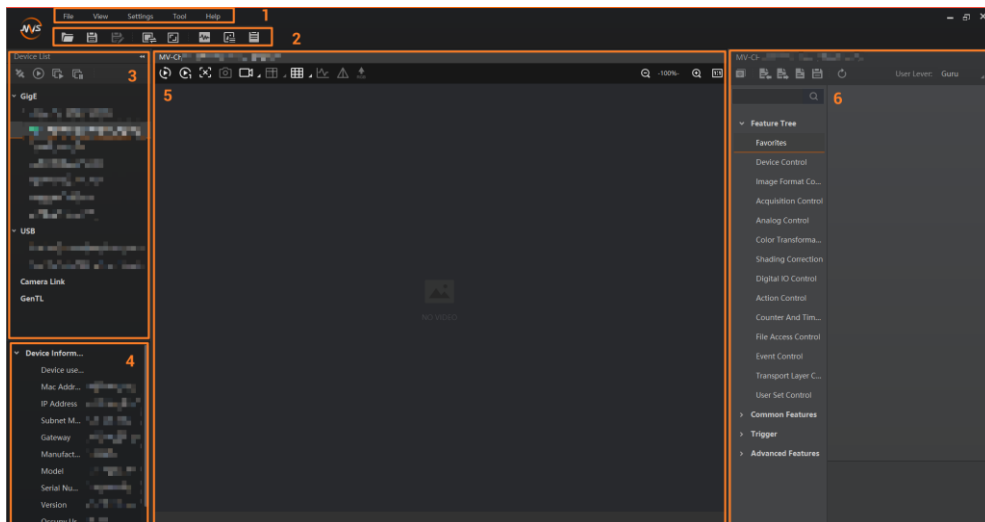


Figure 5-1 Main Window

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 PoCL 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 Install Drive Package

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 10 Gbps fiber port 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.

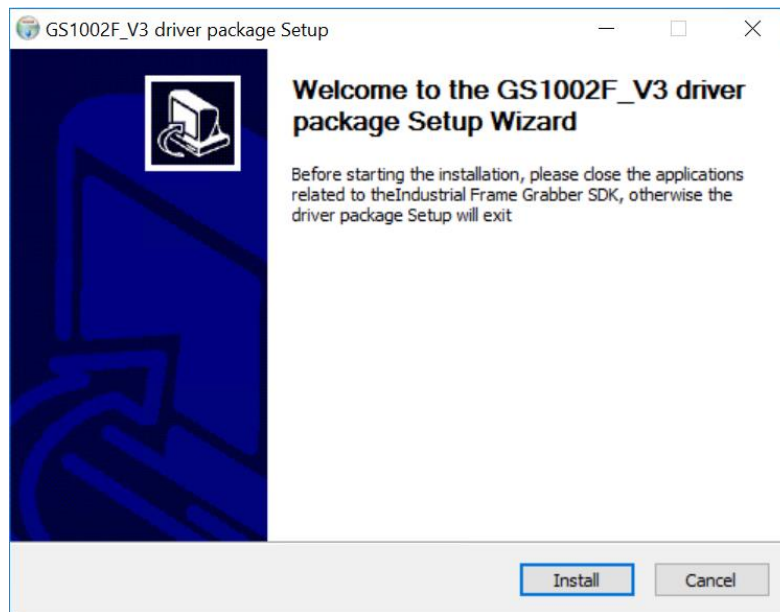


Figure 5-2 Install

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.

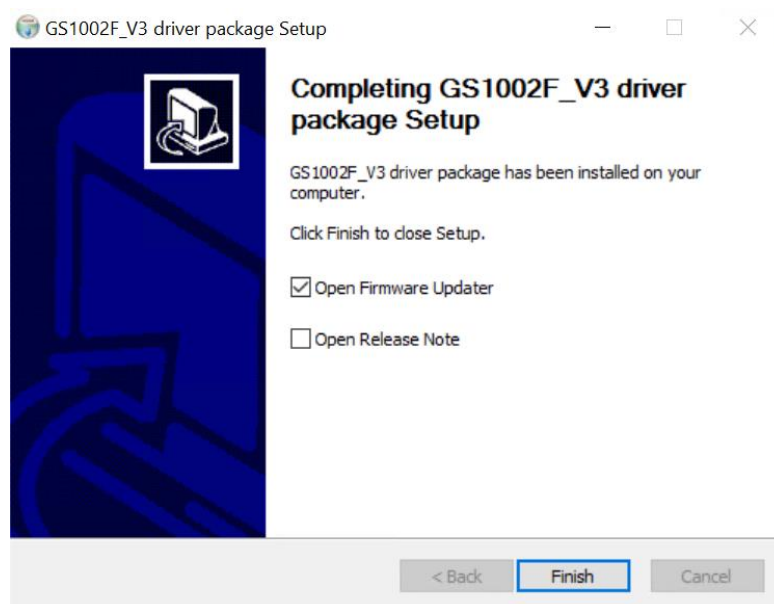


Figure 5-3 Finish Installation

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, as shown below. Please refer to the following table for the specific contents of each folder.

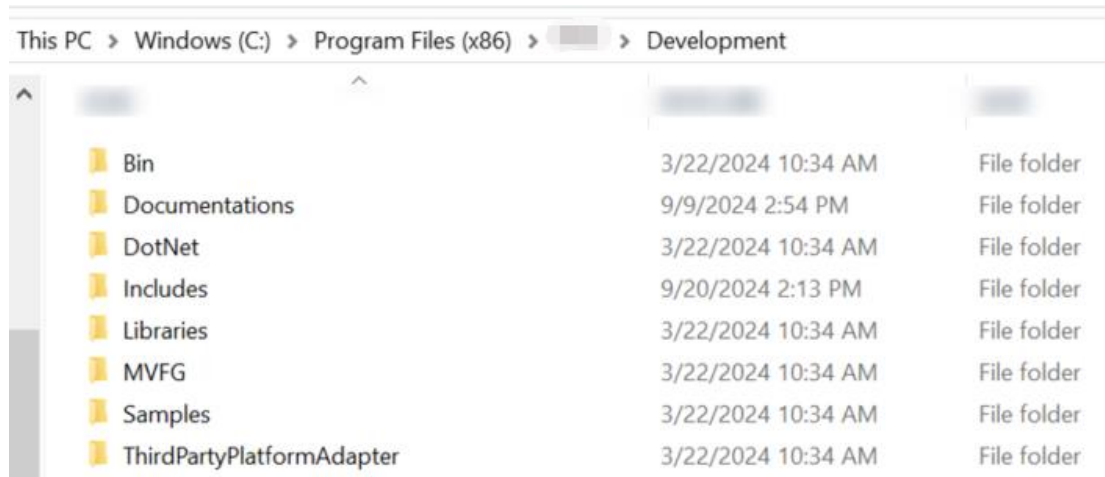


Figure 5-4 Secondary Development

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 to the camera via the control packet, and controls the camera to output the corresponding image.

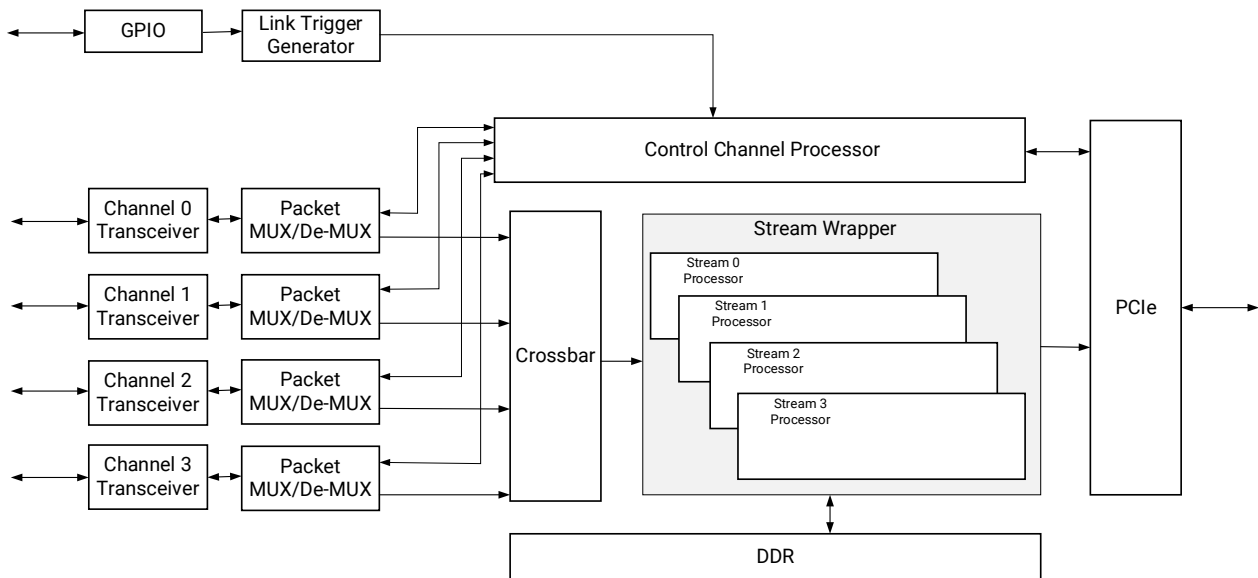


Figure 6-1 Operating Principle

Chapter 7 I/O Introduction

The frame grabber has 11 configurable differential input/output signals. 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 their internal circuit is shown below.

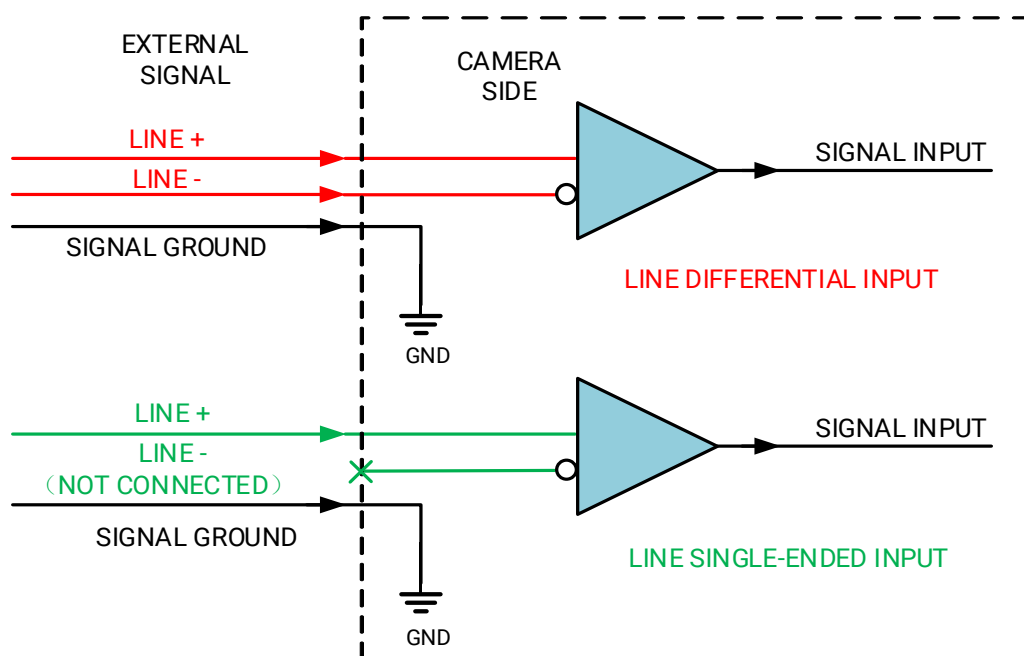


Figure 7-1 Internal Circuit of Differential Input

Differential input can receive RS-422 standard and TTL&LVTTTL standard input signals.

- Using RS-422 standard input

If the differential input uses RS-422 standard signals, to ensure the normal operation of the device input circuit, the device ground signal should be connected to the external ground signals.

- Using TTL and LVTTTL standard input

If the differential input uses TTL or LVTTTL standard signals, see the table below for the electrical feature requirements.

Table 7-1 Electrical Feature Requirement of TTL&LVTTTL

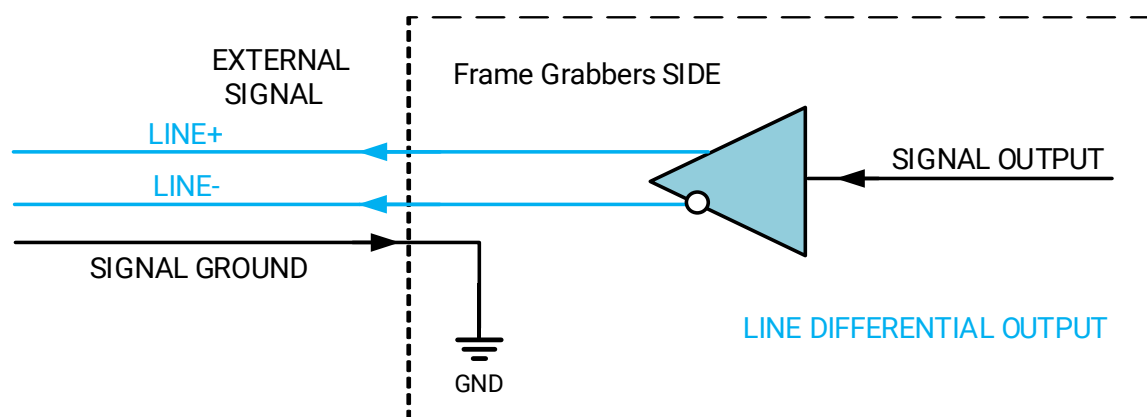
Voltage Range	Definition
0 VDC to 1 VDC	Low level.
1 VDC to 3 VDC	Unstable voltage, and it is not recommended to use it.
3.3 VDC to 24 VDC	Line 0 to Line 10 high level.

Note

- The upper limit voltage of Line 0 to Line 10 is 26.3 VDC.
- Refer to section [Input Signal](#) to adjust the threshold of Line 2 to Line 5.

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

Differential output uses RS-485 standard signals.

To ensure the normal operation of the device output circuit, the device ground signal should be connected to the external ground signals. This connector can be configured as a main transmitter to connect the RS-485 bus.

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.

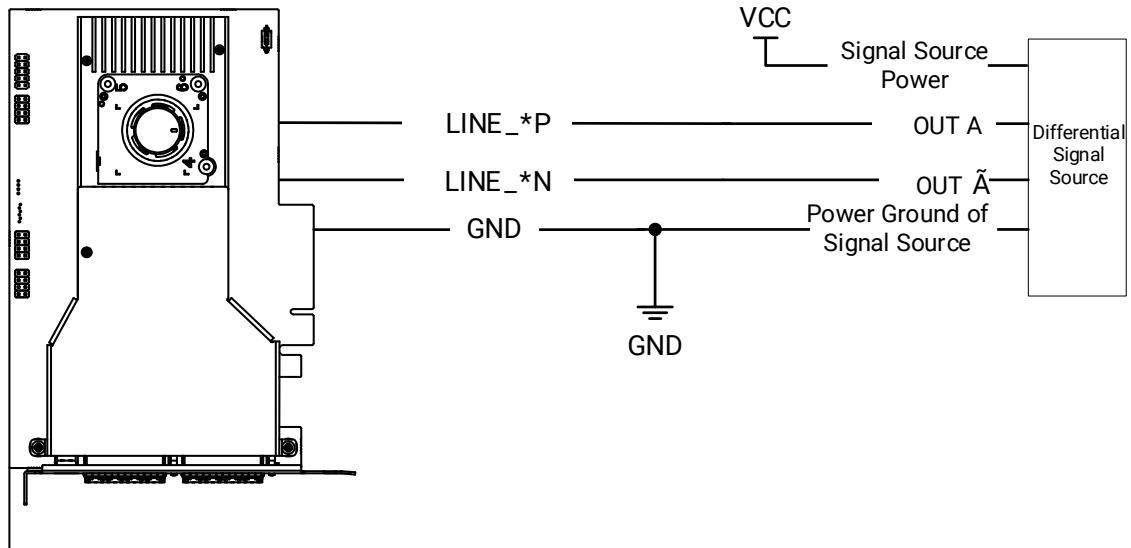


Figure 7-3 Differential Input Wiring

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

Note

The range of pull-down resistor is 1 K Ω to 4.7 K Ω .

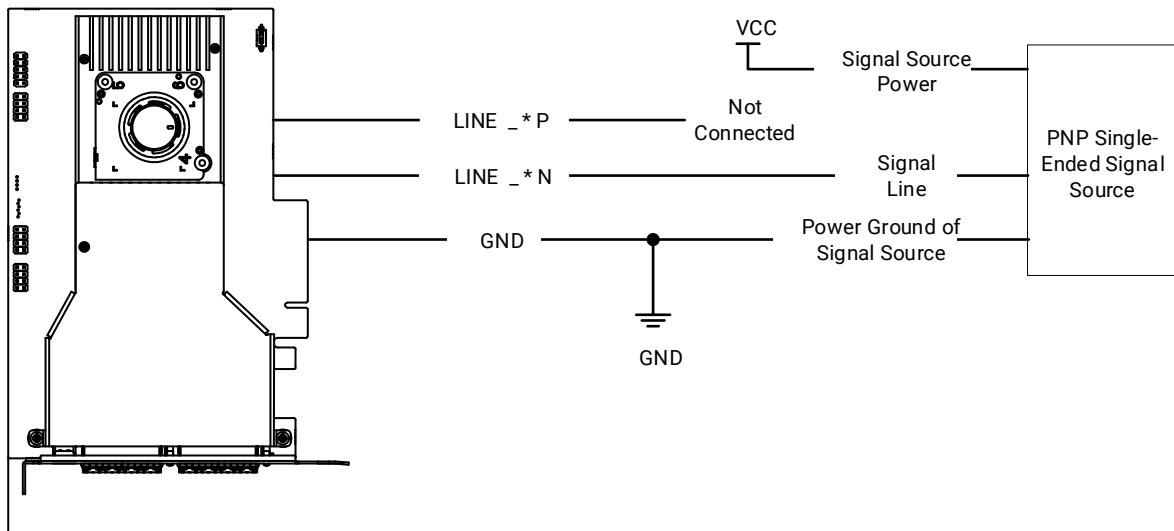


Figure 7-4 PNP Single-Ended Input Wiring Without Pull-Down Resistor

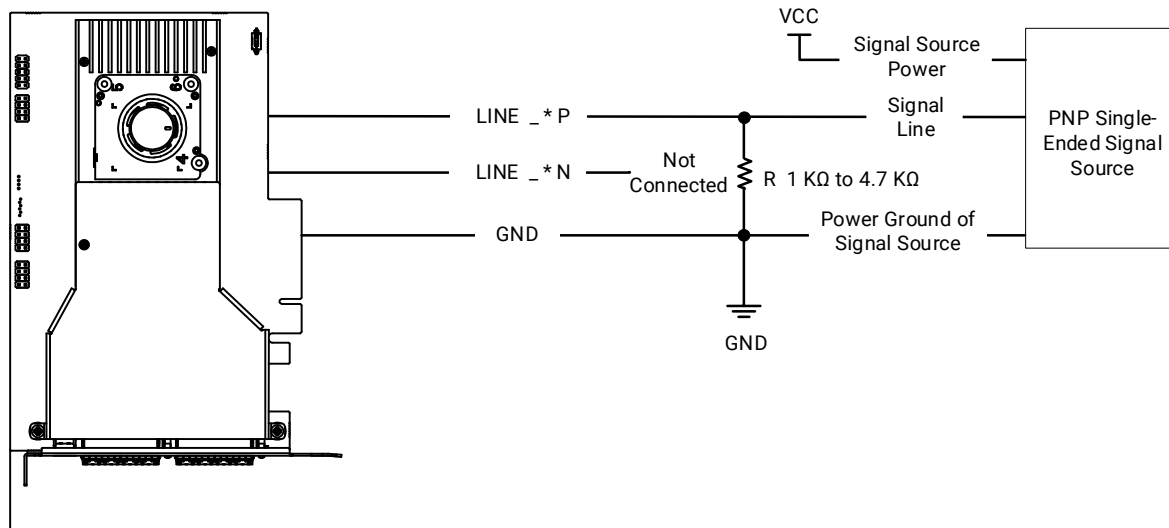


Figure 7-5 PNP Single-Ended Input Wiring with Pull-Down Resistor

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

Note

The range of pull-up resistor is 1 KΩ to 10 KΩ.

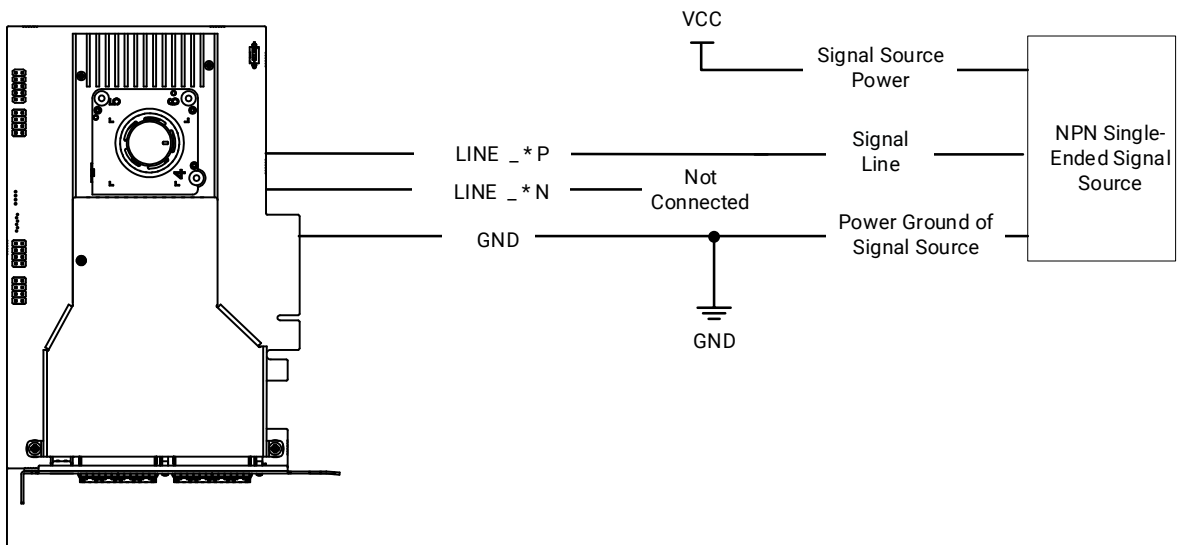


Figure 7-6 NPN Single-Ended Input Wiring Without Pull-Up Resistor

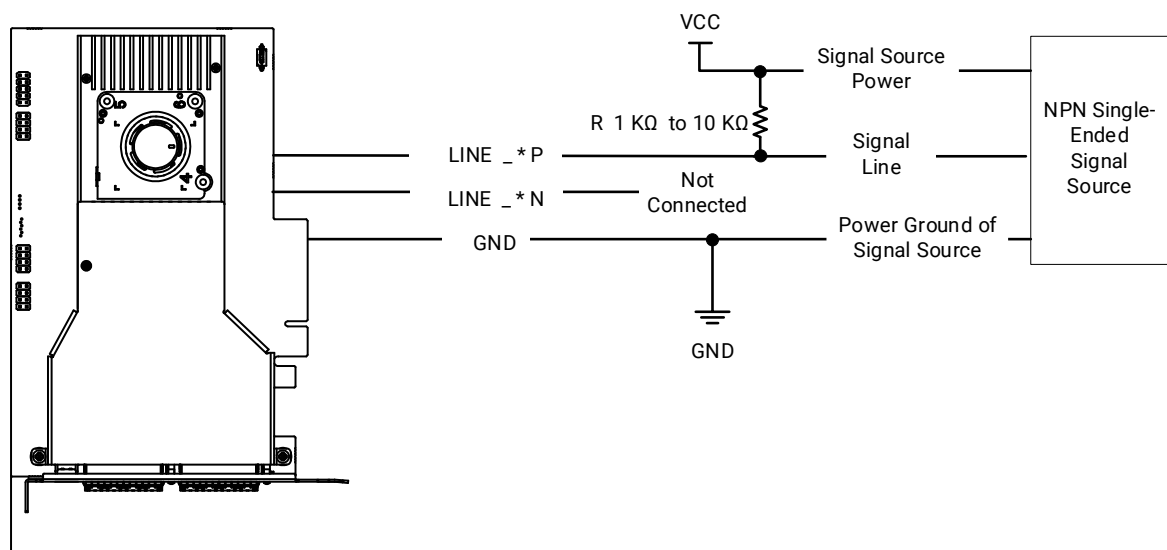


Figure 7-7 NPN Single-Ended Input Wiring with Pull-Up Resistor

Table 7-2 Relation between VCC and Resistor

Voltage Range	Resistor
5 VDC	1 K
12 VDC	2 K to 4.7 K
24 VDC	4.7 K to 10 K

7.2.2 Output Wiring

The frame grabber's 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.

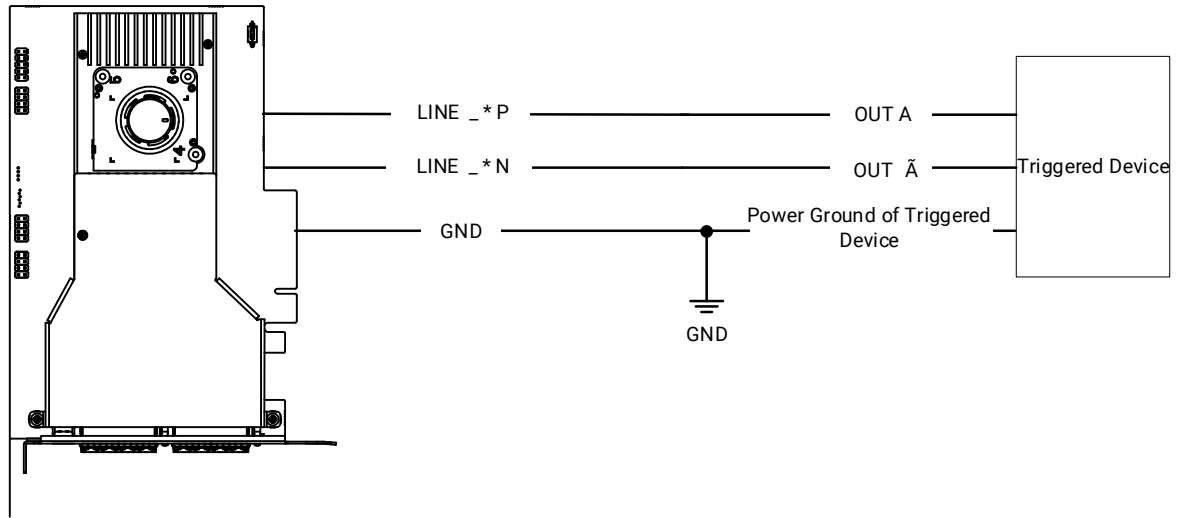


Figure 7-8 Differential Output Wiring

Pull-up resistor is required if Line 0 to Line 7 is 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.

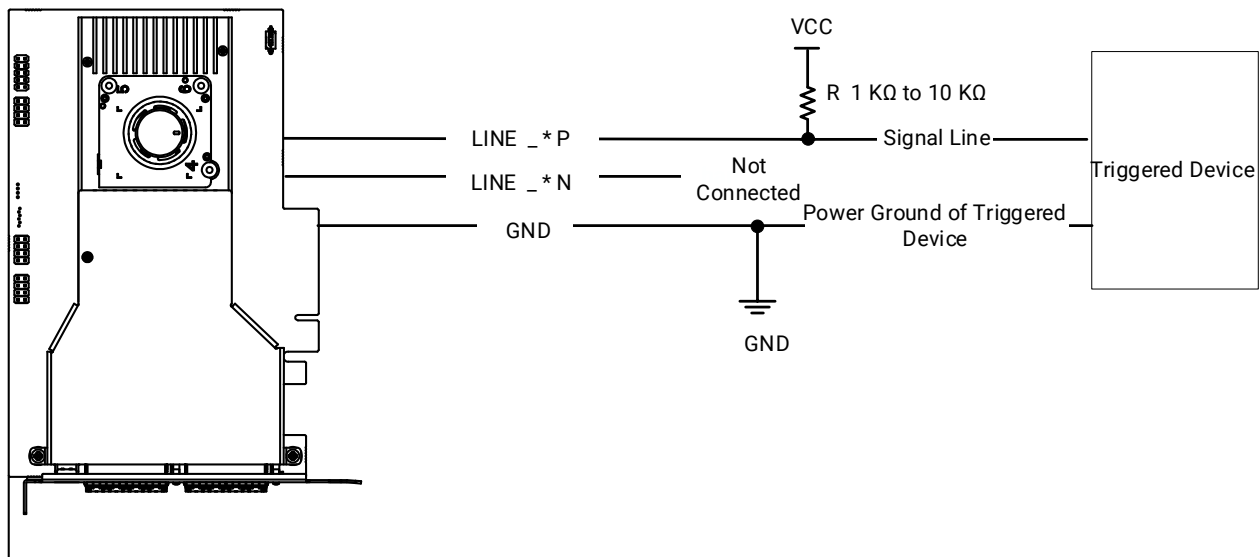


Figure 7-9 Single-Ended Output Wiring with Pull-Up Resistor

Table 7-3 Relation Between VCC and Resistor

Voltage Range	Resistor
5 VDC	1 K
12 VDC	2 K to 4.7 K
24 VDC	4.7 K to 10 K

Note

Line 8 to Line 10 is the cascading I/O of the frame grabbers, and cannot be set as the single-ended output I/O.

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 Camera Control.

Steps

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

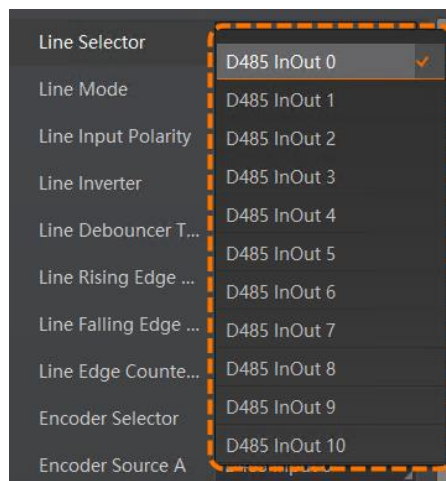


Figure 7-10 Line Selector

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.

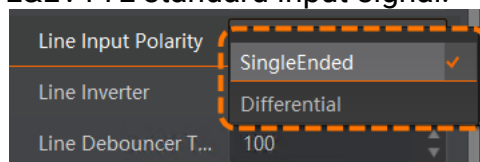


Figure 7-11 Line Input Polarity

Caution

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

4. You can set level threshold in **Line Level (mV)** according to actual demands, ranging from 200 mV to 6500 mV.
 - When the input signal is connected to the P terminal of the frame grabber and the actual level is greater than the level configured in the client, the input signal can be triggered.
 - When the input signal is connected to the N terminal of the frame grabber and the input level is less than 2.6 V, the input signal can be triggered.

Note

- When D485 InOut 2/3/4/5 is selected, and SingleEnded is set, you can set level threshold.
- When the level threshold of one of the Line 2/3/4/5 input signals is set, the level thresholds of the other three input signals will change synchronously.

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

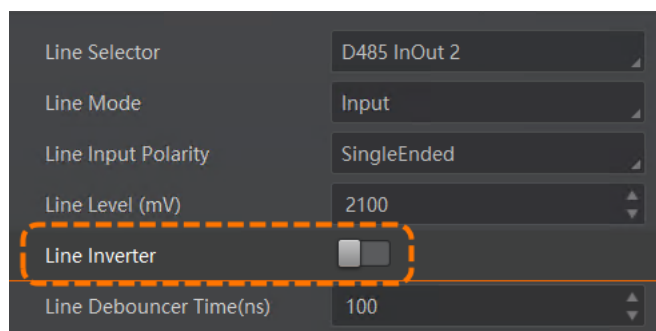


Figure 7-12 Enable Line Inverter

Note

The line inverter is disabled by default.

6. 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.

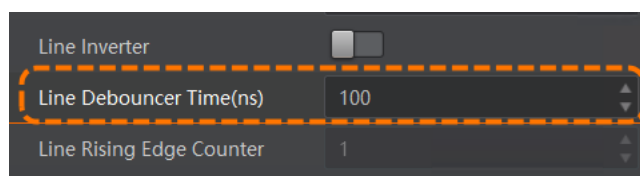


Figure 7-13 Set Line Debouncer Time

Note

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

The sequence diagram is shown below.

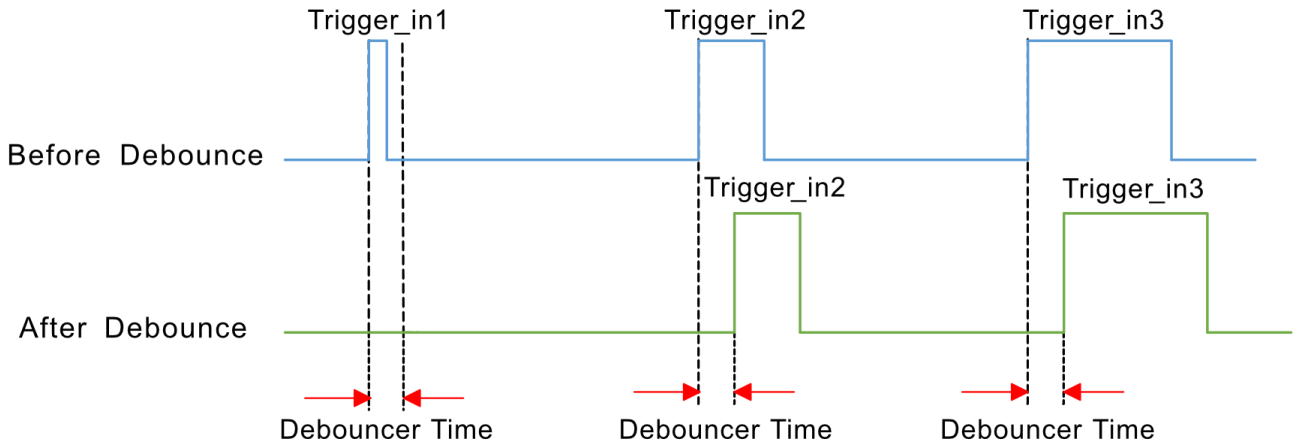


Figure 7-14 Sequence Diagram

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

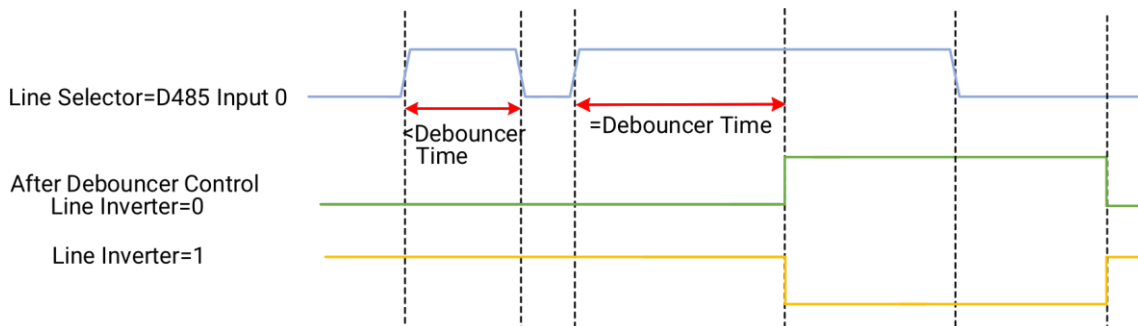


Figure 7-15 Principle

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 outputted signal quantity.

Steps

1. Go to **External Trigger**, and select **Encoder 0** or **Encoder 1** as **Encoder Selector**.
2. Select corresponding signal sources or **Off** as **Encoder Source A** and **Encoder Source B**.

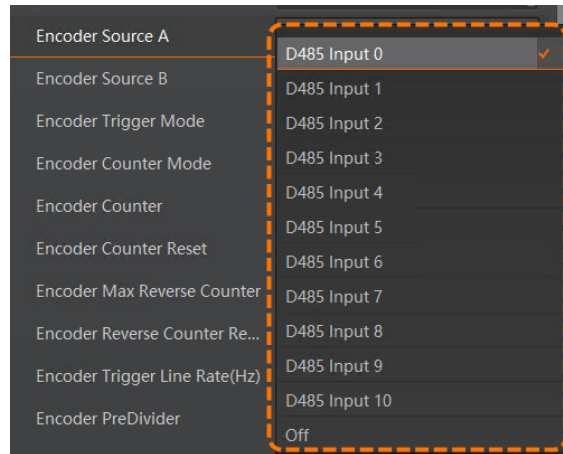


Figure 7-16 Select Encoder Source

Note

Encoder 0 supports Line 0/1 signal source, and **Encoder 1** supports Line 4/5 signal source.

3. Set Encoder Trigger Mode.

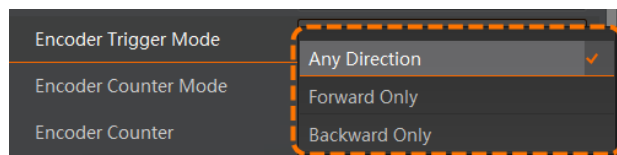


Figure 7-17 Select Encoder Trigger Mode

- **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.

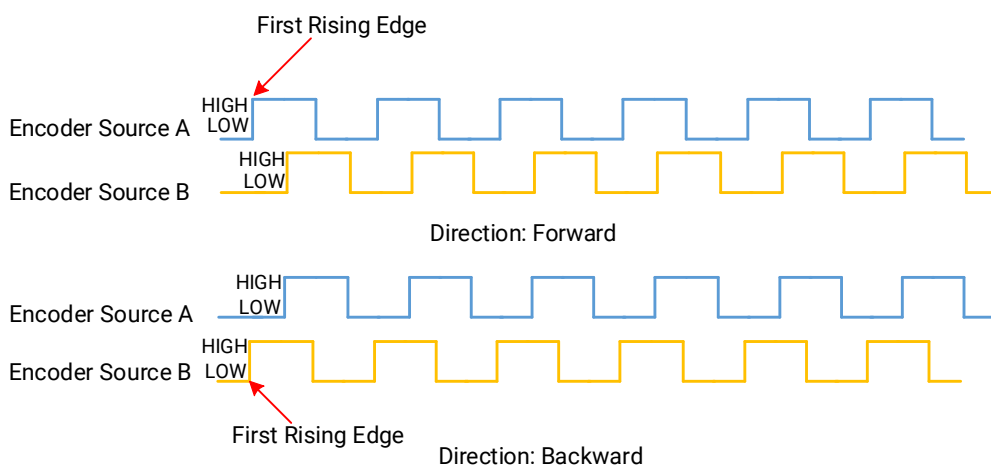


Figure 7-18 Principle

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

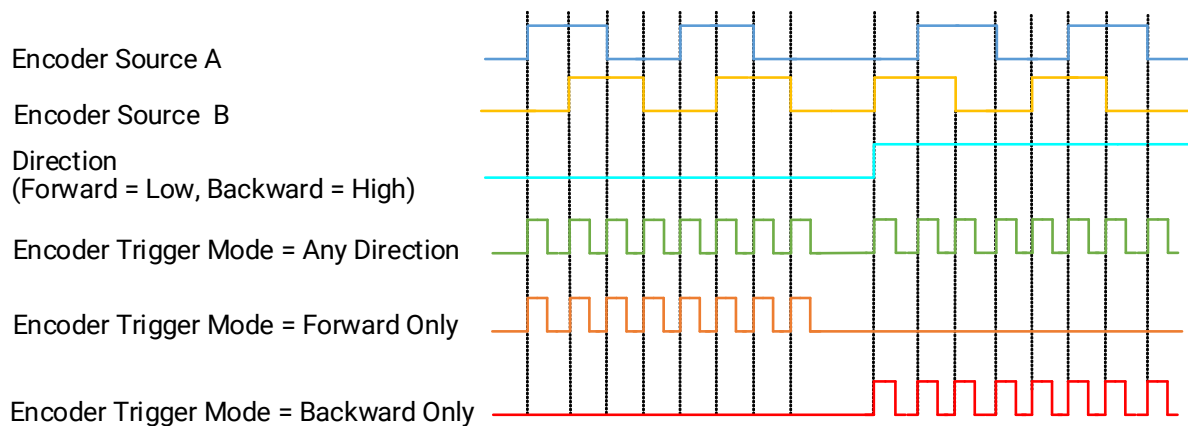


Figure 7-19 Encoder Trigger Signal Mode Principle

4. Set Encoder Counter Mode.

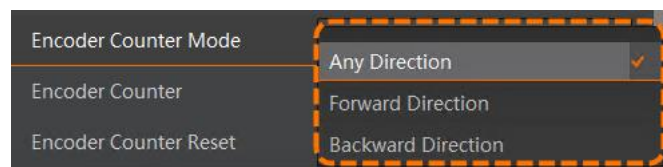


Figure 7-20 Set Encoder Counter Mode

- **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 background 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.

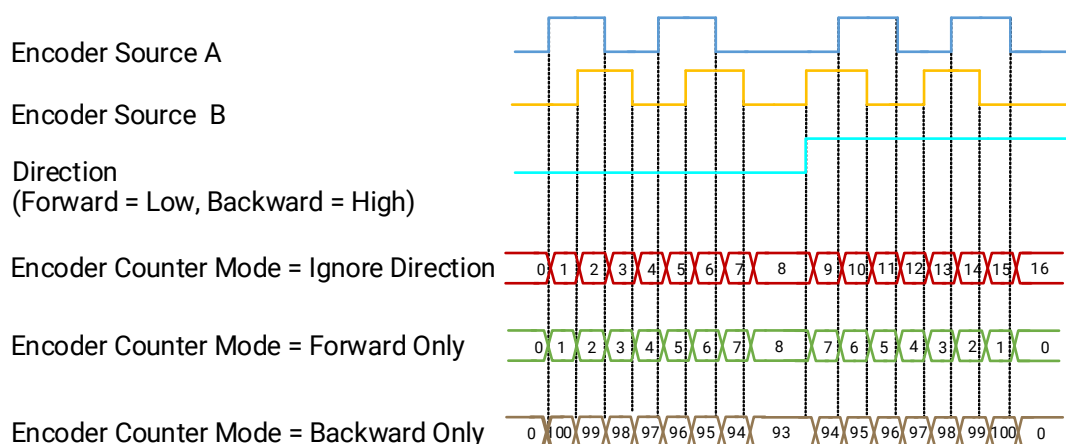


Figure 7-21 Encoder Counter Mode Principle

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.

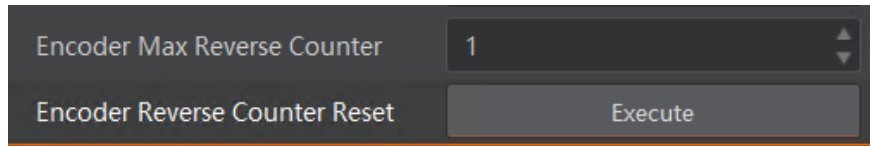


Figure 7-22 Set Encoder Max Reverse Counter

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.

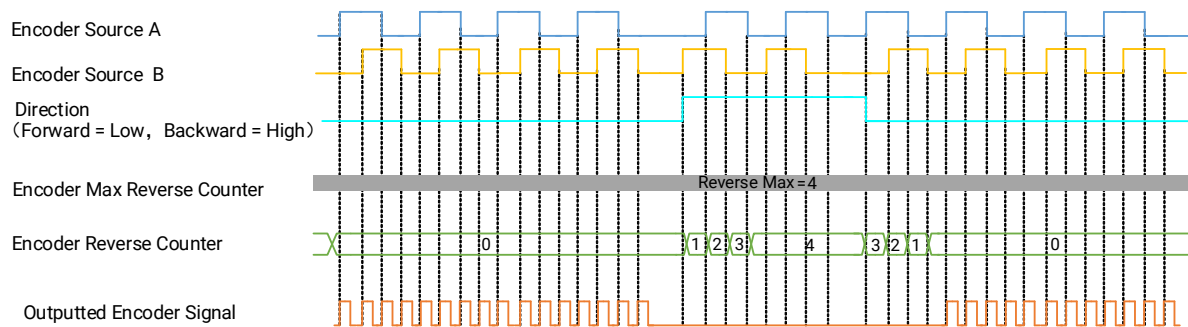


Figure 7-23 Forward Principle

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

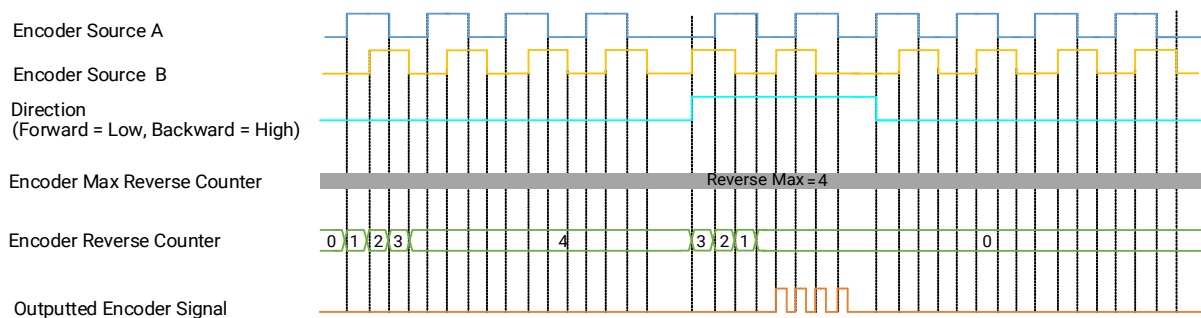


Figure 7-24 Backward Principle

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

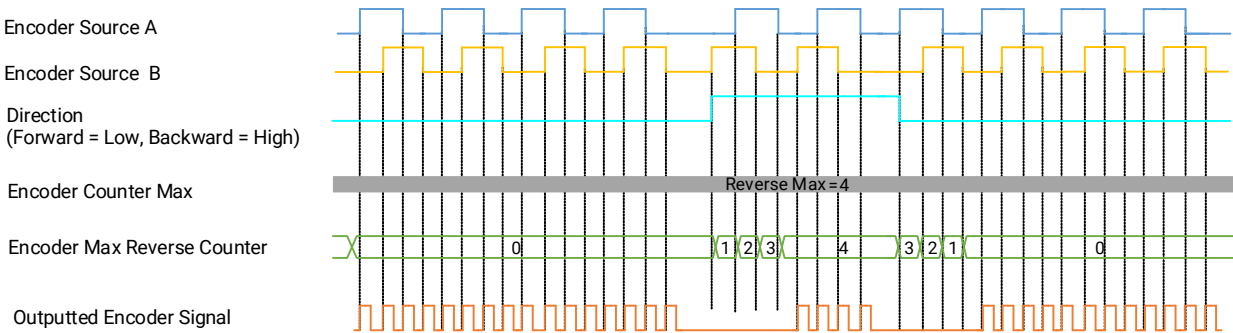


Figure 7-25 Any Direction Principle

- 8. Set **Encoder Trigger Line Rate (Hz)** to display the line rate of the encoder.
- 9. **Resulting Trigger Line Rate (Hz)** displays the actual trigger 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. When the trigger response mode is set to **Rising Edge** or **Any Edge**, it displays the number of rising edges. The value can be updated in real time based on the output situation.
 - **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.

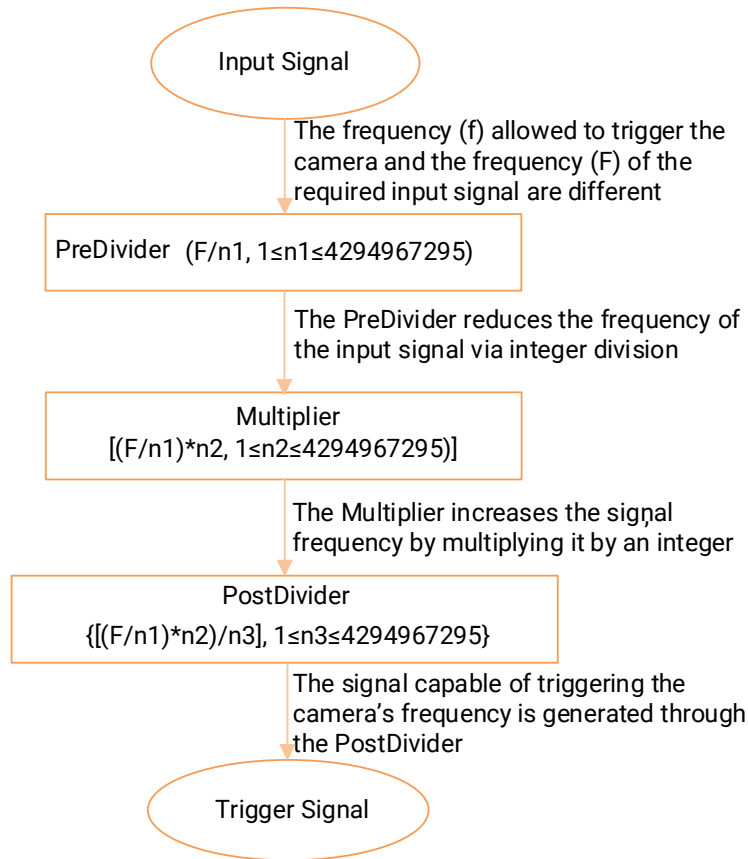


Figure 7-27 Encoder Frequency Converter Control

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.

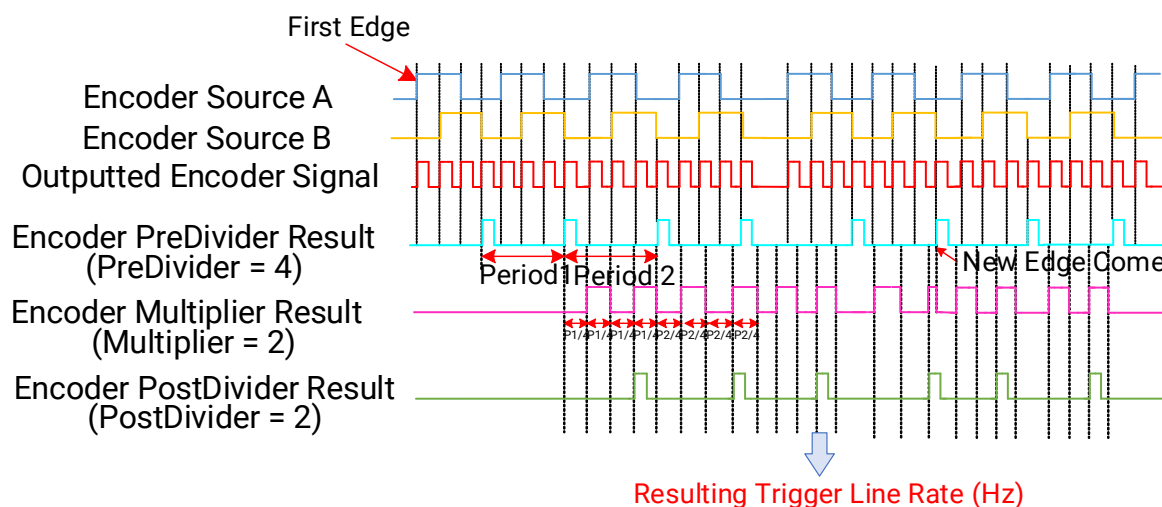


Figure 7-28 Principle of Encoder Frequency Converter

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.

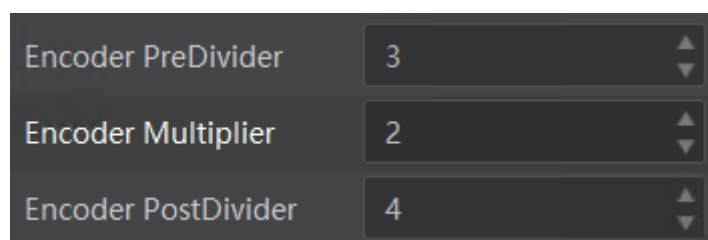


Figure 7-29 Encoder Frequency Converter Control (Before Reduction)

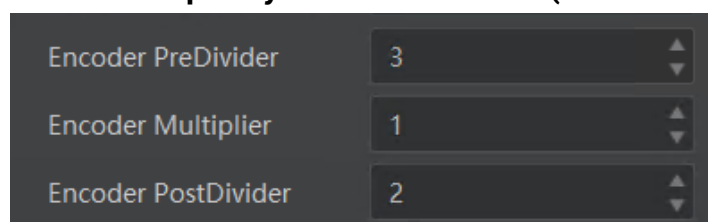


Figure 7-30 Encoder Frequency Converter Control (After Reduction)

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 > Time Control**, and select one timer from **Timer 0** to **Timer 7** as **Timer Selector**.
-

Note

Timer 4 to Timer 7 are dedicated to the function of multiple-light control, and no user configuration is required.

2. Set **Timer Duration(μs)** and **Timer Delay(μs)** according to actual demands. The principle of timer output is shown below.

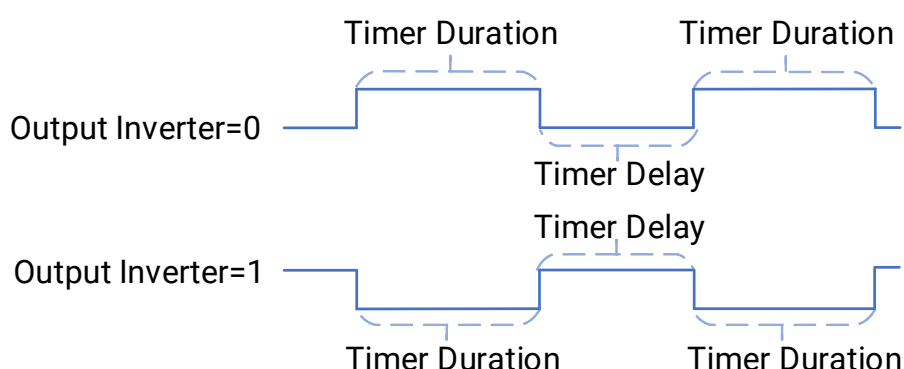


Figure 7-31 Principle of Timer Output

3. Set **Timer Frequency(HZ)** according to actual demands. The timer signal will be outputted 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.
- Timer 4 Active to Timer 7 Active are dedicated to the function of multiple-light control, and no user configuration is required.
- 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.
- If **QuickSoftwareTrigger0/1/2/3** is selected as **Timer Trigger Source**, the frame grabber will receive the trigger signal after you click **Execute**.

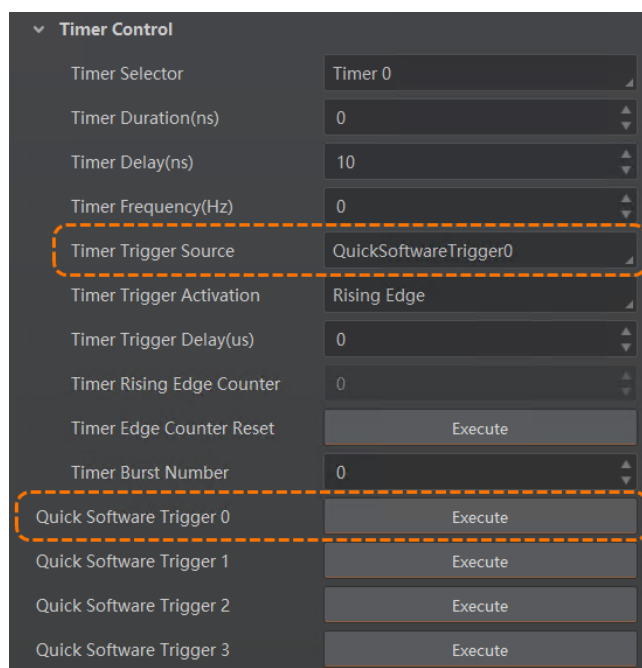


Figure 7-32 Quick Software Trigger

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

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

Table 7-4 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 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.
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 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.

Take **D485 Input *** as **Timer Trigger Source** and **Any Edge** as **Timer Trigger Activation** as an

example, and when the hardware trigger signal given by the external device is on the rising edge or falling edge, and the frame grabber receives the trigger signal and outputs the corresponding timer signal. The principle is shown below.

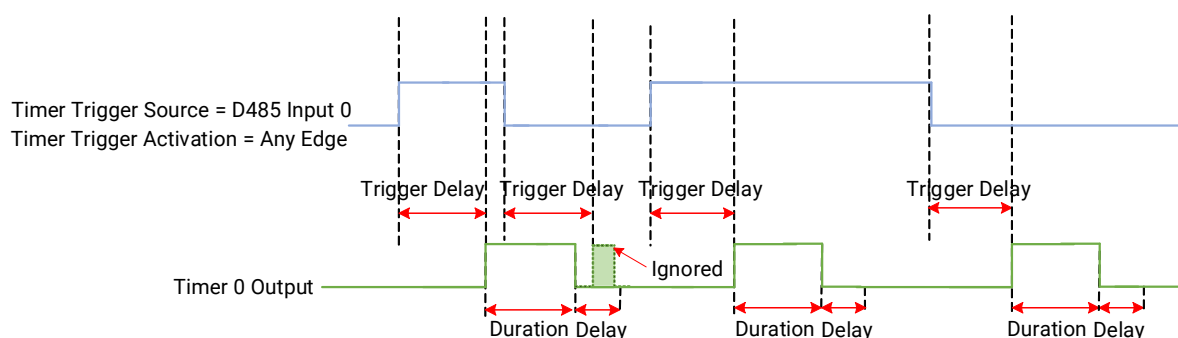


Figure 7-33 Principle

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

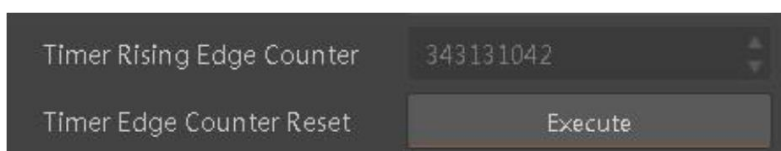


Figure 7-34 Timer Edge Counter

7. (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 edge and falling edge in real time via **Line Rising Edge Counter** and **Line Falling Edge Counter**.

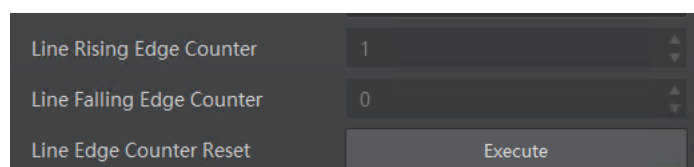


Figure 7-35 View Signal Amount

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 that can be sent to external devices via the frame grabber. The frame grabber provides eight configurable differential output signals.

Steps

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

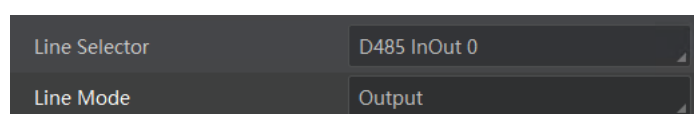


Figure 7-36 Set Output Signal

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

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.

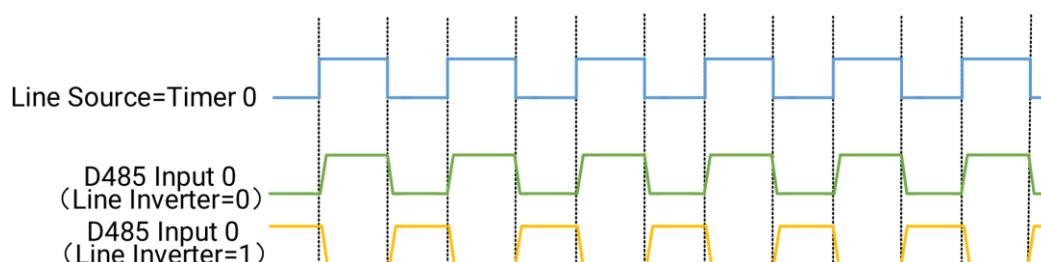


Figure 7-37 Principle

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

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.

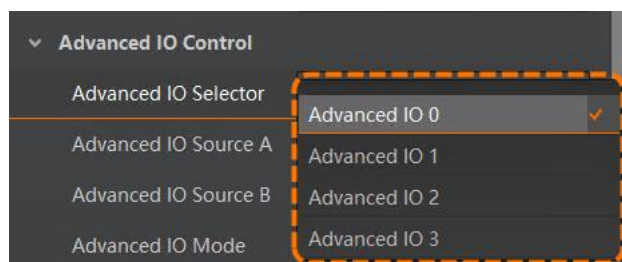


Figure 7-38 Advanced IO Selector

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

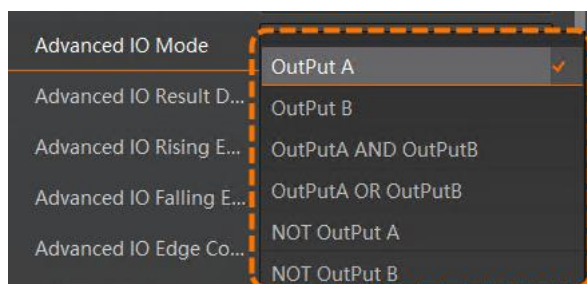


Figure 7-39 Advanced IO Mode

Table 5-4 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 .
Output A and Output B	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.
Output A or Output B	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 outputted after being inverted.
Not Output B	The signal selected by Advanced IO Source B is outputted after being inverted.

The principle of advanced IO mode is shown below.

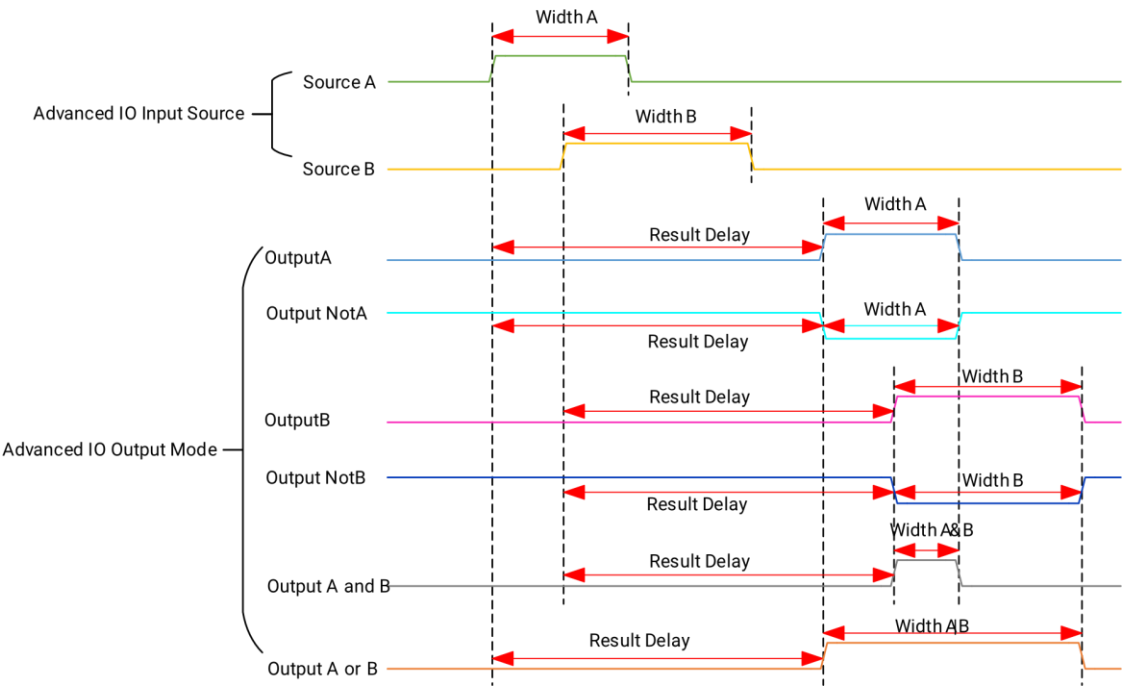


Figure 7-40 Principle of Advanced IO Mode

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

Advanced IO Rising Edge Counter

0

Advanced IO Falling Edge Counter

0

Advanced IO Edge Counter Reset

Execute

Figure 7-41 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 two to four fiber ports, and you can select and set the corresponding links according to actual demands.

Note

The outputted images may be abnormal if the frequency of the Link Trigger is too high.

8.1 Select Link

Steps

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

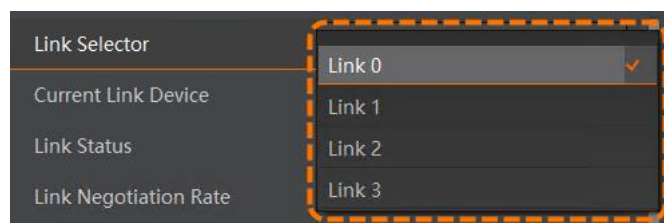


Figure 8-1 Link Selector

Note

Link 0 to **Link 3** correspond to SFP+ 0 to SFP+ 3 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**.

Note

- Regarding the camera, you should select **Link Trigger 0** as **Trigger Source** to enable the trigger source of **Link Trigger**.
 - The number of fiber ports may differ by device model.
-

8.2 Select Link Trigger

Steps

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

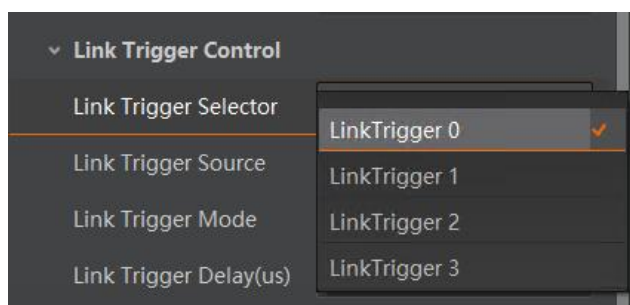


Figure 8-2 Link Trigger Selector

Note

- You can select **LinkTrigger 0** or **LinkTrigger 3** as the **Link Trigger**.
- One SFP+ connector can be configured with four link triggers.
- The number of link triggers supported by the device may differ by device model.

The code below shows the process of link trigger.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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, quick 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.

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 manual executing.
Quick Software Trigger	QuickSoftwareTrigger0/1/2/3	
Hardware Trigger	D485 Input 0 ~ 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.
Stream Trigger	Stream Trigger 0/1	The frame grabber sends data packet to the camera or external I/O via the StreamTrigger 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.

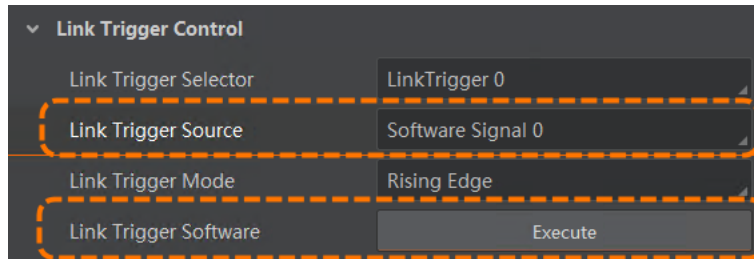


Figure 8-3 Software Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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, "StreamSoftwareTrigger");

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

8.3.2 Quick Software Trigger

1. Go to **Link Trigger Control**.
2. Select **QuickSoftwareTrigger0/1/2/3** as **Link Trigger Source**, and click **Execute** in the correspond parameter to send trigger commands.

Note

Compared with the software trigger, the quick software trigger has a faster trigger speed.

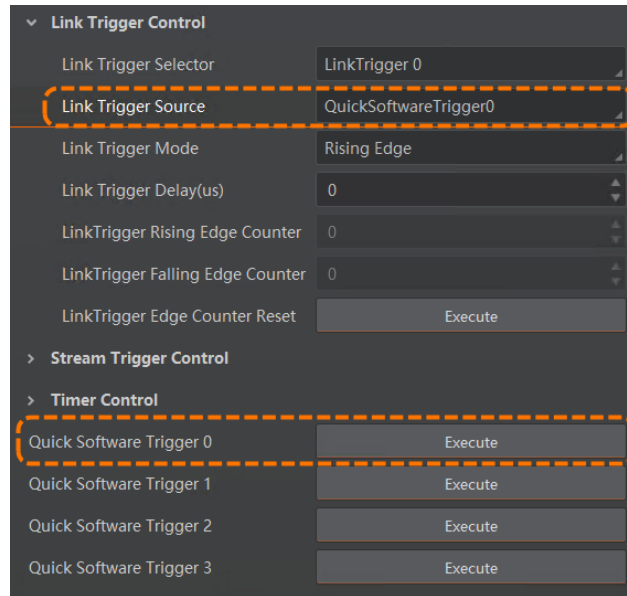


Figure 8-4 Execute Quick Software Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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","QuickSoftwareTrigger0");
MV_CC_SetCommandValue(hInterface,"QuickSoftwareTrigger0");

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

8.3.3 Hardware Trigger

The frame grabber provides 11 configurable differential input/output signals 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**.

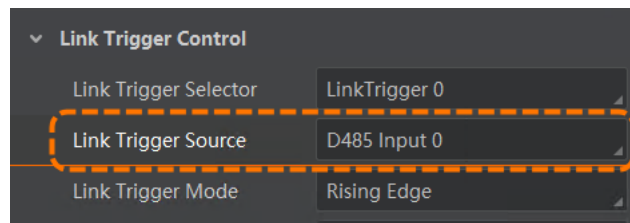


Figure 8-5 Hardware Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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);
```

8.3.4 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**.

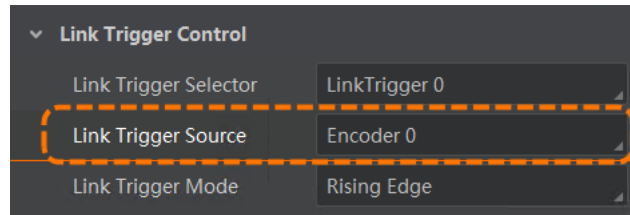


Figure 8-6 Encoder Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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);
```

8.3.5 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**.

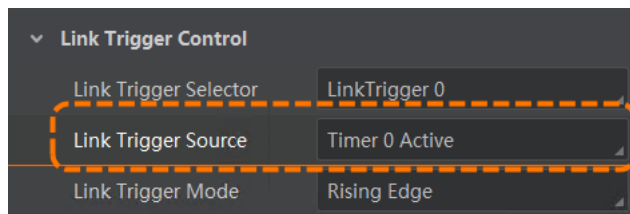


Figure 8-7 Timer Trigger

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

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

```
MV_CC_EnumInterfaces(MV_XOF_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);
```

8.3.6 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**.

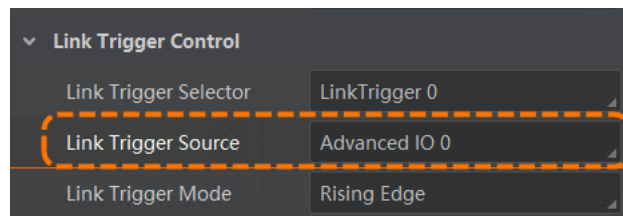


Figure 8-8 Advanced I/O Control

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_XOF_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 selecting specific link trigger source. All trigger sources support setting trigger delay and trigger activation.

Trigger Response Mode

The frame grabber supports setting the trigger response mode 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 **Advanced Setting > Link Trigger Control**.
2. Select **Link Trigger Mode** according to actual demands.

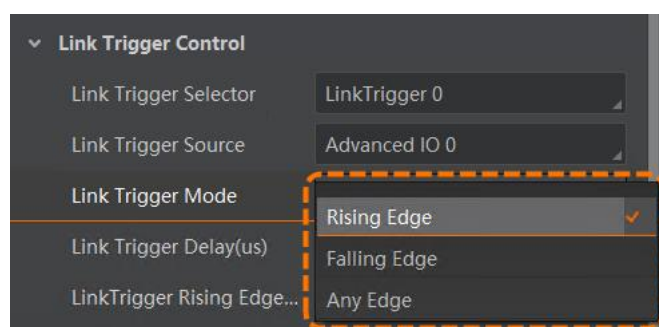


Figure 8-9 Trigger Response Mode

Table 8-2 Trigger Response Mode Parameter

Parameter	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 response modes.

3. (Optional) The frame grabber can execute edge counter of selected link.

- **Link Trigger Rising Edge Counter** returns the rising edge counter value of the selected link. When the trigger response mode is set to **Rising Edge** or **Any Edge**, it displays the number of rising edges. The value can be updated in real time based on the output situation.
- **Link Trigger Falling Edge Counter** returns falling edge counter value of the selected link. When the trigger response mode is set to **Falling Edge** or **Any Edge**, it displays the number of falling edges. The value can be updated in real time based on the output situation.
- **Link Trigger Edge Counter Reset**: Click **Execute** to reset edge counter of selected link.

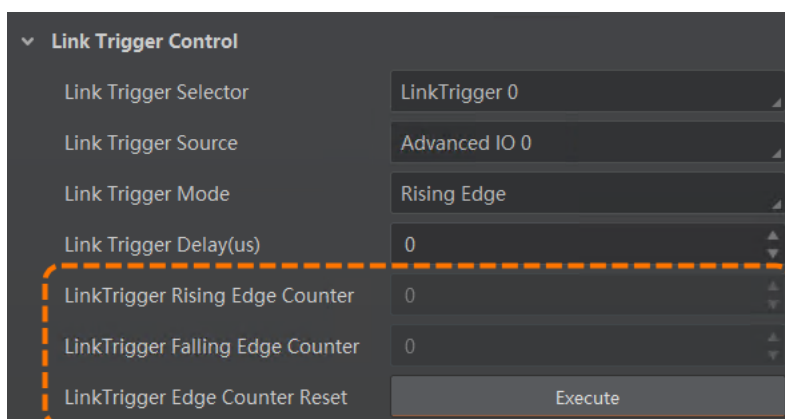


Figure 8-10 Link Trigger Edge Counter

The code below shows the process of setting trigger response mode.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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);
```

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.

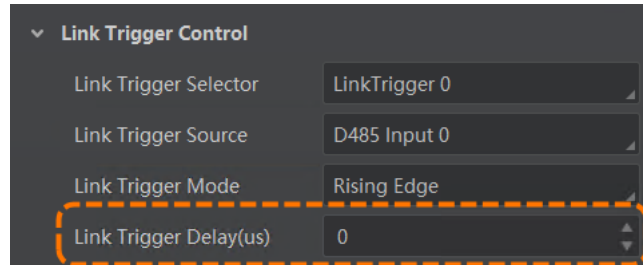


Figure 8-11 Trigger Delay

The code below shows the process of setting trigger delay.

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

MV_CC_SetIntValueEx(hInterface, "LinkTriggerDelay", 100);

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

Chapter 9 Frame Grabber Trigger

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.

9.1 Frame Processing

Frame processing is used to configure the image output method of the camera connected to the frame grabber, including the caching mechanism and fast readout of image data.

Steps

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

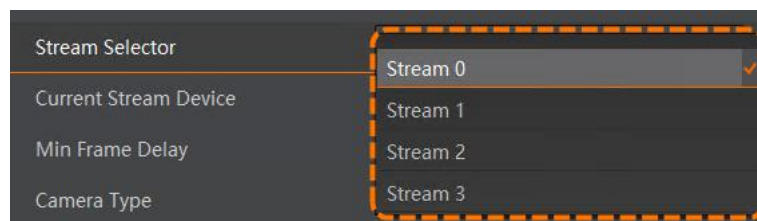


Figure 9-1 Stream Selector

Note

Stream 0 to Stream 3 correspond to the camera displayed in **Current Stream Device**.

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.

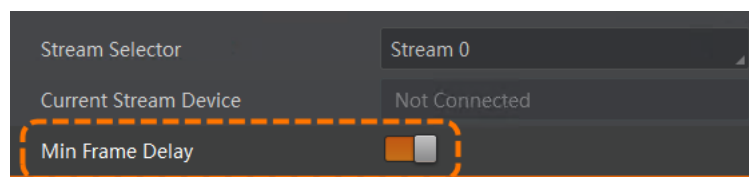


Figure 9-2 Stream Selector

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

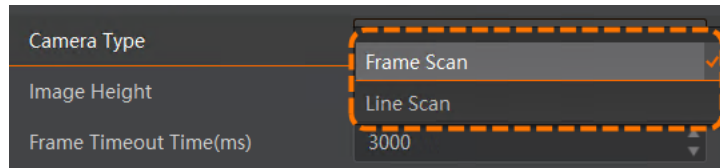


Figure 9-3 Set Camera Type

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

Note

Regarding the line scan camera, you can set its **Scan Mode** to acquire images. Some models of line cameras support **Frame Scan** only.

If **Line Scan** is selected, the image line height should be set in **Image Height**, and the line height will affect the image output mode.

Note

If the frame grabber supports data forwarding and the line-scan camera connected to the main frame grabber is MV-CL084-90F1M model, then the **Image Height** of the sub frame grabber should be configured as the **Image Height** of the main frame grabber multiplied by the number of split images produced by multi-light control. Otherwise, the image line height of the main and sub frame grabbers will not match, which will affect data synchronization.

4. 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 outputted.
5. Enter **Line Timeout Time(μs)** according to actual demands. If the complete line data is received within the configured frame timeout duration, the image will be outputted normally, otherwise, the image of actual lines received will be outputted.

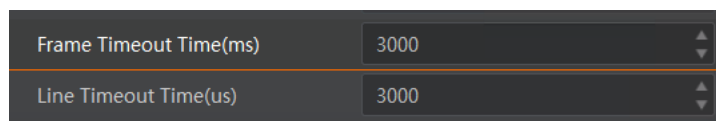


Figure 9-4 Frame Timeout Time and Line Timeout Time

6. (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**.

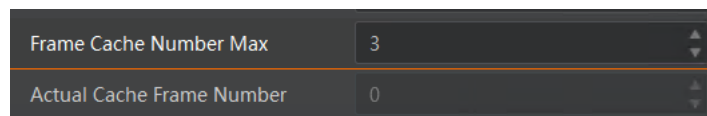


Figure 9-5 Frame Cache Number Max and Actual Cache Frame Number

Note

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

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

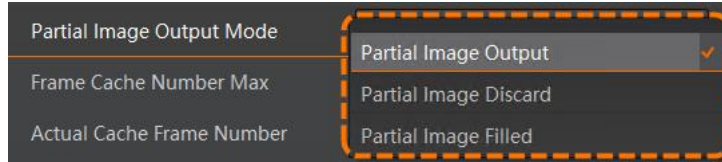


Figure 9-6 Partial Image Output Mode

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, and 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, and 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, and 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, SDK will output the image after filling the black according to the height parameter for the remaining part.

8. Select the encoder counter value to be saved into the image data packet via **Frame Chunk Source**. The image data packet contains relevant information about the current frame's image data. Once the encoder counter value is saved, it can be transmitted along with the image data packet.

The code below shows the process of getting parameter values via Frame Chunk Source.

```
// Enumerate frame grabbers
MV_INTERFACE_INFO_LIST stInterfaceInfoList = {0};
MV_CC_EnumInterfaces(MV_XOF_INTERFACE, &stInterfaceInfoList);
```

```
// Turn on the frame grabber
unsigned int nInterfaceIndex = 0;
void* hInterface = NULL;
MV_CC_CreateInterface(&hInterface, stInterfaceList.pInterfaceInfos[nInterfaceIndex]);
MV_CC_OpenInterface(hInterface, NULL);

// Set FrameChunkSource
MV_CC_SetEnumValueByString(hInterface, "StreamSelector", "Stream0");
MV_CC_SetEnumValueByString(hInterface, "FrameChunkSource", "Encoder0");

// Enumerate cameras
MV_CC_DEVICE_INFO_LIST stDeviceList = {0};
MV_CC_EnumDevicesByInterface(hInterface, &stDeviceList);

// Turn on the camera
unsigned int nDeviceIndex = 0;
void* hDevice = NULL;
MV_CC_CreateHandle(&hDevHandle, stDeviceList.pDeviceInfo[nDeviceIndex]);
MV_CC_OpenDevice(hDevice);

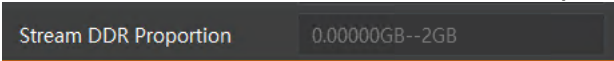
// Start grabbing images and parse encoder counting values
MV_CC_StartGrabbing(hDevice);
MV_FRAME_OUT stOutFrame = {0};
MV_CC_GetImageBuffer(hDevice, &stOutFrame, 1000);
printf("Get Image Buffer: FrameNum[%d], FirstLineEncoderCount[%d] LastLineEncoderCount[%d]\n",
        stOutFrame.stFrameInfo.nFrameNum, stOutFrame.stFrameInfo.nFirstLineEncoderCount,
        stOutFrame.stFrameInfo.nLastLineEncoderCount);
MV_CC_FreelImageBuffer(hDevice, &stOutFrame);
MV_CC_StopGrabbing(hDevice);

// Turn off the camera and frame grabber
MV_CC_CloseDevice(hDevice);
MV_CC_DestroyHandle(hDevice);
```

```
MV_CC_CloseInterface(hInterface);
```

```
MV_CC_DestroyInterface(hInterface);
```

9. View the actual DDR utilization for the selected stream channel in **Stream DDR Proportion**, as shown below. The value "—2GB" indicates the total DDR capacity of the frame grabber.



Stream DDR Proportion 0.00000GB--2GB

Figure 9-7 Stream DDR Proportion

Note

The actual DDR capacity used by the stream channel depends on the pixel format, resolution, and the number of DDR buffers. Specific values may vary.

10. View **Received Frame Start Counter** and **Received Frame End Counter** for the frame start signals and frame end signals received by the stream channel selected in **Stream Selector**.
11. View **Received Line Counter** for the number of lines received by the stream channel selected in **Stream Selector**.
12. (Optional) Click **Execute** in **Received Frame Counter Reset** to manually clear the counts of frame start signals, frame end signals, and lines.

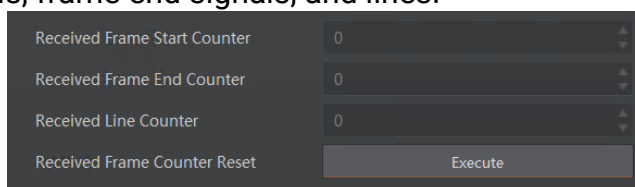


Figure 9-8 Counter Reset

9.2 Stream Trigger

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

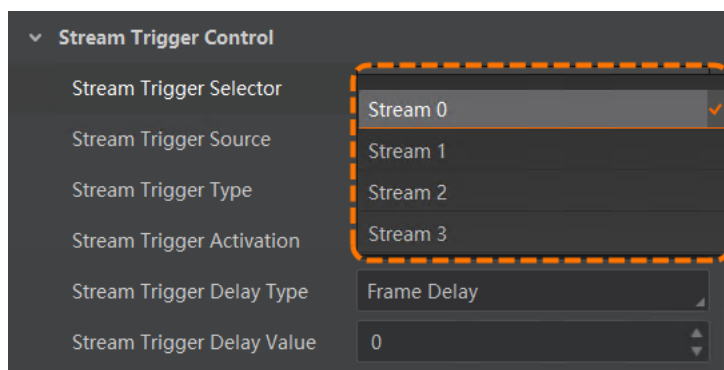


Figure 9-9 Stream Trigger Selector

9.3 Trigger Source

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

Steps

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

Table 9-2 Trigger Source Parameters and Principles

Trigger Source	Parameter Value	Principle
Software Trigger	Software Signal 0	The frame grabber acquires and processes the received camera image data by manual executing.
Quick Software Trigger	QuickSoftwareTrigger0/1/2/3	
Hardware Trigger	D485 Input*	The frame grabber acquires and processes the received camera image data via hardware trigger source.
Encoder Trigger	Encoder*	The frame grabber acquires and processes the received camera image data via the encoder.
Timer Trigger	Timer* Active	The frame grabber acquires and processes the received camera image data via the timer.
Advanced I/O Control	Advanced IO*	The frame grabber acquires and processes the received camera image data via advanced I/O control.
Link Trigger	Link*Trigger 0/1	The frame grabber acquires and processes the received camera image data via the Link Trigger signal received on Link*.
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**.

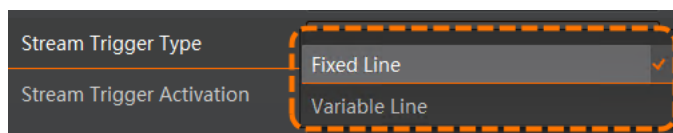


Figure 9-10 Set Stream Trigger Type

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.

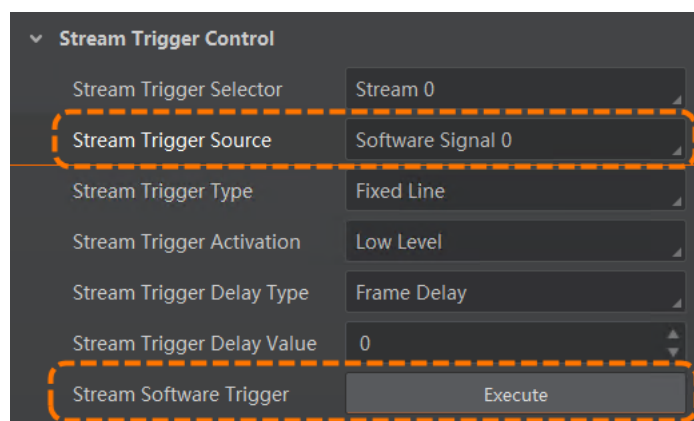


Figure 9-11 Software Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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 Quick Software Trigger

Steps

1. Go to **Advanced Setting > Stream Trigger Source**.
2. Select **QuickSoftwareTrigger0/1/2/3** as **Stream Trigger Source**, and click **Execute** in the correspond parameter to send trigger commands.

Note

Compared with the software trigger, the quick software trigger has a faster trigger speed.

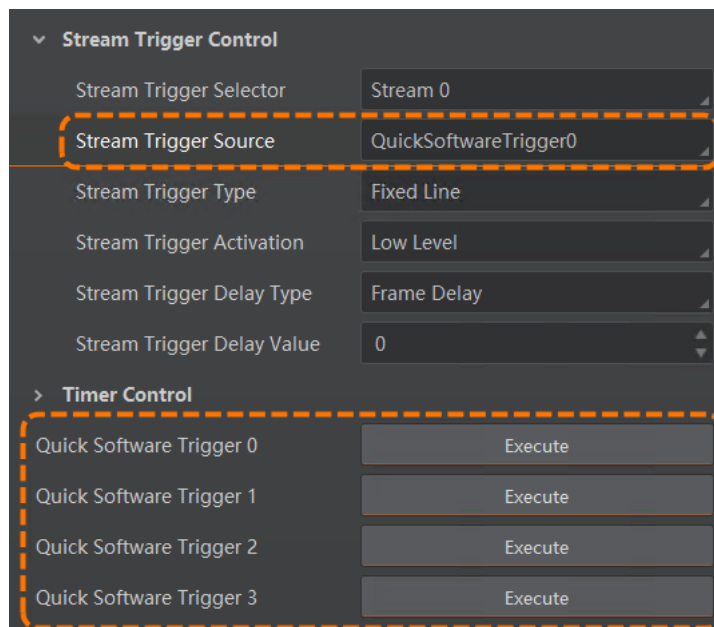


Figure 9-12 Execute Quick Software Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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","QuickSoftwareTrigger0");  
MV_CC_SetCommandValue(hInterface,"QuickSoftwareTrigger0");  
  
MV_CC_CloseInterface(hInterface);  
MV_CC_DestroyInterface(hInterface);
```

9.3.3 Hardware Trigger

The frame grabber provides 11 configurable differential input/output signals 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**.

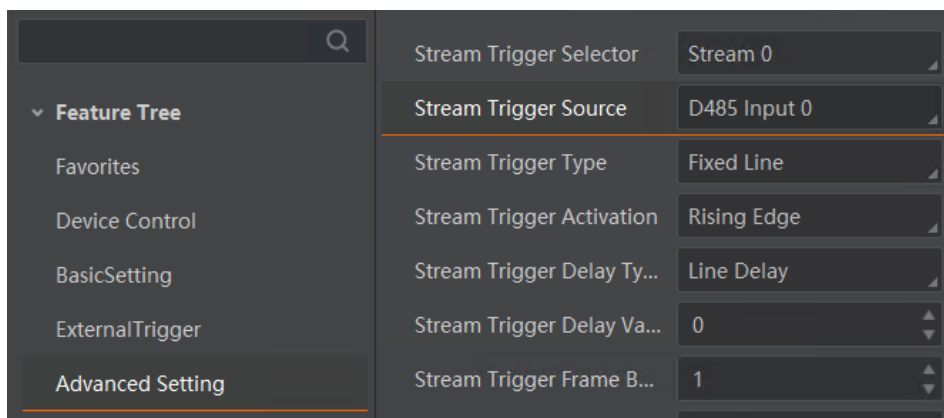


Figure 9-13 Hardware Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};  
MV_CC_EnumInterfaces(MV_XOF_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);
```

9.3.4 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** as **Stream Trigger Source**.

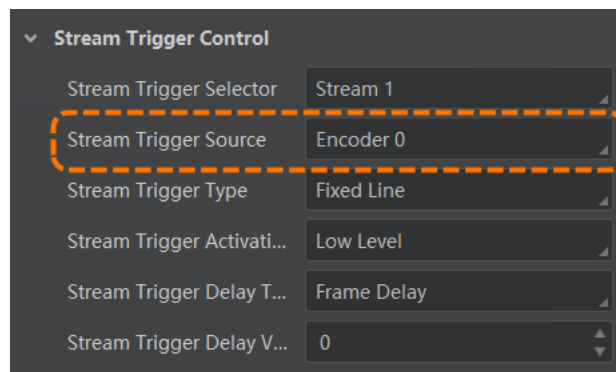


Figure 9-14 Encoder Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};  
MV_CC_EnumInterfaces(MV_XOF_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);
```

9.3.5 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**.

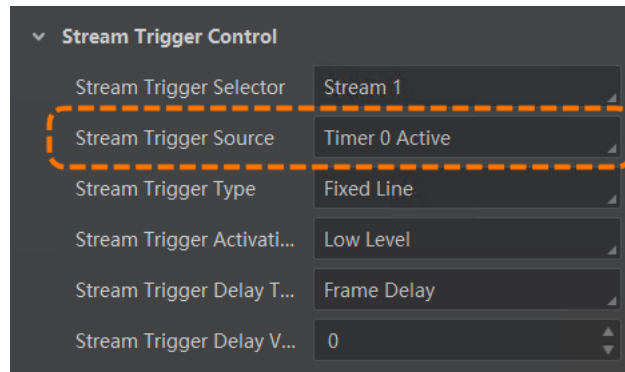


Figure 9-15 Timer Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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", "Timer0Active");

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

9.3.6 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**.

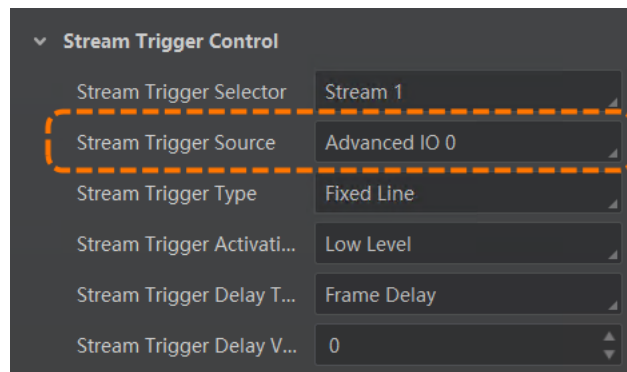


Figure 9-16 Advanced I/O Control

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_XOF_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", "AdvancedIO0");

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

9.4 Trigger Related Parameters

You can set trigger response mode, trigger delay, and trigger cache after enabling selecting specific stream trigger source.

9.4.1 Trigger Response Mode

The frame grabber supports setting the trigger response mode of the trigger source. When the electrical level signal given by external devices is triggered in selected trigger response

mode, the frame grabber acquires and processes the received camera image data.

Steps

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

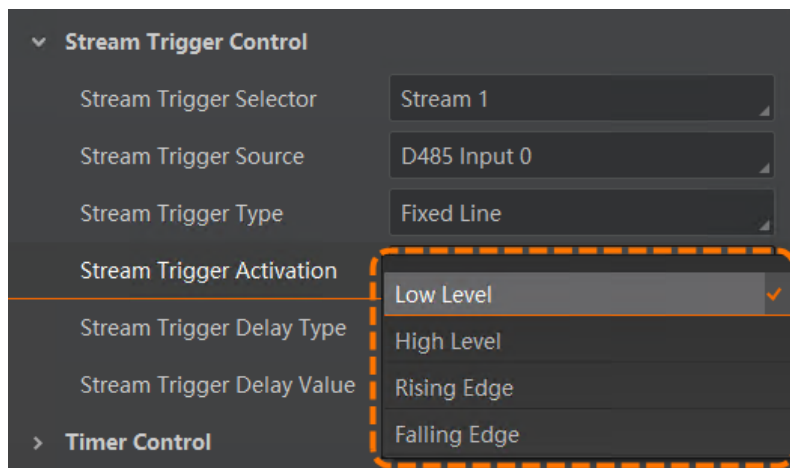


Figure 9-17 Trigger Activation

Table 9-3 Trigger Activation Parameter

Parameter	Description
Rising Edge	When the electrical level signal given by external devices is in rising edge, the frame grabber acquires and processes the received camera image data.
Falling Edge	When the electrical level signal given by external devices is in falling edge, the frame grabber acquires and processes the received camera image data.
High Level	When the electrical level signal given by external devices is in high level, the frame grabber acquires and processes the received camera image data.
Low Level	When the electrical level signal given by external devices is in low level, the frame grabber acquires and processes the received camera image data.

The frame grabber can perform real-time counting of the generated Stream Trigger in any trigger response mode.

- **StreamTrigger Edge Counter:** It displays the Stream Trigger count value in real time.
- **StreamTrigger Edge Counter Reset:** Click **Execute** to reset the Stream Trigger count value.

When **Stream Trigger Type** is set to **Fixed Line**, and **Stream Trigger Activation** is set to **Rising Edge** or **Falling Edge**, you can set the number of images triggered by **Stream Trigger** in **Stream Trigger Frame Burst**. It means that when a level signal from an external device

triggers on the rising or falling edge, the frame grabber acquires and processes the specified number of image data.

The code below shows the process of setting trigger activation.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};

MV_CC_EnumInterfaces(MV_XOF_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);
```

9.4.2 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.

Steps

1. Go to **Advanced Setting > Stream Trigger Delay Type**.
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** is set to n, the n+1 frame trigger signal can be received.

Note

Only when the **Camera Type** is **Frame Scan**, you can select **Frame Delay** as **Stream Trigger Delay Type**.

- **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.
-

Note

Only when the **Camera Type** is **Line Scan**, you can select **Line Delay** as **Stream Trigger Delay Type**.

- **Time Delay (μs)**: The trigger signal is delay in the unit of μs.

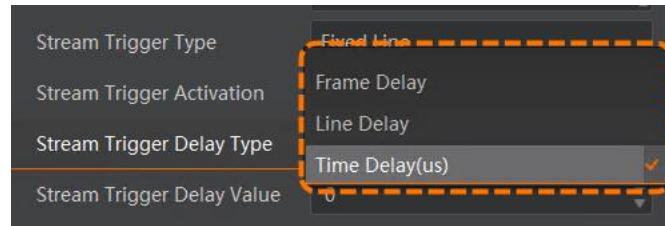


Figure 9-18 Stream Trigger Delay Type

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

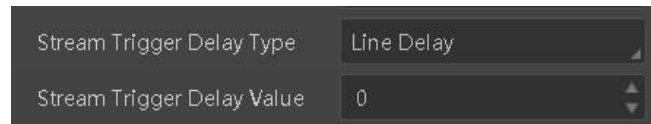


Figure 9-19 Set Stream Trigger Delay Value

The code below shows the process of setting trigger delay.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_XOF_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);
```

9.4.3 Trigger Cache

After the **Stream Trigger Cache Enable** is enabled, if a new trigger signal is received, during the triggering process, the signal will be retained and processed. While processing the current signal, up to one trigger signal can be retained for processing.

Stream Trigger Cache Enable is supported when **Stream Trigger Activation** is set to **Rising Edge** or **Falling Edge**.

Steps

1. Go to **Advanced Setting > Stream Trigger Control**.
2. Set **Stream Trigger Activation** to **Rising Edge** or **Falling Edge**.
3. Enable or disable **Stream Trigger Cache Enable**.

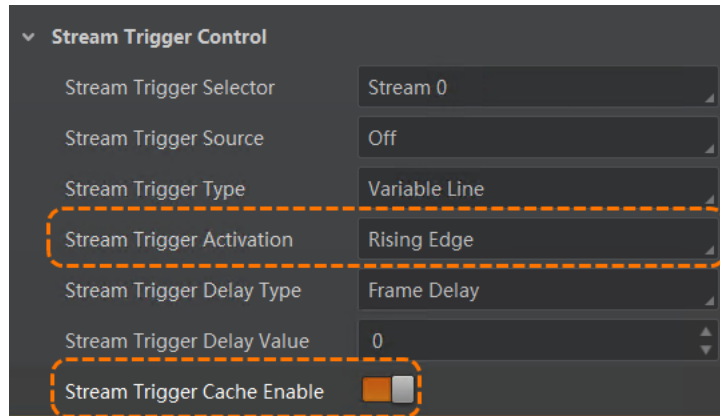


Figure 9-20 Set Trigger Cache

Chapter 10 Other Functions

10.1 Data Forwarding

Some models support the Data Forwarding function. By connecting frame grabbers in series, the main frame grabber can forward received image data to sub frame grabbers, enabling multiple frame grabbers to synchronously acquire images from the same source. Up to 10 frame grabbers can be connected in series, with a maximum transmission distance of 300 m between devices, and the latency of a single-hop forwarding is on the order of hundreds of nanoseconds. This function allows multiple industrial PCs to process the same data in parallel, reducing the time required for image analysis and processing.

Connect the camera and frame grabbers according to the following modes based on the actual application scenario.

- **Serial Mode:** This mode is suitable for scenarios where a single camera is connected. In this mode, the same image data is transmitted sequentially: the main frame grabber saves the image data locally while forwarding it to sub frame grabber 1, and sub frame grabber 1 also saves the data and forwards it to sub frame grabber 2, enabling multi-level cascading.

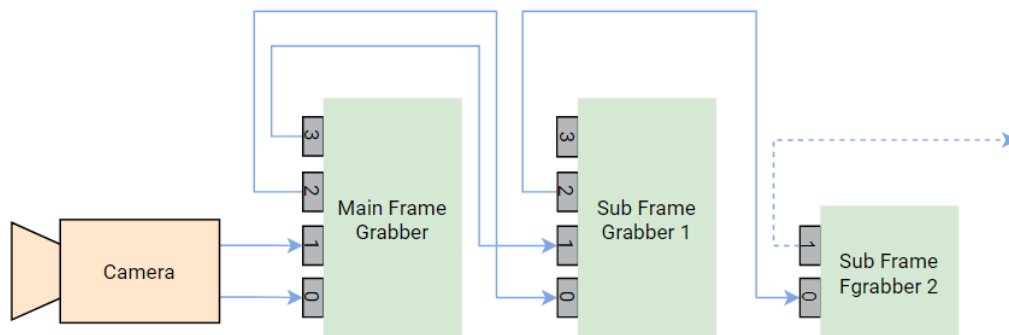


Figure 10-1 Serial Mode

- **Parallel Mode:** This mode is specifically designed for scenarios involving multiple camera connections. In this mode, the main frame grabber is connected to two cameras. While saving image data locally, it transmits the image data to both sub frame grabbers 1 and 2 at the same time. Subsequent frame grabbers are connected in serial to achieve cascaded data forwarding.

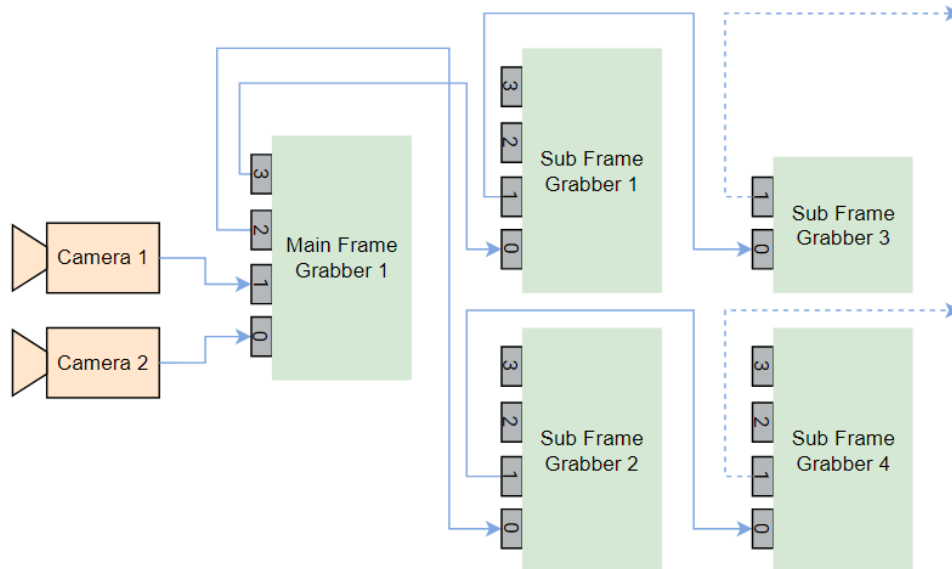


Figure 10-2 Parallel Mode 1

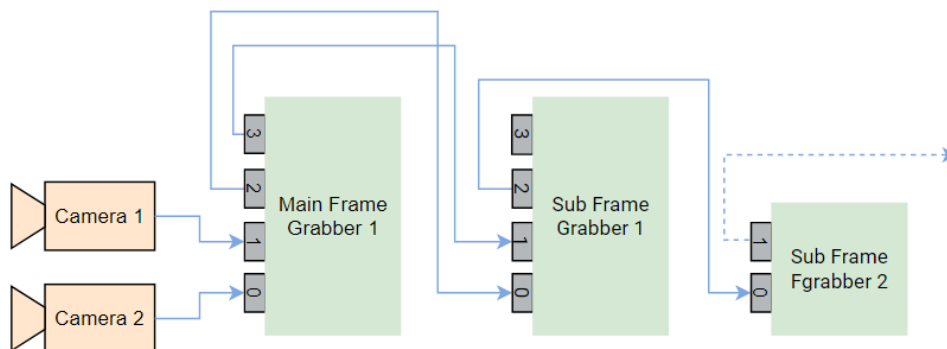


Figure 10-3 Parallel Mode 2

10.1.1 Parameter Configuration

After connection, you can set the data forwarding function of the frame grabbers in **Advanced Setting**.

Steps

1. According to the actual connection mode, set the frame grabber as main or sub in **DF Type** under **Advanced Setting**. Then you can view the topology information of the frame grabber in **DF Topology** in X-In/Y-Out format, with X indicating the number of input channels and Y indicating the number of output channels.

The link functions are assigned based on the link No.: the first X links (starting from Link 0) operate support input mode, and the remaining Y links support output mode. For example:

- If the frame grabber has four links (Link 0 to Link 3) and **DF Topology** displays 2-In/2-Out,

then Link 0 and Link 1 are used for receiving data, while Link 2 and Link 3 are used for forwarding data.

- If the frame grabber has two links (Link 0 to Link 1) and **DF Topology** displays 1-In/1-Out, then Link 0 is used for receiving data, and Link 1 is used for forwarding data.

Note

- The **DF Topology** value will be updated in real time according to the configuration in step 2.
- When the frame grabber is set as the main card, the client will automatically enumerate the cameras connected to it; when the frame grabber is set as the sub card, the client will automatically create a virtual camera for the frame grabber.

2. Set the DF link information of the frame grabber in **Link Info(DF)**.

- **DF Output Link Selector**: Set the link for outputting image data. Only Link 2 and Link 3 are supported.
- **DF Source Link Selector**: Set the link for receiving data, corresponding to the output link set in **DF Output Link Selector**. Only Off, Link 0, and Link 1 are supported.

Note

When **DF Source Link Selector** is set to **Off**, the data-forwarding function of the output link set in **DF Output Link Selector** is disabled, and the output link only receives data and does not forward it, increasing the number of data-receiving channels.

3. When the frame grabber is a sub card, it is required to set **DF Link Stream Binding**, namely the source channel of the stream data for the link selected in **Link Selector**.

For example, if the stream data of Link 0 and Link 1 is from the same camera, the same Stream channel should be selected; if the data comes from different cameras, different Stream channels should be selected.

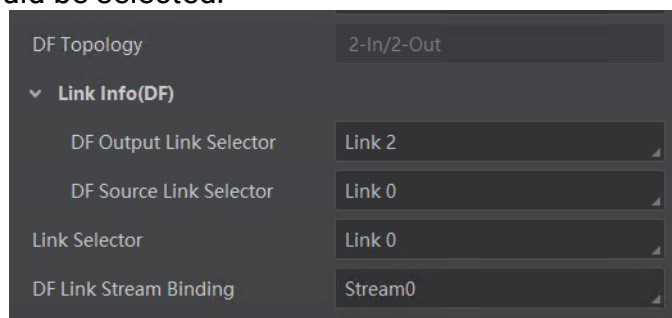


Figure 10-4 Data Forwarding

4. When the frame grabber is set as the sub card, set the image output parameters in **BasicSetting a210nd BasicSeeting > Camera Info(DF)**.

- **Camera Type**: Set the image output mode to be consistent with that of the main card. **Line Scan** and **Frame Scan** are supported.
- **Camera Width(DF)**: Set the image horizontal resolution of the virtual camera of the sub card to be consistent with that of the camera connected to the main card.
- **Camera Height(DF)**: Set the image vertical resolution of the virtual camera of the sub card

to be consistent with that of the camera connected to the main card.

Note

This parameter is not available when **Camera Type** is set to Line Scan.

- **Camera Pixel Format(DF)**: Set the image pixel format of the virtual camera of the sub card to be consistent with that of the camera connected to the main card.

Example

The configuration logic is illustrated with the following example:

Suppose the **DF Output Link Selector** is set to **Link 2** while the **DF Source Link Selector** for that output is set to **Link 0**, and the **DF Output Link Selector** is set to **Link 3** with its **DF Source Link Selector** set to **Link 1**. In this configuration, Link 2 forwards the image data received by Link 0, and Link 3 forwards the image data received by Link 1. Thus, Link 0 and Link 1 are used for receiving image data, whereas Link 2 and Link 3 are used for forwarding the received image data, and **DF Topology** will display **2-In/2-Out**.

If, on this basis, the **DF Source Link Selector** for Link 2 is set to **Off** while the settings for Link 3 remain unchanged, the forwarding function of Link 2 is disabled. Consequently, Link 2 is released and becomes an available input channel, while Link 1 continues to be occupied by Link 3 for forwarding. At this point, the links that can receive image data are Link 0, Link 1, and Link 2, only Link 3 remains as a forwarding channel, and **DF Topology** will be updated in real time to **3-In/1-Out**.

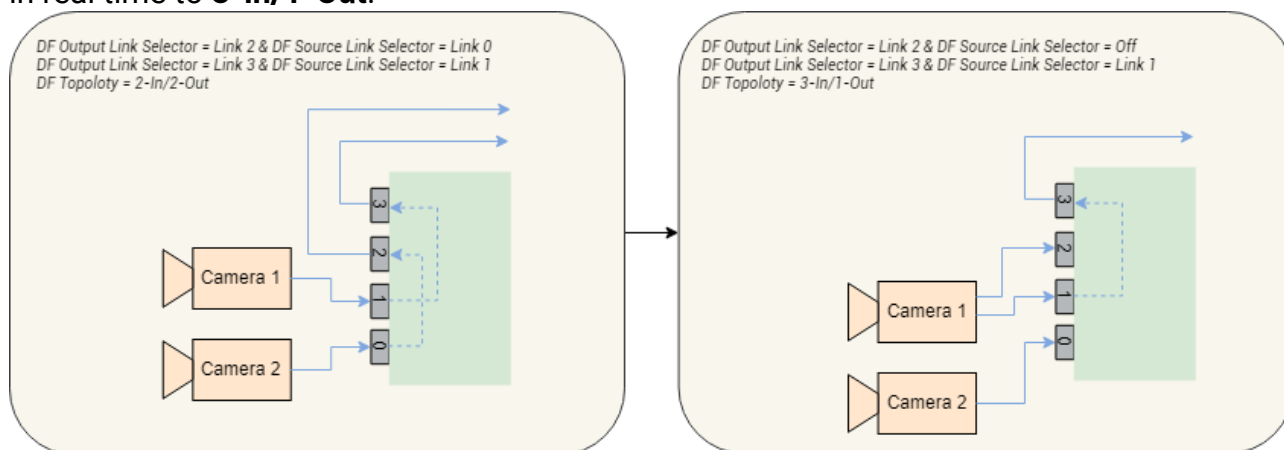


Figure 10-5 Configuration Logic

10.1.2 Quick Configuration

In addition to configuring the data-forwarding function via parameters, you can also use the quick tool in the client to configure the function.

Right-click the unconnected frame grabber, click **Data Forwarding Type Selection**, and select either open as a main card or a sub card.

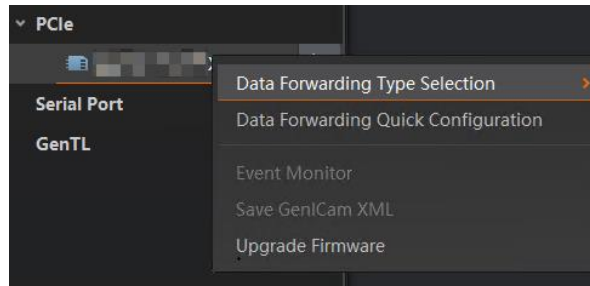


Figure 10-6 Data Forwarding Type Selection

- If the frame grabber is opened as a main card, the client will automatically enumerate the camera(s) connected to the frame grabber, and you can connect the camera to set corresponding parameters.
- If the frame grabber is opened as a sub card, the client will automatically create virtual camera(s) for the frame grabber, and you can connect the virtual camera to set corresponding parameters.

Note

- After the frame grabber is opened, the parameters previously configured for the main card or sub card are loaded by default.
 - When selecting the data-forwarding type, make sure the select type matches the actual connection mode of the frame grabber.
-

After opening the frame grabber, right-click **Data Forwarding Quick Configuration** to open the **DF Quick Configuration** window.

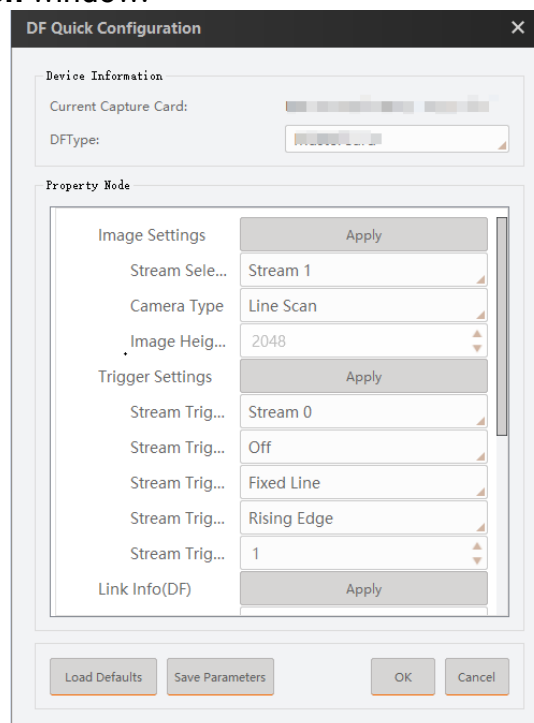


Figure 10-7 DF Quick Configuration

Set the frame grabber to main card or sub card in **DFTYPE**, and then configure the corresponding parameters.

Image Settings

- **Stream Selector**: Select the corresponding stream according to actual demands. The stream is related to the connection mode between frame grabber and camera.
- **Camera Type**: Select the image output mode of the connected camera. Frame Scan and Line Scan are supported.
- **Image Height**: View the image line height of the connected camera.
- **Camera Height(DF)**: Set the image vertical resolution of the virtual camera of the sub card to be consistent with that of the camera connected to the main card. This parameter is available when the frame grabber is set as a sub card and **Camera Type** is set to Frame Scan.
- **Camera Width(DF)**: Set the image horizontal resolution of the virtual camera of the sub card to be consistent with that of the camera connected to the main card. This parameter is available when the frame grabber is set as a sub card.
- **Camera Pixel Format(DF)**: Set the image pixel format of the virtual camera of the sub card to be consistent with that of the camera connected to the main card. This parameter is available when the frame grabber is set as a sub card.

After configuration, click **Apply** in **Image Settings** to save the settings to the frame grabber.

Trigger Settings

- **Stream Trigger Selector**: Select the stream for configuring frame grabber trigger.
- **Stream Trigger Source**: Set the trigger signal source.
- **Stream Trigger Type**: Set the trigger type. **Fixed Line** and **Variable Line** are supported.
- **Stream Trigger Activation**: Set the response mode of the trigger signal source. When the electrical level signal given by external devices is triggered in the selected trigger response mode, the frame grabber acquires and processes the received camera image data.
- **Stream Trigger Edge Counter**: It displays the stream trigger count value.

After configuration, click **Apply** in **Trigger Settings** to save the settings to the frame grabber.

Note

See [Frame Grabber Trigger](#) for details on the parameters.

Link Info(DF)

- **DF Topology**: It displays the topology information of the frame grabber in X-In/Y-Out format, with X indicating the number of input channels and Y indicating the number of output channels.
- **DF Output Link Selector**: Set the link for outputting image data. Only Link 2 and Link 3 are supported.
- **DF Source Link Selector**: Set the link for receiving data, corresponding to the output link set in **DF Output Link Selector**. Only Off, Link 0, and Link 1 are supported.
- **Link Selector**: Select the corresponding frame grabber link according to actual

demands.

- **DF Link Stream Binding:** Set the source channel of the stream data for the Link selected in **Link Selector**. When the frame grabber is set as a sub card, this parameter is required. After configuration, click **Apply** in **Link Info(DF)** to save the settings to the frame grabber.

Note

See [Parameter Configuration](#) for details on the parameters.

Link Trigger

- **Link Selector:** Select the corresponding frame grabber link according to actual demands.
 - **Link Trigger Selector:** Select the corresponding link trigger according to actual demands.
 - **Link Trigger Source:** Set the source of link trigger signals.
 - **Link Trigger Mode:** Set the response mode of the trigger signal source. When the electrical level signal given by external devices is in the selected edge, the frame grabber sends the corresponding edge trigger packet to the camera to acquire images.
- After configuration, click **Apply** in **Link Trigger** to save the settings to the frame grabber.

Note

See [Link Trigger](#) for details on the parameters.

Configuration Saving

After configuring all above parameters, click **OK** to save all settings to the frame grabber. Clicking **Cancel** will exit the **DF Quick Configuration** window without saving any changes, except for parameters that have already been saved individually via the **Apply** button.

If you want to make the current settings as default, click **Save Parameters** and save them to the default location. Later, you can click **Load Defaults** to load the saved default parameters. If no default parameters have been saved, clicking **Load Defaults** will restore the frame grabber to its factory-default settings.

10.1.3 Other Functions

When using the data-forwarding function of the frame grabber for synchronized acquisition, you should first configure the trigger-synchronization function and define the image acquisition order for the cameras connected to the main and sub frame grabbers.

Trigger Synchronization

The trigger-synchronization function allows the sub frame grabber to receive trigger signals from the main frame grabber, enabling synchronized image acquisition between multiple frame grabbers. The main frame grabber transmits the trigger event over its link to the sub frame grabber, ensuring that both frame grabbers start acquiring images only after they have received the same trigger event.

If the frame grabber connection mode below is adopted and the stream trigger source of the main frame grabber is set to software trigger, you can configure the trigger

synchronization function as shown in steps below.

Connection Mode

- Link 0 and Link 1 of the main frame grabber are connected to the camera to acquire images.
- Link 2 and Link 3 of the main frame grabber are used to forward the image data to the sub frame grabber.
- Stream 0 of the main frame grabber is used to get data stream from the camera.
- Link 0 and Link 1 of the sub frame grabber are used to receive data forwarded by Link 2 and Link 3 of the main frame grabber.

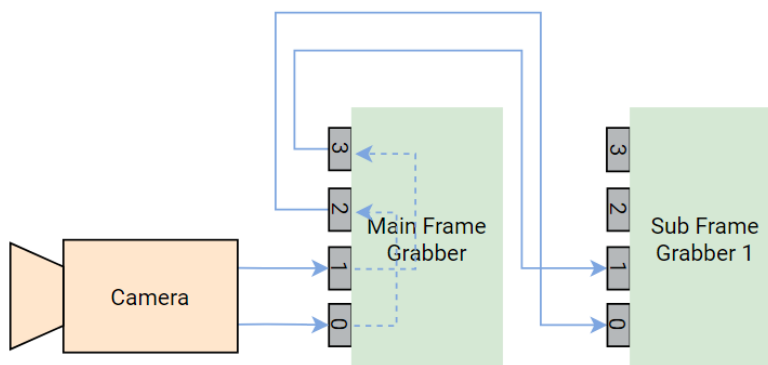


Figure 10-8 Synchronized Trigger of Frame Grabbers

Steps

1. For the main frame grabber, go to **Advanced Setting > Stream Trigger Control**, set **Stream Trigger Selector** to Stream 0, **Stream Trigger Source** to Software Signal 0, and set the **Stream Trigger Activation**.

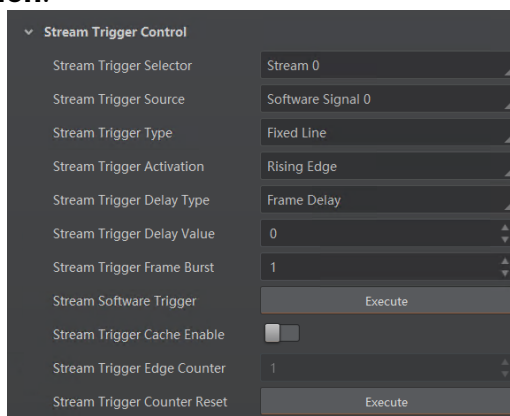


Figure 10-9 Stream Trigger Configuration for Main Frame Grabber

2. For the main frame grabber, go to **Advanced Setting**, set the **Link Selector** to Link 2 or Link 3, and set the frame trigger forwarding function as follows.
 - 1) In **Link Trigger Control**, set **Link Trigger Selector** of Link 2 or Link 3 to LinkTrigger0.
 - 2) In **Link Trigger Control**, set **Link Trigger Source** of LinkTrigger0 to StreamTrigger0.
 After the first two steps, the main frame grabber will forward the trigger event of Stream 0

via Link 2 and Link 3.

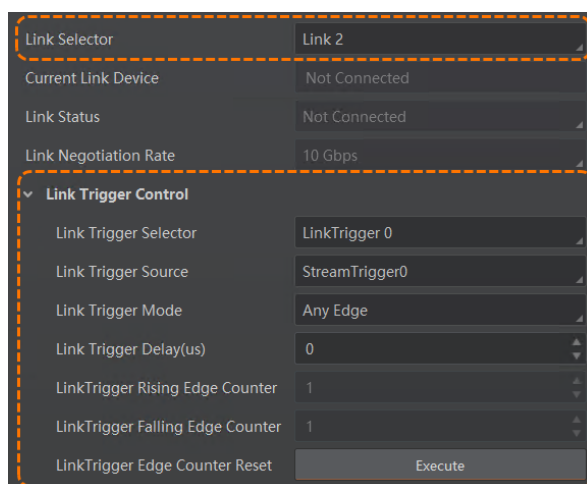


Figure 10-10 Link Trigger 0 Configuration of Main Frame Grabber Link 2

3. For the sub frame grabber, go to **Advanced Setting > Stream Trigger Control**, **Stream Trigger Selector** to Stream 0, and set **Stream Trigger Source** to Link0Trigger0 or Link1Trigger0, then the LinkTrigger signal received by Link 0 or Link 1 will be used as the trigger source of Stream Trigger. Other configurations are consistent with those of the main frame grabber.

Note

When the **Stream Trigger Source** of the sub frame grabber is set to Link*Trigger*, the **Stream Trigger Source** of the main frame grabber cannot be set to Off.

After the configuration above, go to **Advanced Setting > Stream Trigger Control**, click **Execute** in **Stream Software Trigger**, then both main and sub frame grabbers and acquire images at the same time.

Image Acquisition Sequence

To ensure that the main and sub frame grabbers acquire the same amount of image data, the image acquisition start and image acquisition stop operations should follow the strict sequence below:

- **Image Acquisition Start**

- 1) Sequentially start the image acquisition of virtual camera(s) of the sub frame grabber(s).
- 2) Start the image acquisition of the camera connected to the main frame grabber, ensuring that the sub frame grabber(s) can acquire all image data without missing frames.

- **Image Acquisition Stop**

- 1) Stop the image acquisition of the camera connected to the main frame grabber.
- 2) Sequentially stop the image acquisition of virtual camera(s) of the sub frame grabber(s).

10.2 Image Debug

Some models of frame grabbers support setting ROI (Region-of-Interest) image processing function.

When you are interested only in a specific portion of the image, the frame grabber can crop the received original image according to a preset width and an X-axis offset, producing an ROI-cropped output.

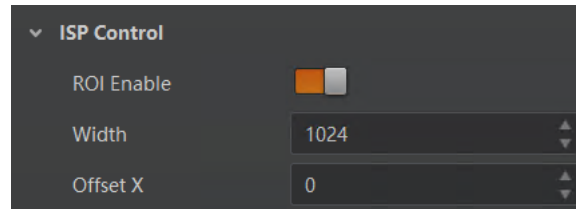


Figure 10-11 Image Debug

Steps

1. Go to **BasicSetting > ISP Control**.
2. Enable ROI Enable to enable the function, and set the **Width** and **Offset X**.
 - **Width**: Set the horizontal size of the original image.
 - **Offset X**: Set the horizontal offset from the left edge of the original image to the start of the ROI.

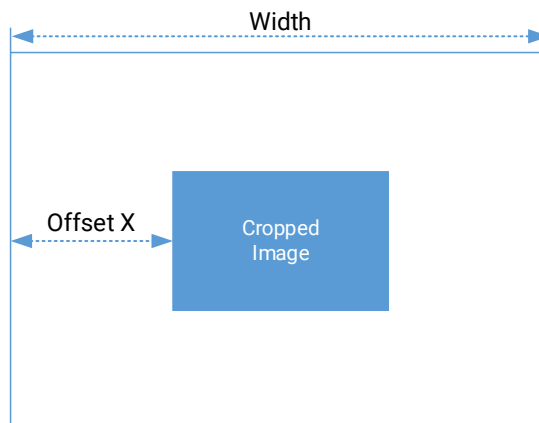


Figure 10-12 ROI Cropping

10.3 Multi-Light Control

The frame grabber supports the function of multiple-light control, which means the device can control up to 4 lights installed at different angles to light up in accordance with configured strobe logic. Then the device can get multiple images of the same target

illuminated from different angles.

Go to **Advanced Setting**, and select **Multi Lights Control** according to actual demands.

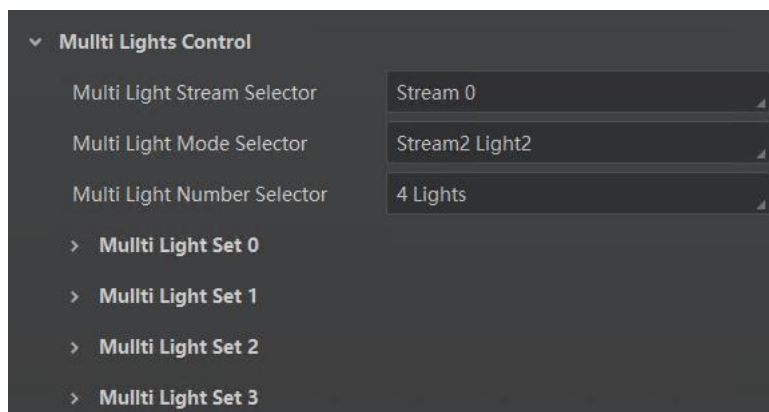


Figure 10-13 Set Multiple-Light Control

Steps

1. Select the stream channel to be configured via **Multi Light Stream Selector**.
2. Select the multi-light control mode via **Multi Light Mode Selector**.

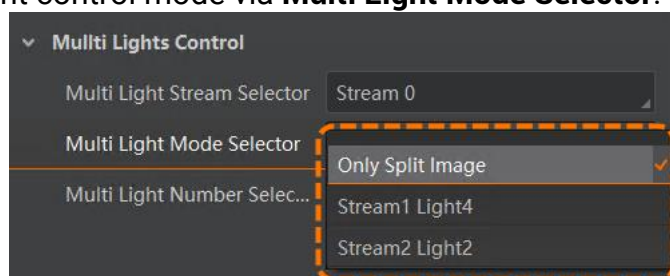


Figure 10-14 Multi Light Mode Selector

- **Only Split Image**: Only split image. The image splitting via multi-light control can be set via **Multi Light Number Selector**.
- **Stream1 Light4**: 1 stream, 4 lights. The frame grabber controls 1 camera through 1 stream channel, and 1 camera controls 4 light sources. In this case, the multi-light polling control mode can be set via **Multi Light Number Selector**.
- **Stream2 Light2**: 2 streams, 2 lights. The frame grabber controls 1 camera each through 1 stream channels, and 2 cameras control 2 light sources respectively. In this case, the multi-light polling control mode can be set via **Multi Light Number Selector**.

Note

- If the camera connected to the frame grabber does not support multi-light polling control or the function is disabled, only **Only Split Image** can be selected, and **Stream1 Light4** and **Stream2 Light2** should not be selected.
- When the frame grabber is used with MV-CL084-90F1M XoFLink line scan camera and the multi-light polling control is enabled, **Stream1 Light4** and **Stream2 Light2** can be selected. In this case, the parameters configured for the camera will be synchronized to

the frame grabber, and no additional parameter configuration is required for the frame grabber. For details on how to configure parameters for the camera, refer to the *XoFLink Line Scan Camera User Manual*.

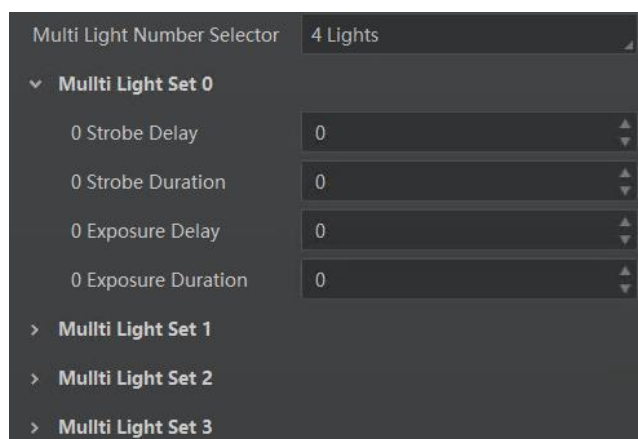
3. Set image splitting via multi-light control function or multi-light polling control mode via **Multi Light Number Selector**.

- If **Only Split Image** is selected in **Multi Light Mode Selector**, **Multi Light Number Selector** only supports setting the function of image splitting via multi-light control.
- If **Stream 1 Light4** or **Stream2 Light2** is selected in **Multi Light Mode Selector**, **Multi Light Number Selector** only supports setting multi-light polling control mode.

Table 10-1 Multi Light Mode Selector Description

Multi Light Mode Selector	Description	Multi Exposure Set * Attribute
Off	Function is disabled.	Not display.
1 Light	Light 1 is turned on, and other lights are turned off.	Set Multi Exposure Set 0 Attribute : • 0 Strobe Delay: Delay time of Light 1. • 0 Strobe Duration: Duration of Light 1. • 0 Exposure Delay: The first group of exposure time of camera. • 0 Exposure Duration: The first group of exposure delay time of camera.
2 Lights	Lights 1/2 are turned on respectively, and other lights are turned off.	Set Multi Exposure Set 0/1 Attribute : • 0/1 Strobe Delay: Delay time of Light 1/2. • 0/1 Strobe Duration: Duration of Light 1/2. • 0/1 Exposure Delay: The first/second group of exposure time of camera. • 0/1 Exposure Duration: The first/second group of exposure delay time of camera.

Multi Light Mode Selector	Description	Multi Exposure Set * Attribute
3 Lights	Lights 1/2/3 are turned on respectively, and Light 4 is turned off.	Set Multi Exposure Set 0/1/2 Attribute: ● 0/1/2 Strobe Delay: Delay time of Light 1/2/3. ● 0/1/2 Strobe Duration: Duration of Light 1/2/3. ● 0/1/2 Exposure Delay: The first/second/third group of exposure time of camera. ● 0/1/2 Exposure Duration: The first/second/third group of exposure delay time of camera.
4 Lights	Lights 1/2/3/4 are turned on respectively.	Set Multi Exposure Set 0/1/2/3 Attribute: ● 0/1/2/3 Strobe Delay: Delay time of Light 1/2/3/4. ● 0/1/2/3 Strobe Duration: Duration of Light 1/2/3/4. ● 0/1/2/3 Exposure Delay: The first/second/third/fourth group of exposure time of camera. ● 0/1/2/3 Exposure Duration: The first/second/third/fourth group of exposure delay time of camera.


Figure 10-15 Multi Light Set

When the camera begins to acquire images after **Multi Light Control** is enabled, the frame grabber will synchronize with the camera's set parameters and automatically configure the timer and output signal parameters. The configurations for timer and output signal under **Multi Exposure Set 0/1/2/3** are shown in tables below.

Table 10-2 Timer Configuration

Multi Exposure Control	Timer Selector	Timer Trigger Source	Timer Trigger Delay(us)
Multi Exposure Set 0	Timer 0	Encoder 0	Consistent with 0 Strobe Delay .
	Timer 1		Consistent with 0 Exposure Delay , and the camera's Exposure0 Delay .
Multi Exposure Set 1	Timer 2	Timer 1	Consistent with 1 Strobe Delay .
	Timer 3		Consistent with 1 Exposure Delay , and the camera's Exposure1 Delay .
Multi Exposure Set 2	Timer 4	Timer 3	Consistent with 2 Strobe Delay .
	Timer 5		Consistent with 2 Exposure Delay , and the camera's Exposure2 Delay .
Multi Exposure Set 2	Timer 6	Timer 5	Consistent with 3 Strobe Delay .
	Timer 7		Consistent with 3 Exposure Delay , and the camera's Exposure3 Delay .

Table 10-3 Output Signal Configuration

Multi Exposure Control	Line Selector	Line Mode
Multi Exposure Set 0	D485 Inout2	Output
Multi Exposure Set 1	D485 Inout3	Output

Multi Exposure Control	Line Selector	Line Mode
Multi Exposure Set 2	D485 Inout6	Output
Multi Exposure Set 2	D485 Inout7	Output

Taking the 4-light mode as an example, upon receiving an external trigger signal, the frame grabber will control the camera to execute exposure delay and other exposure operations according to the parameters synchronized from the camera. Then, it will control light sources to perform strobe delay and other strobe operations, as shown below.

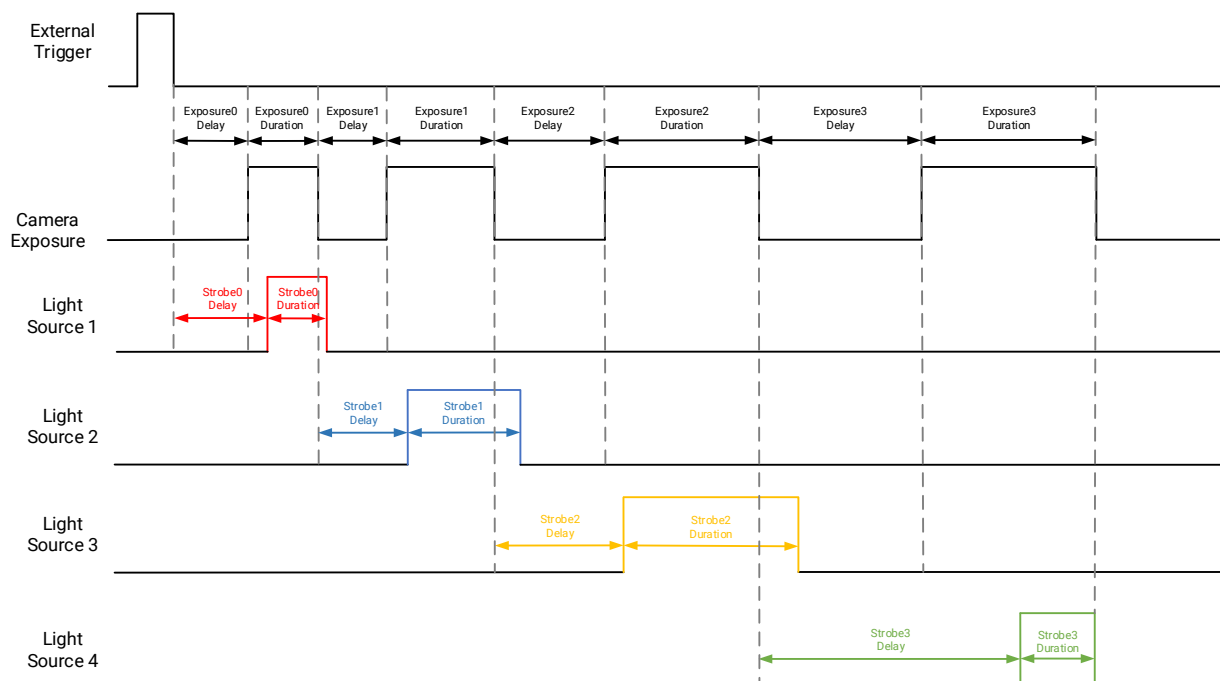


Figure 10-16 Light Mode Trigger Diagram

Note

The sum of **Strobe* Duration** and **Strobe* Delay** should be less than or equal to line trigger period due to the device's limitation. If the camera exposure has not concluded within a line trigger period, the camera will not respond to the trigger signal when the next line trigger period arrives.

10.4 Test Mode

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

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 quantity of error data packet sent by the camera.
- **Test Packet Count Tx:** It displays the quantity of data packet sent by the frame grabber.
- **Test Packet Count Rx:** It displays the quantity of data packet sent by the camera.
- **Test Packet Group Tx:** It displays the number of data packet groups sent by the frame grabber, ranging from 1 to 64.
- **Test Packet Value:** It is the test data value of data packet sent by the frame grabber, ranging from 0 to 255. It will be displayed when **Mode 2** is selected for **Test Packet Mode Tx**.

2. Click **Execute** in **Test Error Count Reset**, **Test Packet Count Tx Reset**, or **Test Packet Count Rx Reset** to reset quantity.

Note

- **Link 0** to **Link 3** correspond to SFP+ connectors respectively.
- Make sure to select **Off** as **Test Mode** first when change the connector to test.

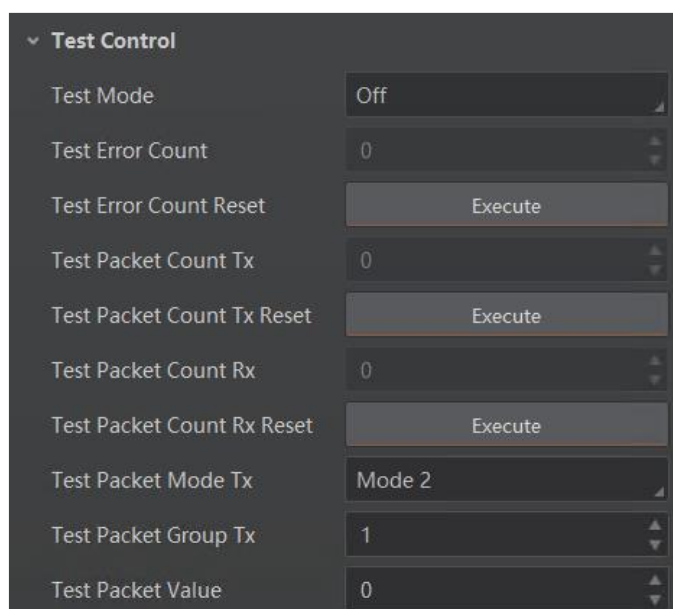


Figure 10-17 Test Mode

10.5 Device Control

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

Table 10-4 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.

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Parameter	Read/Write	Description
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
Optical Module Temperature Selector	Read & Write	It selects SFP+ module to view its real-time temperature.
Optical Module Temperature	Read Only	It displays the temperature of selected SFP+ module in Optical Module Temperature Selector .
Max Bandwidth Per Stream	Read Only	It is the max. bandwidth per stream channel.
PCIe Current Link Speed	Read Only	It is the max. link speed of the current PCIe.
PCIe Current Link Width	Read Only	It is the link width of the current PCIe.
PCIe Bus Max Link Speed	Read Only	It is the max. link speed of PCIe supported by device firmware.
PCIe Bus Max Link Width	Read Only	It is the max. link width of PCIe supported by device firmware.
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.
Device Log Clean	Read & Write	Click Execute to clear logs saved in device.

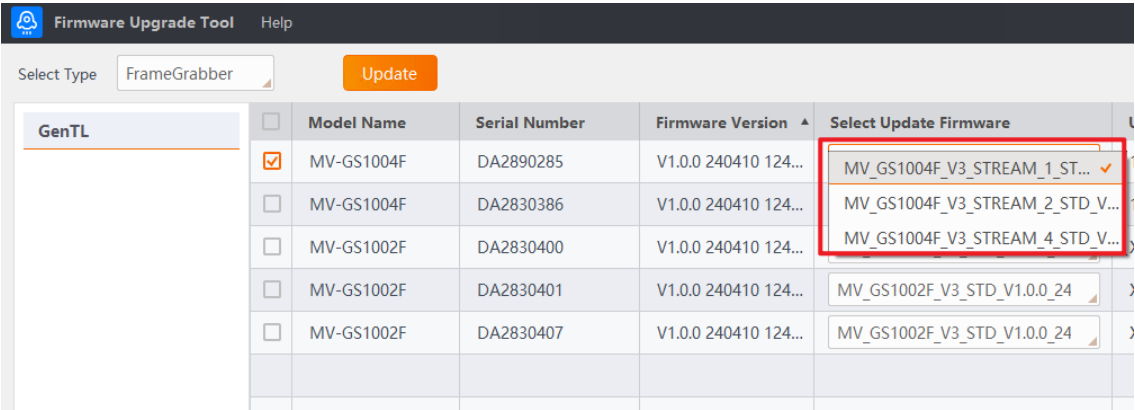


Figure 10-19Update Firmware

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.

10.7 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.

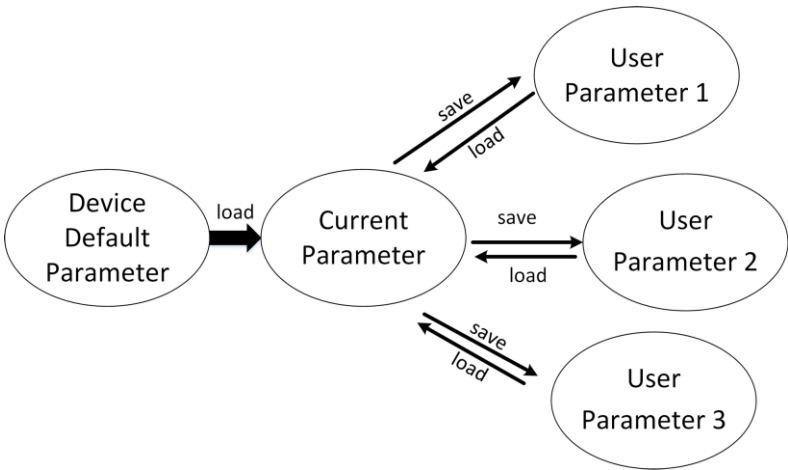


Figure 10-20Parameter Relation

10.7.1 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.

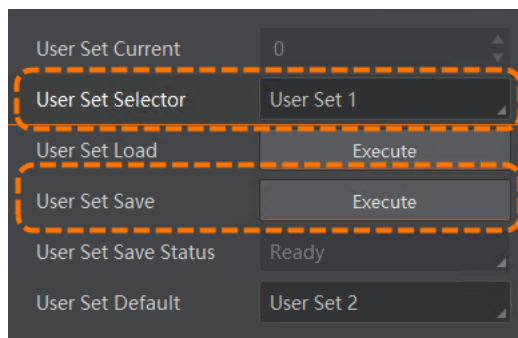


Figure 10-21 Save User Set

10.7.2 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.

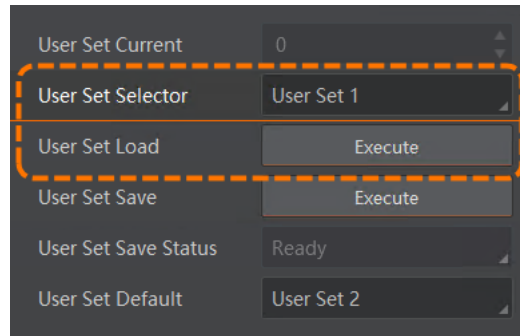


Figure 10-22 Load User Set

10.7.3 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.

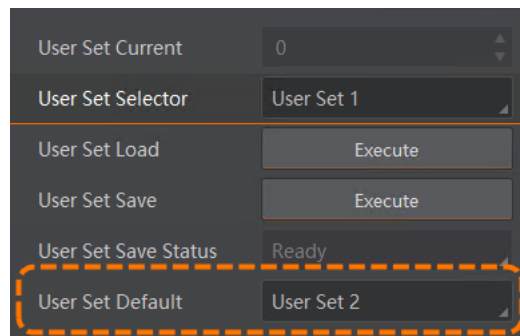


Figure 10-23 Set User Default

The code below shows the process of setting user parameters.

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

10.8 File Access Control

The file access function can be used to import or export the 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.

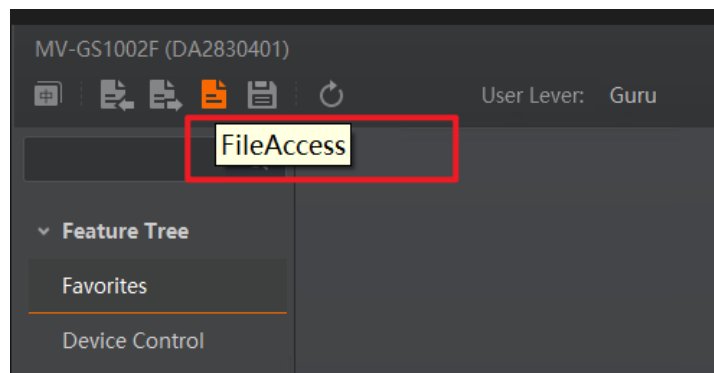


Figure 10-24 File Access

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

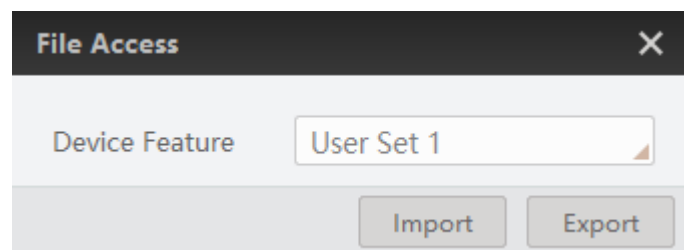


Figure 10-25 Import or Export

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.
-

10.9 Event Control

The event control can record events happen to the device and allow you to view them.

Note

- The event control function 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**.

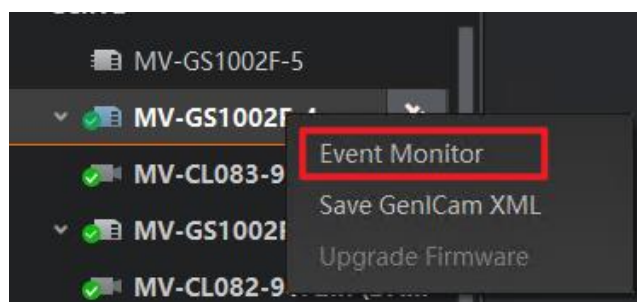


Figure 10-26 Select Event Monitor

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.

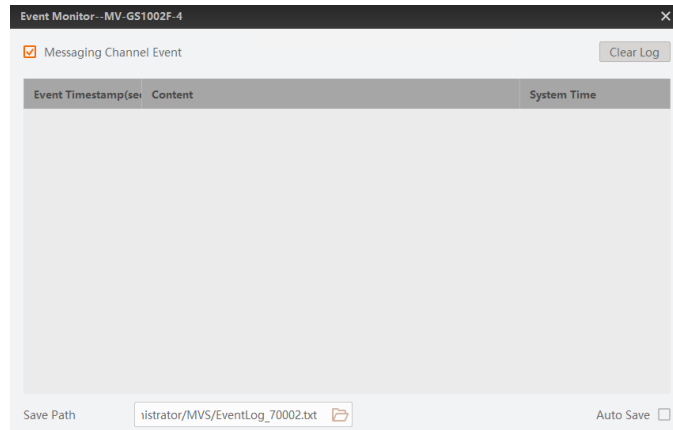


Figure 10-27 Event Monitor

Note

- The event monitor is only available when the frame grabber firmware supports the function.
 - The event sources supported in event monitor may differ by different models of frame grabbers you use.
-

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

MV_CC_RegisterEventCallBackEx(hInterface, "TimerRisingEdge0", EventCallBack, NULL);
MV_CC_SetEnumValueByString(hInterface, "EventCategory", "SoftEvent");
MV_CC_SetEnumValueByString(hInterface, "ChannelSelector", "Channel0");
MV_CC_SetEnumValueByString(hInterface, "EventSelector", "TimerRisingEdge0");
MV_CC_SetEnumValueByString(hInterface, "EventNotification", "On");

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

Chapter 11 FAQ (Frequently Asked Questions)

There may be some problems when using the frame grabber. If the problems below occur, follow the guidance to solve by yourself. If you cannot solve them or have other problems, contact the technical support in time.

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.	Install the driver again. After installation, check the frame grabber via device manager.
2	The MVS client software or other software is using the frame grabber.	Close the MVS client software or other software that is using the frame grabber. It should be noted that there may be processes after the MVS client software or the software using the frame grabber is closed, causing the frame grabber to be occupied and unsearchable. You can shut down the MVS process or the process of the software that uses the frame grabber in the task manager. If you cannot confirm whether there are processes occupying the frame grabber, you can try to restart the PC.
3	Improper installation of the frame grabber.	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.
4	The firmware of frame grabber is updated without restarting the industrial PC afterward.	Restart the industrial PC.

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.
2	Improper wiring of the data cable.	Check the wiring of the data cable.

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

Table 11-3 Reasons and Solutions

No.	Reason	Solution
1	Insufficient PCIe bandwidth.	• Check whether PCIe Max Link Speed is 5000 M and whether PCIe Maximum Link Width is in x4 mode in Device Control. • Replace the PCIe slot to match the bandwidth requirements for PCIe 3.0 x4. Be aware that bandwidth may be shared among slots on some industrial PCs, potentially leading to bandwidth limitations. • Check the PCIe slot's bandwidth in the BIOS. If the ROI meets your application requirements, use the ROI function to increase frame rates.
2	Low CPU performance.	Use high performance CPU.

11.4 Why horizontal stripes appear in images acquired by the camera when using multiple-light control function?

When using MV-GS1002F frame grabber with MV-CL084-90F1M XoFLink line scan camera to enable the function of multiple-light control, horizontal stripes appear in the acquired

images.

Table 11-4 Reasons and Solutions

No.	Reason	Solution
1	The light source, camera, and linear stage are set up improperly.	Ensure that the light source, camera, and linear stage are set up properly without any inclination and are relatively parallel.
2	The speed of linear stage is not in sync with the camera's line rate.	Ensure that the linear stage's speed is in sync with the camera's line rate, avoiding any stretching or compression.
3	The direction of linear stage's movement does not align with the sensor's output direction.	Confirm that the direction of the linear stage's movement aligns with the sensor's output direction.
4	The sum of the set strobe delay and strobe duration is bigger than line period time.	Adjust the light source's strobe delay and strobe duration and ensure that their sum is smaller than or equal to line period time.

Chapter 12 Revision History

Table 12-1 Revision History

Version	Date	Revision Details
V2.0.4	Jan. 19, 2026	• Add descriptions of some parameters in Section 9.1 Frame Processing. • Add functions of image triggering by Stream Trigger and real-time counting in Section 9.4.1 Trigger Response Mode. • Add Section 10.1 Data Forwarding. • Add some event sources in Appendix B Frame Grabber Fields.
V2.0.3	Sept. 10, 2025	• Edit Chapter 5 Basic Operation of Client Software. • Edit Section 9.1 Frame Processing. • Edit Section 9.2 Stream Trigger. • Add Section 9.4.3 Trigger Cache. • Edit Section 10.1 Multi-Light Control. • Edit Section 10.3 Device Control.
V2.0.2	July. 14, 2025	• Adjusted the structure of Section 3.2 I/O Connector. • Edited Section 10.1 Multiple-Light Control
V2.0.1	Sep. 4, 2024	• Edit Section 3.5.1 Stream Indicator. • Edit Section 7.3.4 Timer Control. • Edit Section 8.2 Select Link Trigger. • Add Section 10.1 Multiple-Light Control. • Edit Section 10.2 Test Mode. • Edit Chapter 11 FAQ (Frequently Asked Questions). • Edit Appendix B Frame Grabber Fields.
V2.0.0	May 22, 2024	Modify the structure and the content of the whole user manual.
V1.0.0	Mar. 30, 2023	Original version.

Appendix A Frame Grabber Accessories

When using the frame grabber, you need to prepare these cables: optical fiber patch cord, I/O trigger cable, and I/O adapter cable with bracket. The appearance and pin definitions of accessories are shown below.

Optical Fiber Patch Cord

The optical fiber patch cord is used to establish the data transmission between the frame grabber and the camera. It can provide five lengths of 3 m, 5 m, 7 m, 10 m, and 15 m, which can be selected as required.



Figure A-1 Optical Fiber Patch Cord

Note

Refer to the datasheet of the corresponding product for the specific size and parameter of the optical fiber patch cord.

SFP+ Module

The SFP+ module can be used with optical fiber patch cord and frame grabber.



Figure A-2 SFP+ Module

Note

Refer to the datasheet of the corresponding product for the specific size and parameter of the optical module.

I/O Trigger Cable

The I/O trigger cable (MiniDP to open) is used for I/O trigger signal wiring of MiniDP connector of the frame grabber, as shown below. Refer to the following table for pin definition. The cable has shielding protection, providing six lengths of 3 m, 5 m, 7 m, 10 m, 15 m, and 20m, which can be selected as required.



Figure A-3 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
1	White/Green	RS485_0P	15	White/Yellow	RS485_5P
2	Green	RS485_0N	17	Yellow	RS485_5N
3	White/Orange	RS485_1P	16	White/Purple	RS485_6P
5	Orange	RS485_1N	18	Purple	RS485_6N
4	White/Brown	RS485_2P	19	White/Gray	RS485_7P
6	Brown	RS485_2N	20	Gray	RS485_7N
9	White/Blue	RS485_3P	7	Black	GND
11	Blue	RS485_3N	8	White	GND
10	White/Red	RS485_4P	13	Pink	GND
12	Red	RS485_4N	14	Light green	GND

I/O Adapter Cable with Bracket

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

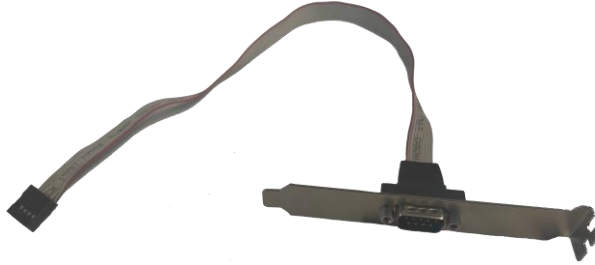


Figure A-4 I/O Adapter Cable

Appendix B Frame Grabber Fields

The event-related nodes have been removed from the client. If you need to configure events, please use the Event Configuration tool provided in the toolkit. This chapter merely introduces the event fields and the configurable event sources to aid your secondary development.

Table B-1 Event Fields

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

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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
	107	Trigger0FallingEdge3
	208	Trigger1RisingEdge0
	209	Trigger1RisingEdge1
	210	Trigger1RisingEdge2
	211	Trigger1RisingEdge3
	212	Trigger1FallingEdge0
	213	Trigger1FallingEdge1
	214	Trigger1FallingEdge2

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Event Type	Enumerated Value	Value Name
Link Event	215	Trigger1FallingEdge3
	216	Trigger2RisingEdge0
	217	Trigger2RisingEdge1
	218	Trigger2RisingEdge2
	219	Trigger2RisingEdge3
	220	Trigger2FallingEdge0
	221	Trigger2FallingEdge1
	222	Trigger2FallingEdge2
	223	Trigger2FallingEdge3
	224	Trigger3RisingEdge0
	225	Trigger3RisingEdge1
	226	Trigger3RisingEdge2
	227	Trigger3RisingEdge3
	228	Trigger3FallingEdge0
	229	Trigger3FallingEdge1
	230	Trigger3FallingEdge2
	231	Trigger3FallingEdge3
	108	LockedEvent0
	109	LockedEvent1
	110	LockedEvent2

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Event Type	Enumerated Value	Value Name
Link Event	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

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Event Type	Enumerated Value	Value Name
Link Event	131	ControlPacketTransmitted3
	132	LinkTriggerPacketTransmitted0
	133	LinkTriggerPacketTransmitted1
	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

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Event Type	Enumerated Value	Value Name
Stream Event	95	TransmitImageBlockStart3
	96	TransmitImageBlockEnd0
	97	TransmitImageBlockEnd1
	98	TransmitImageBlockEnd2
	99	TransmitImageBlockEnd3
	200	TheFirstLineInFrame0
	201	TheFirstLineInFrame1
	202	TheFirstLineInFrame2
	203	TheFirstLineInFrame3
	204	TheLastLineInFrame0
	205	TheLastLineInFrame1
	206	TheLastLineInFrame2
	207	TheLastLineInFrame3
	272	ImageLeaderReceived0
	273	ImageLeaderReceived1
	276	ImageTrailerReceived0
	277	ImageTrailerReceived1
	280	ImagePayloadReceived0
	281	ImagePayloadReceived1
	284	StreamTriggerRisingEdge0

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Event Type	Enumerated Value	Value Name
Stream Event	285	StreamTriggerRisingEdge1
	288	StreamTriggerFallingEdge0
	289	StreamTriggerFallingEdge1
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
	264	TimerRisingEdge4
	265	TimerRisingEdge5
	266	TimerRisingEdge6
	267	TimerRisingEdge7
	4	TimerFallingEdge0

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Event Type	Enumerated Value	Value Name
IO Event	5	TimerFallingEdge1
	6	TimerFallingEdge2
	7	TimerFallingEdge3
	268	TimerFallingEdge4
	269	TimerFallingEdge5
	270	TimerFallingEdge6
	271	TimerFallingEdge7
	8	EncoderRisingEdge0
	9	EncoderRisingEdge1
	10	EncoderFallingEdge0
	11	EncoderFallingEdge1
	60	D485InRisingEdge0
	61	D485InRisingEdge1
	62	D485InRisingEdge2
	63	D485InRisingEdge3
	64	D485InRisingEdge4
	65	D485InRisingEdge5
	66	D485InRisingEdge6
	67	D485InRisingEdge7
	252	D485InRisingEdge8

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Event Type	Enumerated Value	Value Name
IO Event	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

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Event Type	Enumerated Value	Value Name
IO Event	151	D485OutRisingEdge7
	258	D485OutRisingEdge8
	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

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Event Type	Enumerated Value	Value Name
IO Event	249	AdvancedIOFallingEdge1
	250	AdvancedIOFallingEdge2
	251	AdvancedIOFallingEdge3

Table B-3 Other Fields

Field Name	Field Type	Enumerated Value	Value Name	Description
Link trigger				
LinkTriggerSelector	Enum	0	LinkTrigger0	Link trigger selector
		1	LinkTrigger1	
		2	LinkTrigger2	
		3	LinkTrigger3	
LinkTriggerSource	Enum	255	Off	Trigger source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		52	Timer4Active	
		53	Timer5Active	
		54	Timer6Active	
		55	Timer7Active	
		64	Encoder 0	

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LinkTriggerSource	Enum	65	Encoder 1	Trigger source
		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	QuickSoftwareTrigger0	
		130	QuickSoftwareTrigger0	
		131	QuickSoftwareTrigger0	

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LinkTriggerSource	Enum	144	StreamTrigger0	Trigger source
		145	StreamTrigger1	
LinkTriggerMode	Enum	0	RisingEdge	Trigger mode
		1	FallingEdge	
		2	AnyEdge	
LinkTriggerDelay	Integer	/	/	Trigger delay value, range: 0 to 42949672.
LinkTriggerRisingEdgeCounter	Integer	/	/	Trigger rising edge count value, range: 0 to 4294967295.
LinkTriggerFallingEdgeCounter	Integer	/	/	Trigger falling edge count value, range: 0 to 4294967295.
LinkTriggerEdgeCounterReset	Command	/	/	Trigger edge counter reset.
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

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				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	
		52	Timer4Active	
		53	Timer5Active	
		54	Timer6Active	
		55	Timer7Active	
		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	

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		113	AdvancedIO1	
		114	AdvancedIO2	
		115	AdvancedIO3	
		128	QuickSoftwareTrigger0	
		129	QuickSoftwareTrigger1	
		130	QuickSoftwareTrigger2	
		131	QuickSoftwareTrigger3	
		144	Link0Trigger0	
		145	Link0Trigger1	
		146	Link1Trigger0	
		147	Link1Trigger1	
		148	Link2Trigger0	
		149	Link2Trigger1	
		150	Link3Trigger0	
		151	Link3Trigger1	
StreamTriggerType	Enum	0	FixedLine	Triger type
		1	VariableLine	
StreamTriggerActivation	Enum	0	LowLevel	Trigger activation
		1	HighLevel	
		2	RisingEdge	
		3	FallingEdge	
StreamTriggerDelayType	Enum	0	FrameDelay	Trigger delay type
		1	LineDelay	
		2	TimeDelay	
StreamTriggerDelayValue	Integer	/	/	Trigger delay value
Encoder control				
EncoderSelector	Enum	0	Encoder0	Select encoder
		1	Encoder1	
EncoderSourceA	Enum	48	D485Input0	Select encoder input

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		49	D485Input1	source (PHASE_A)
		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;

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				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: 0 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	

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		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	
		52	Timer4Active	
		53	Timer5Active	
		54	Timer6Active	
		55	Timer7Active	
		64	HighLevel	
		65	LowLevel	
		81	D485Input1	
		82	D485Input2	
		83	D485Input3	
		84	D485Input4	
		85	D485Input5	
		86	D485Input6	
		87	D485Input7	
		88	D485Input8	
		89	D485Input9	
		90	D485Input10	

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		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	
		4	Timer4	
		5	Timer5	
		6	Timer6	
		7	Timer7	
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	
		52	Timer4Active	
		53	Timer5Active	
		54	Timer6Active	

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	55	Timer7Active
	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	ReceiveImageFrameStart0
	129	ReceiveImageFrameStart1
	130	ReceiveImageFrameStart2
	131	ReceiveImageFrameStart3
	144	ReceiveImageFrameEnd0
	145	ReceiveImageFrameEnd1
	146	ReceiveImageFrameEnd2
	147	ReceiveImageFrameEnd3
	160	Fval_0
	161	Fval_1

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		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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