

Hikrobot Co., Ltd.

Camera Link Frame Grabber

User Manual

HIKROBOT

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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 Camera Link 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).
- Caution: If the device has battery, risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.
- Please dispose of the device in strict accordance with the relevant national or regional regulations and standards to avoid environmental pollution and property damage.

Note:

- Check whether the device's package is in good condition, whether there is damage, intrusion, moisture, deformation, etc. before unpacking.
- Check the surface of the device and accessories for damage, rust, bumps, etc. when unpacking.
- Check whether the quantity and information of the device and accessories are complete after unpacking.
- Store and transport the device according to the storage and transport conditions of the device, and the storage temperature and humidity should meet the requirements.
- It is strictly prohibited to transport the device in combination with items that may affect or damage the device.
- 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 Camera Link frame grabber supports Base, Medium, Full, and 80-bit configuration modes based on the Camera Link protocol. It adopts 1 GB on-board memory to cache images. The frame grabber provides SDK interface and complies with Genlcam standard for secondary development.

2.2 Key Feature

- Supports Camera Link protocol with each SDR connector accessing up to 6.8 Gbps data transfer speed theoretically.
- Supports PoCL with each channel providing 4 W at most.
- Adopts multiple I/O connectors for input and output.
- Provides SDK and supports GenTL protocol for secondary development.
- Complies with Genlcam standard.

 **Note**

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

Chapter 3 Appearance, Connector and Indicator

3.1 Appearance

Note

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

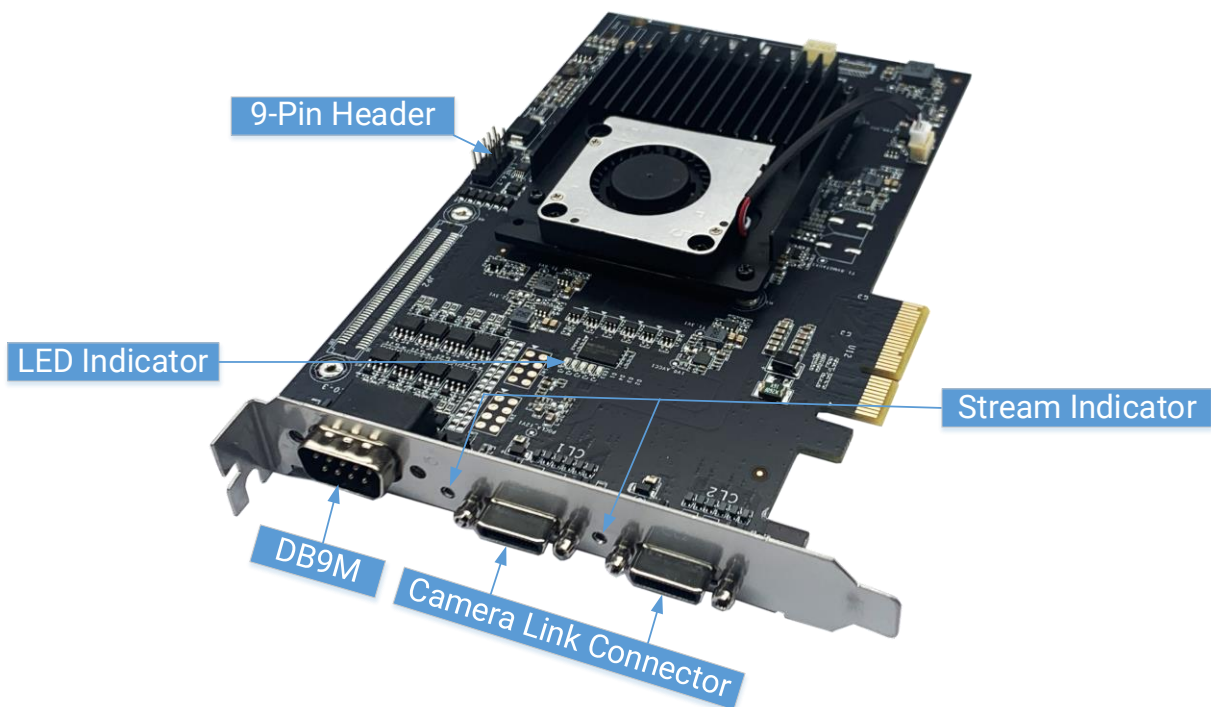


Figure 3-1 Appearance of MV-GC1102IOL

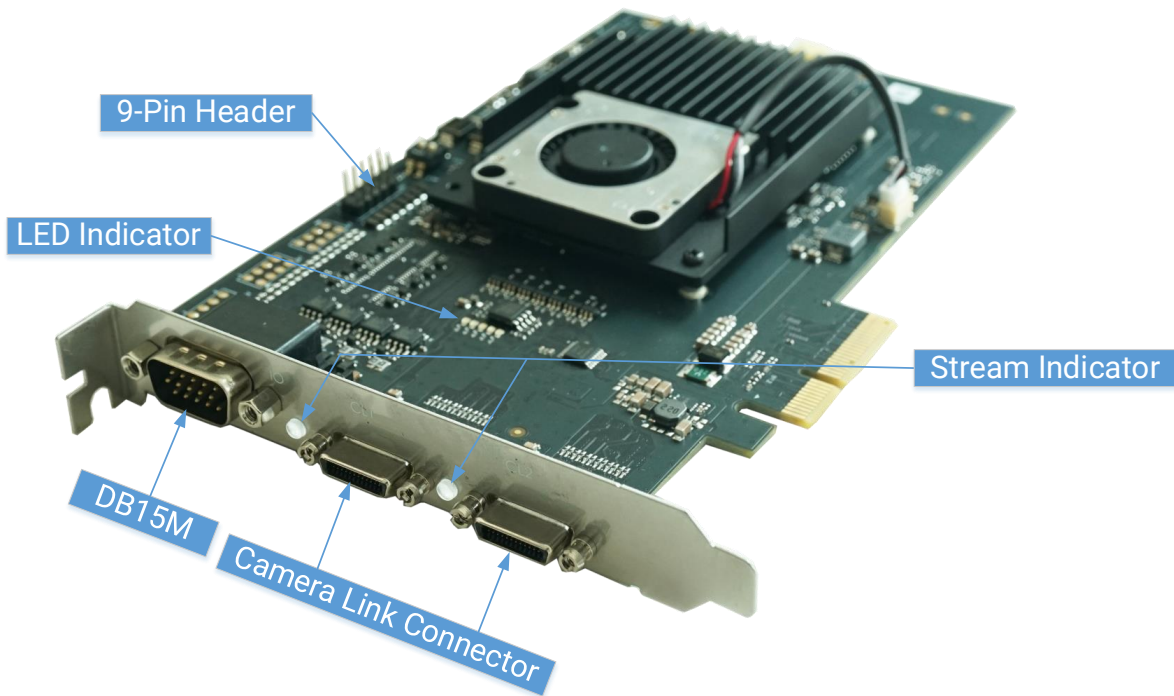


Figure 3-2 Appearance of MV-GC1002-V2

3.2 I/O Connector

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

- MV-GC1102IOL frame grabber adopts DB9 male connector and 9-pin header, and you can use I/O trigger cable and I/O adapter cable to wire the device.
- MV-GC1002-V2 frame grabber adopts DB15 male connector and 9-pin header, and you can use I/O trigger cable and I/O adapter cable to wire the device.

I/O Trigger Cable 1

The I/O trigger cable 1 is applicable to MV-GC1102IOL frame grabber. The two ends of the cable are DB9F and open to have 4 input and output signals, as shown below. The DB9 (female connector) is connected to the DB9 male socket on the frame grabber.

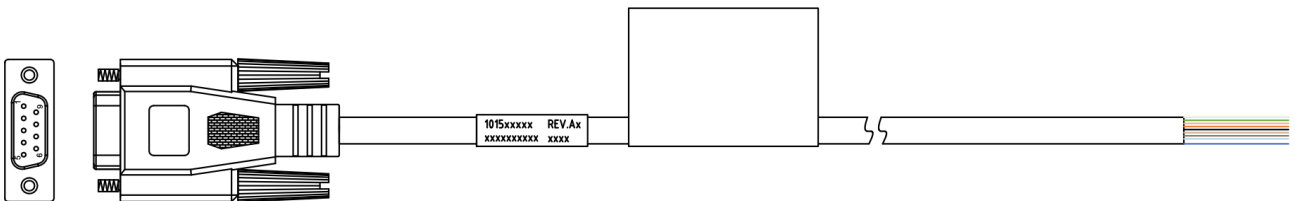


Figure 3-3 I/O Trigger Cable 1



Figure 3-4 Appearance of I/O Trigger Cable 1

I/O Trigger Cable 2

The I/O trigger cable 2 is applicable to MV-GC1002-V2 frame grabber. The two ends of the cable are DB15F and open to have 7 input and output signals, as shown below. The DB15 (female connector) is connected to the DB15 male socket on the frame grabber.

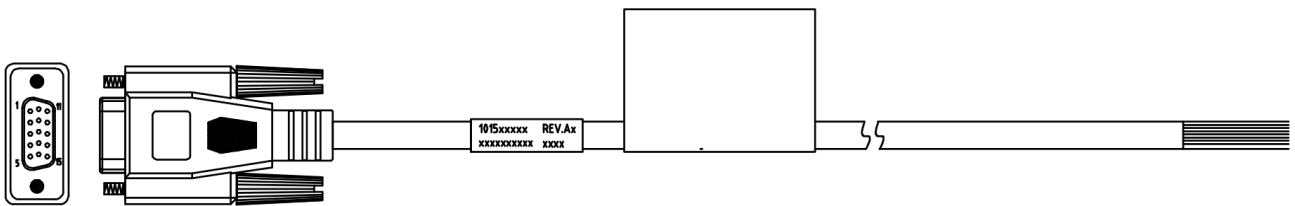


Figure 3-5 I/O Trigger Cable 2

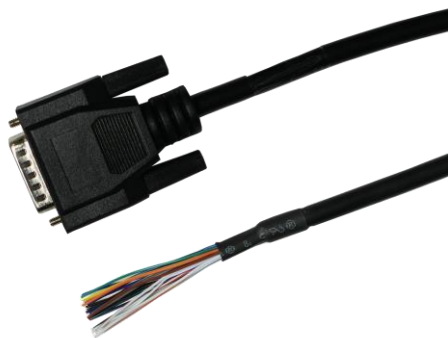


Figure 3-6 Appearance of I/O Trigger Cable 2

I/O Adapter Cable

The I/O adapter cable connects the 9-pin header of the frame grabber at one end, connects

PC at the other end, and connects I/O trigger cable to have four input and output signals.

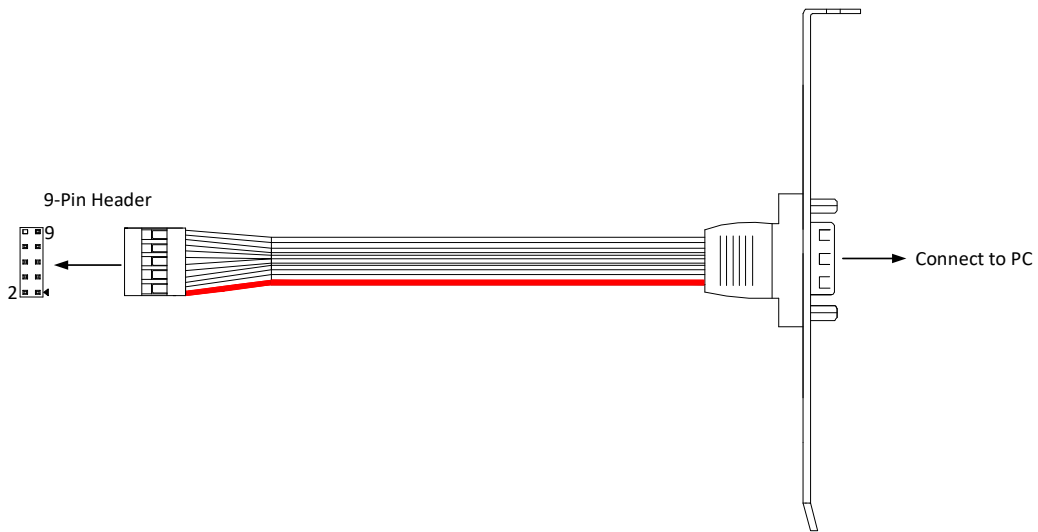


Figure 3-7 I/O Adapter Cable

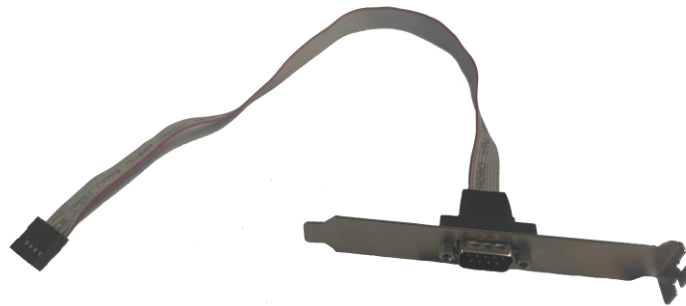


Figure 3-8 Appearance of I/O Adapter Cable

Note

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

3.2.1 DB9 Male Connector

Refer to the figure and table below for the pin definition of the DB9 male connector.



Figure 3-9 DB9 Male Connector

Table 3-1 Pin Definition of DB9 Male Connector

No.	Signal	Description	No.	Signal	Description
1	LINE_0P	Differential input/output IO0 positive.	6	LINE_2P	Differential input/output IO2 positive.
2	LINE_0N	Differential input/output IO0 negative.	7	LINE_2N	Differential input/output IO2 negative.
3	LINE_1P	Differential input/output IO1 positive.	8	LINE_3P	Differential input/output IO3 positive.
4	LINE_1N	Differential input/output IO1 negative.	9	LINE_3N	Differential input/output IO3 negative.
5	GND	Non-isolated I/O ground.	/	/	/

3.2.2 DB15 Male Connector

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

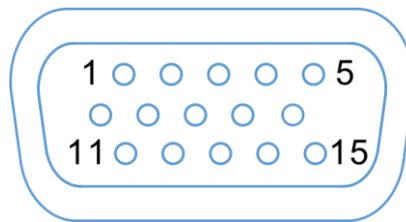


Figure 3-10 DB15 Male Connector

Table 3-2 Pin Definition of DB15 Male Connector

No.	Signal	Description	No.	Signal	Description
5	LINE_0P	Differential input/output IO0 positive.	1	LINE_4P	Differential input/output IO4 positive.
10	LINE_0N	Differential input/output IO0 negative.	6	LINE_4N	Differential input/output IO4 negative.
4	LINE_1P	Differential input/output IO1 positive.	15	LINE_5P	Differential input/output IO5 positive.
9	LINE_1N	Differential input/output IO1 negative.	14	LINE_5N	Differential input/output IO5 negative.
3	LINE_2P	Differential input/output IO2 positive.	13	LINE_6P	Differential input/output IO6 positive.
8	LINE_2N	Differential input/output IO2 negative.	12	LINE_6N	Differential input/output IO6 negative.

No.	Signal	Description	No.	Signal	Description
2	LINE_3P	Differential input/output IO3 positive.	11	GND	Non-isolated I/O ground.
7	LINE_3N	Differential input/output IO3 negative.	/	/	/

3.2.3 9-Pin Header 1

Refer to the figure and table below for the pin definition of the 9-pin header 1, which is applicable to MV-GC1102IOL frame grabber.

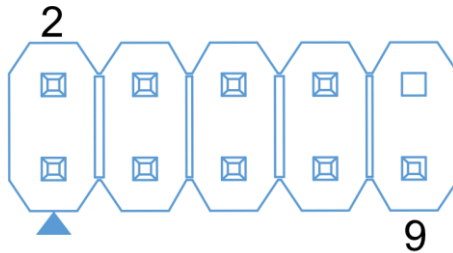


Figure 3-11 9-Pin Header 1

Table 3-3 Pin Definition of 9-Pin Header 1

No.	Signal	Description	No.	Signal	Description
1	LINE_4P	Differential input/output IO4 positive	6	LINE_6P	Differential input/output IO6 positive
2	LINE_4N	Differential input/output IO4 negative	7	LINE_6N	Differential input/output IO6 negative
3	LINE_5P	Differential input/output IO5 positive	8	LINE_7P	Differential input/output IO7 positive
4	LINE_5N	Differential input/output IO5 negative	9	LINE_7N	Differential input/output IO7 negative
5	GND	Non-isolated I/O ground	/	/	/

3.2.4 9-Pin Header 2

Refer to the figure and table below for the pin definition of the 9-pin header 2, which is

applicable to MV-GC1002-V2 frame grabber.

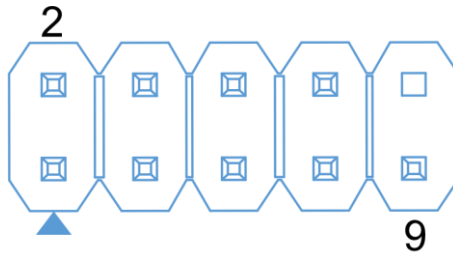


Figure 3-12 9-Pin Header 2

Table 3-4 Pin Definition of 9-Pin Header 2

No.	Signal	Description	No.	Signal	Description
1	LINE_7P	Differential input/output I07 positive	6	LINE_9P	Differential input/output I09 positive
2	LINE_7N	Differential input/output I07 negative	7	LINE_9N	Differential input/output I09 negative
3	LINE_8P	Differential input/output I08 positive	8	LINE_10P	Differential input/output I010 positive
4	LINE_8N	Differential input/output I08 negative	9	LINE_10N	Differential input/output I010 negative
5	GND	Non-isolated I/O ground	/	/	/

3.3 Camera Link Connector

The frame grabber has 2 Camera Link connectors (SDR interface), namely CL1 and CL2, which are used to transfer data and perform serial port communication.

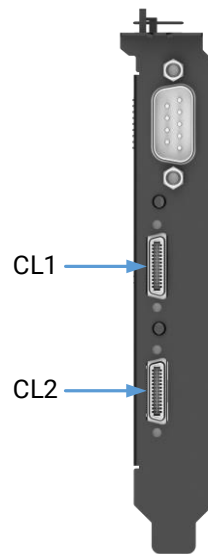


Figure 3-13 Camera Link Connector

3.4 PCIe2.0 Interface

The frame grabber has a PCIe2.0 interface in x4 mode, which can be connected to the host. When in use, the PCIe2.0 interface of the frame grabber can be inserted into the X8 or X16 slots of the host, as shown below.



Figure 3-14 PCIe2.0 Interface

3.5 Indicator

The frame grabber has 2 types of indicators, including stream indicator and LED indicator.

3.5.1 Stream Indicator

There are 2 stream indicators each for CL1 and CL2 connectors, and they are used to indicate the operation status of the frame grabber. Refer to the tables below for details.

Note

When the stream indicator is flashing slowly, its unlit interval is 1 s.

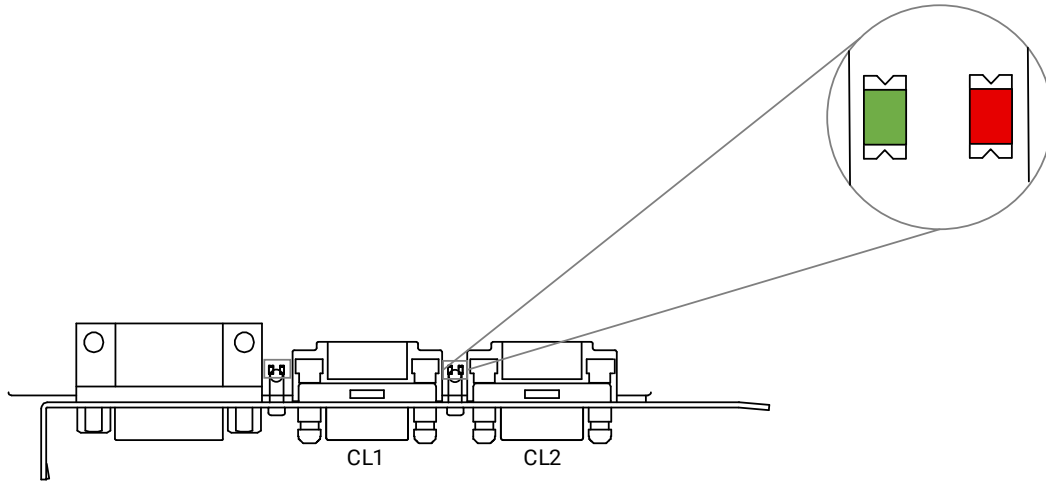


Figure 3-15 Stream Indicator

- The left green indicator is used to detect whether the camera is connected and worked.

Table 3-5 Left Green Indicator Status

Indicator Status	Description
Solid green	The frame grabber detects the camera, but no data is transmitted.
Slow flashing green	The frame grabber detects the camera and data is transmitting.
Unlit	The frame grabber does not detect the camera.

- The right red indicator is used to indicate whether the camera uses PoCL power supply.

Table 3-6 Right Red Indicator Status

Indicator Status	Description
Solid red	The camera uses PoCL power supply.
Unlit	The camera does not use PoCL power supply.

3.5.2 LED Indicator

The frame grabber has 5 LED indicators to indicate the working status of the frame grabber. Refer to the table below for detailed status description.

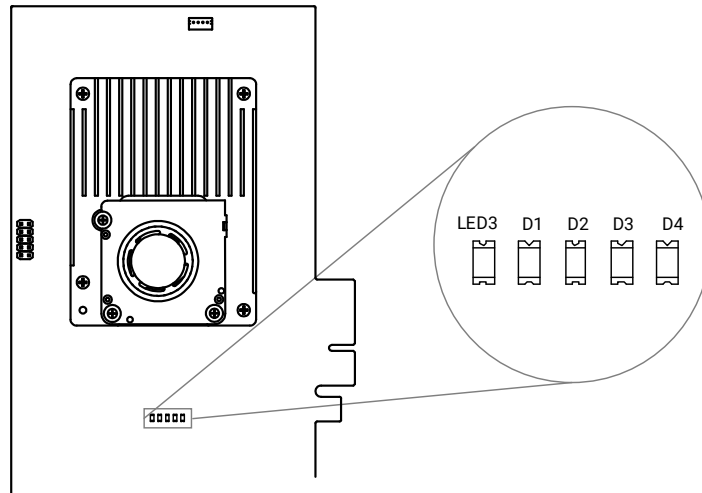


Figure 3-16 LED Indicator

Table 3-7 LED Indicator Status

Indicator Name	Indicator Status	Description
LED3	Red	It detects whether the frame grabber has normal power supply. <ul style="list-style-type: none"> • The frame grabber has normal power supply if the indicator is solid. • The PCIe is not recognized or power supply fails if the indicator is unlit.
D1	Flashing green	The frame grabber works normally.
D2	Green	It detects whether the PCIe recognizes the frame grabber or not. <ul style="list-style-type: none"> • The PCIe recognizes the frame grabber if the indicator is solid. • The PCIe does not recognize the frame grabber if the indicator is unlit.
D3	Solid green	The frame grabber loads normally.
D4	Solid green	The frame grabber's DDR initialization is finished.

Chapter 4 Installation

4.1 Installation Preparation

Figure 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	Camera Link Cable	It is used to connect the frame grabber and cameras.
	I/O Extension Cable	They are used to connect the frame grabber via I/O connector (DB9 male connector or 9-pin header) to other external devices.
	I/O Adapter Cable	
	I/O Wiring Board	
API Function Library	SDK	It is used for the secondary development.
Firmware Package	For example: MV_GC1102_... .zip MV_GC1102_BASE... .zip	It is used to update the frame grabber's firmware. <ul style="list-style-type: none"> • Without suffix: It can connect 1 camera at most, and support 2 links at most. • With BASE suffix: It can connect 2 cameras at most, and support 1 link at most

4.2 Install Frame Grabber

Before You Start

- Power off the host before installing the frame grabber, and then power on the host after the frame grabber is installed to avoid damage to it.
- In order to avoid the damage of human body static electricity to the frame grabber, make sure to clear the body static electricity before installing the frame grabber. Under normal circumstances, you can choose to touch the ground or computer metal shell and other simple methods to quickly release the body static electricity.

Steps

1. Insert the frame grabber into the computer's PCIe2.0 × 4 slot or above.
2. Use screws to fix the frame grabber with the computer.
3. Use Camera Link cables to connect the frame grabber and camera (s).
Here we list some common wirings, and you can wire the camera and the frame grabber according to actual demands.

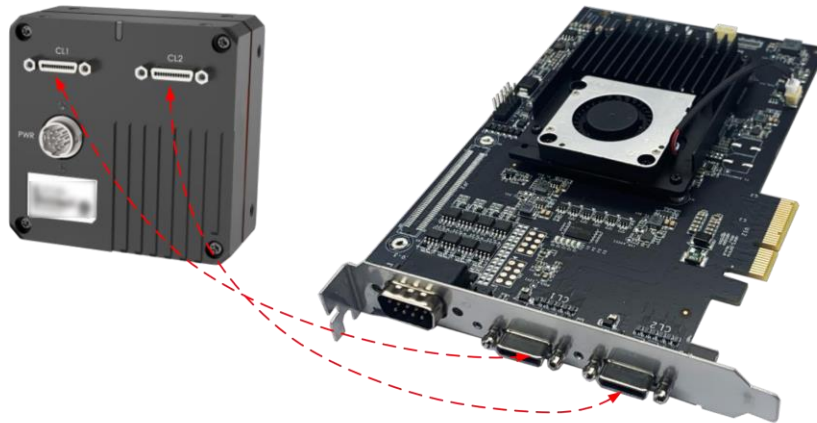


Figure 4-1 Single Camera Wiring

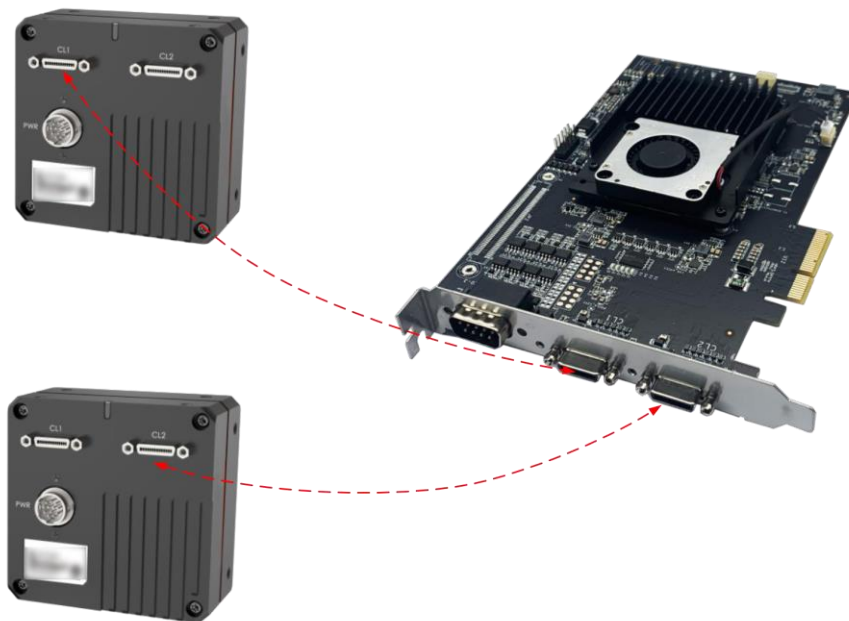


Figure 4-2 Wiring of Two Cameras

Note

- The appearance of camera here is for reference only.
- The quantity of used firmware package may differ by quantity of connected cameras.

- The camera has two Camera Link connectors, and you can use one or two connectors to transfer data. The configuration mode of the camera differs by the quantity of connector used. Refer to the table for details.
-

Figure 4-2 Configuration Mode and Connector Used

Used Connector Quantity	Used Connector	Configuration Mode
1	CL1	Base
2	CL1 (Camera 1), CL1 (Camera 2)	Double Base
2	CL1, CL2	Medium, Full, and 80-bit

4.3 Install Client Software

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

Steps

Note

- The MVS client software is compatible with 32/64-bit Windows 7/10 operating system, and you can download it from <https://en.hikrobotics.com/>.
 - Make sure that the version of MVS is V3.4.1 220324 or later. For more features, it is recommended to install MVS V4.3.0 or later.
 - Make sure that the MVS is closed before installing or updating it.
 - The MVS Tool Kit is installed by default when you install the MVS client software.
 - The graphic user interface may differ by versions of the client software you use.
-

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

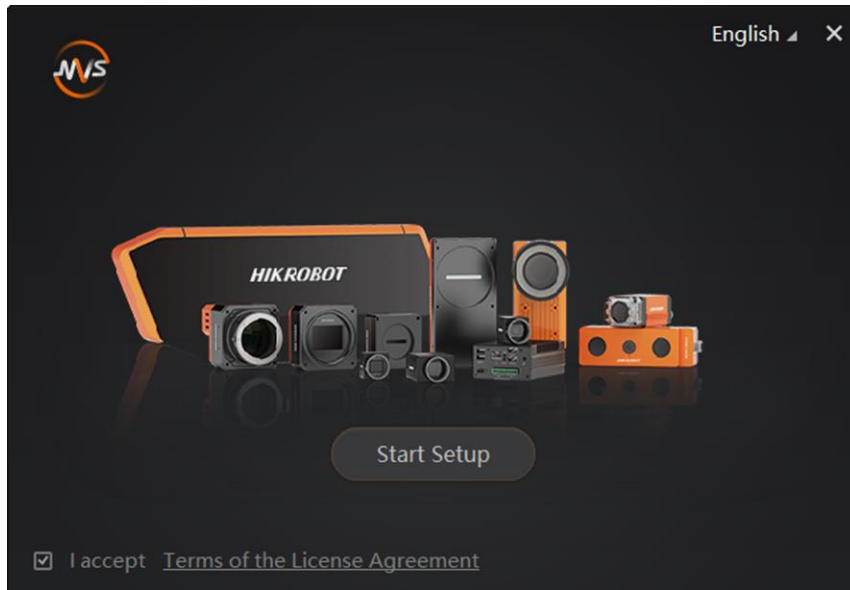


Figure 4-3 Installation Interface

4. Click **Start Setup**.

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

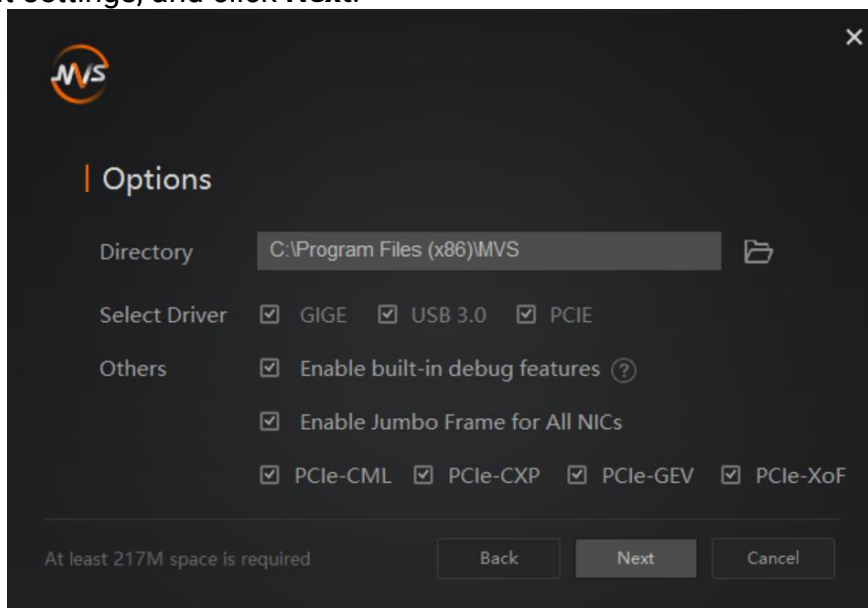


Figure 4-4 Installation Interface

6. Finish the installation according to the interface prompts.

Chapter 5 Basic Operation of Client Software

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

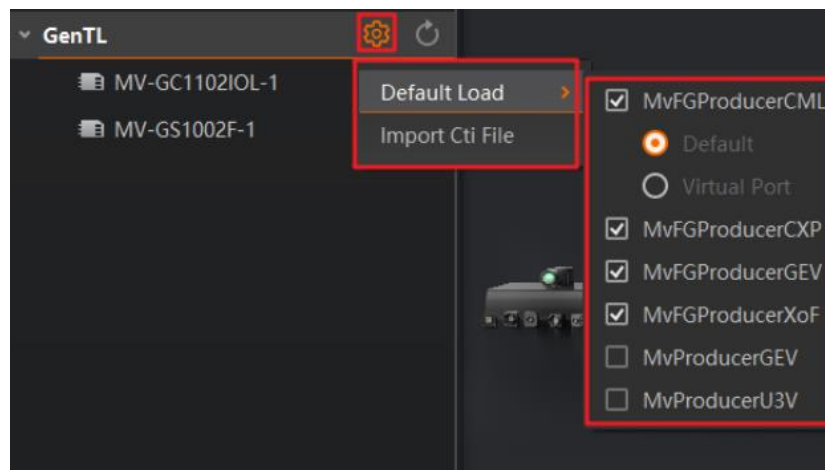


Figure 5-1 Select CTI File

- If you select **Default Load**, check **MvFGProducerCML** and the client software will enumerate the frame grabber automatically.

Note

If you need to enumerate the virtual cameras, you can check the virtual serial port under the MvFGProducerCML, open the CTI file through the virtual serial port, then you can directly enumerate the virtual camera under the frame grabber and perform corresponding operations.

- If you select **Import CTI File**, select **MvFGProducerCML.cti** file from the local PC, and click **Open**.

Note

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

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

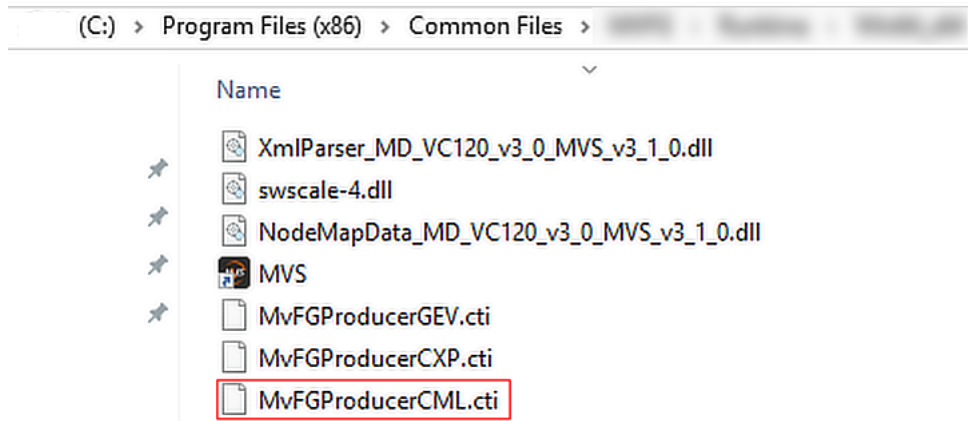



Figure 5-2 Load GenTL Library

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

Note

Refer to the camera's user manual and MVS's user manual for detailed camera operation.

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.

Camera Link Frame Grabber User Manual

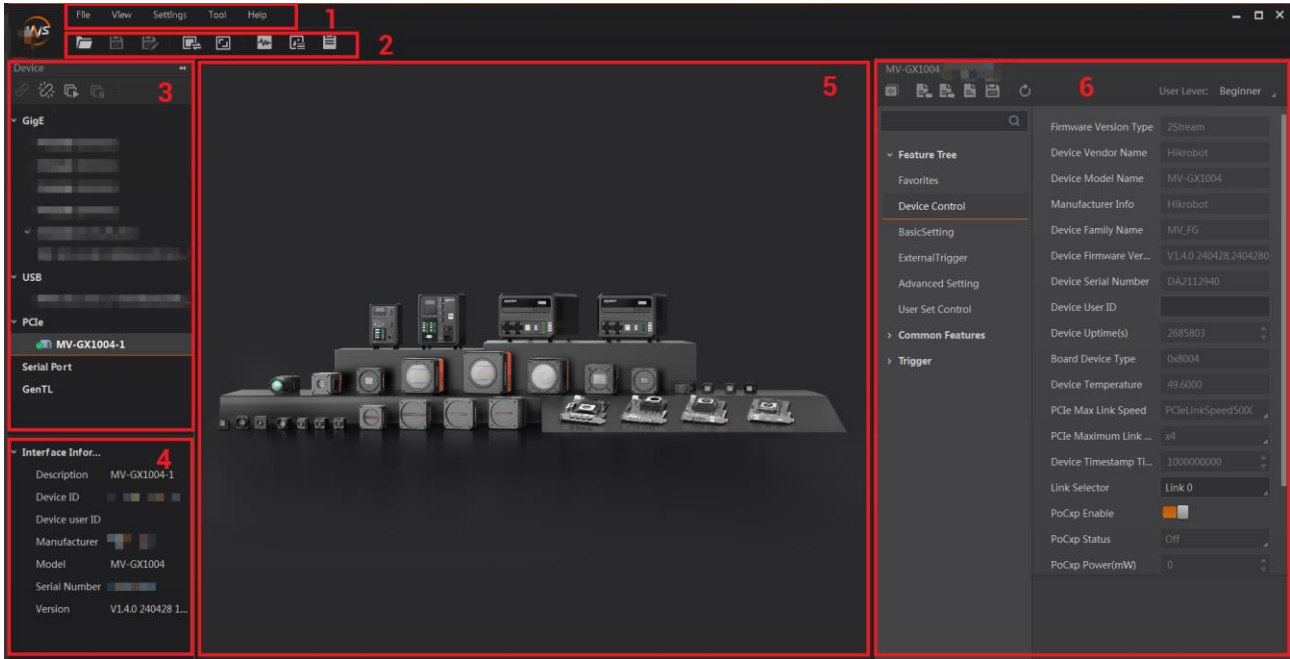


Figure 5-3 Main Window

Table 5-1 Main Window Description

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

Table 5-2 Parameter Description

Parameter Name	Description
Device Control	It displays the basic information about the frame grabber, and you can set the 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.

Parameter Name	Description
Advanced Setting	It allows you to set the timer-related signal source and other parameters, and set and manages 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 Driver Package

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

Note

Contact the technical support to get the patch package for Camera Link frame grabber. The patch package is named with "MVFG_DRIVER_***".

Before You Start

Close the MVS client software before installing the driver package.

Steps

1. Decompress the patch package, open the folder, and double-click the .exe file.
 2. Click Next to continue.
 3. Check the corresponding firmware, and click **Install**. The patch package upgrading includes the client software SDK's and frame grabber's firmware. You should select according to actual needs.
-

Note

- If you need to upgrade the firmware, check **AutoUpgrade**, and select the firmware package to be upgraded.
 - If you do not need to upgrade the firmware, you do not need to check **AutoUpgrade** and only upgrade the client software SDK.
-

4. Wait a few minutes to complete the installation.
 5. Select **Reboot now** or **I want to manually reboot later**, and click **Finish** after selection.
-

Note

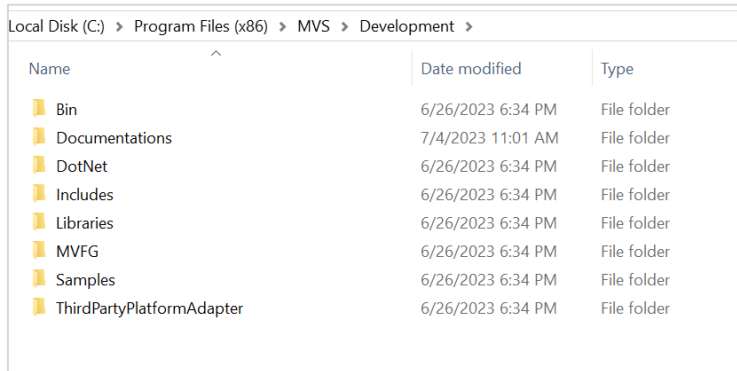
- If the upgraded patch package is the frame grabber's firmware, you must select **Reboot now** to restart the software.
 - If the upgraded patch package is SDK, select **I want to manually reboot later**.
-

5.4 Secondary Development

Users can perform secondary development of the frame grabber. The SDK secondary

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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.



The screenshot shows a Windows Explorer window with the address bar set to 'Local Disk (C:) > Program Files (x86) > MVS > Development'. The main area displays a list of folders with columns for Name, Date modified, and Type. The folders listed are Bin, Documentations, DotNet, Includes, Libraries, MVFG, Samples, and ThirdPartyPlatformAdapter, all of which are file folders.

Name	Date modified	Type
Bin	6/26/2023 6:34 PM	File folder
Documentations	7/4/2023 11:01 AM	File folder
DotNet	6/26/2023 6:34 PM	File folder
Includes	6/26/2023 6:34 PM	File folder
Libraries	6/26/2023 6:34 PM	File folder
MVFG	6/26/2023 6:34 PM	File folder
Samples	6/26/2023 6:34 PM	File folder
ThirdPartyPlatformAdapter	6/26/2023 6:34 PM	File 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 Camera Link signal, transmits the UpLink (control packet) to the camera, and controls the camera to output the corresponding image.

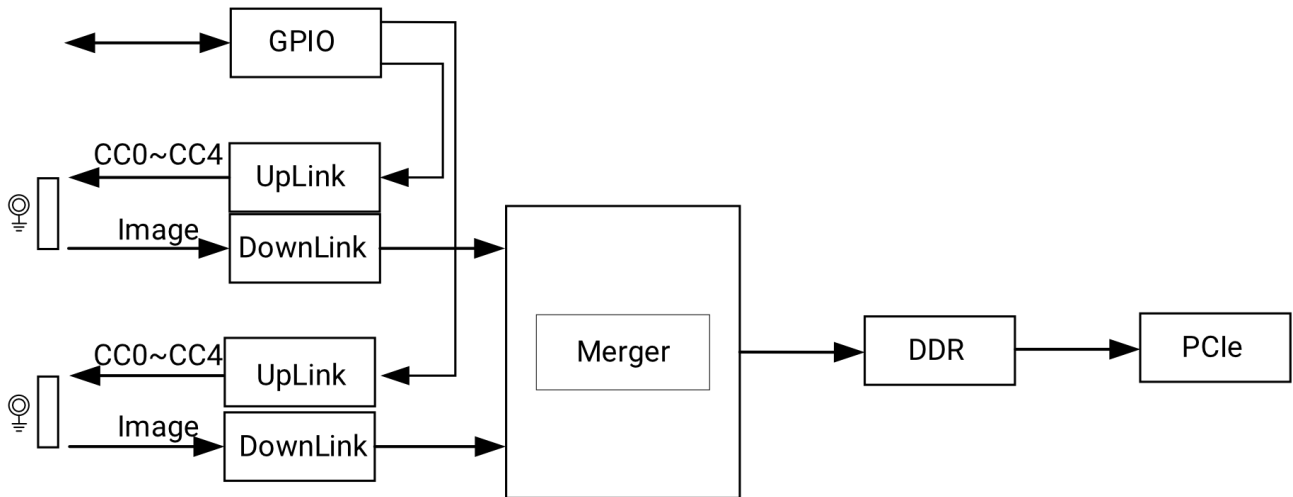


Figure 6-1 Operating Principle

Chapter 7 I/O Introduction

The frame grabber has 8 configurable differential input/output signals (D485 InOut 0 to D485 InOut 7). 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.

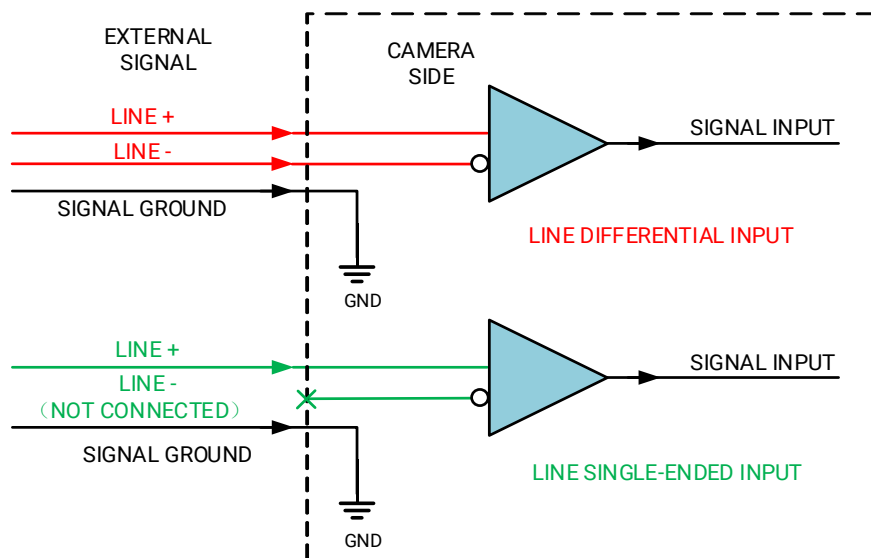


Figure 7-1 Internal Circuit of Differential Input

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

RS-422 Standard Input

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

TTL&LVTTTL Standard Input

If the differential input adopts TTL&LVTTTL standard signal, and its input electrical feature

requirement is shown below.

Table 7-1 Electrical Feature Requirement of TTL&LVTTTL

Voltage Range	Definition
0 VDC to 1 VDC	Level low.
1 VDC to 3 VDC	Unstable voltage, and it is not recommended to use it.
3.3 VDC to 12 VDC	<ul style="list-style-type: none"> ● MV-GC1102IOL: Line 0/1/4/5/6/7 level high ● MV-GC1002-V2: Line 7 to Line 10
3.3 VDC to 24 VDC	<ul style="list-style-type: none"> ● MV-GC1102IOL: Line 2/3 level high ● MV-GC1002-V2: Line 0 to Line 6

Note

The upper limit voltage of Line 0/1/4/5/6/7 is 13 V, and upper limit voltage of Line 2/3 is 26.3 V.

7.1.2 Differential Output Circuit

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

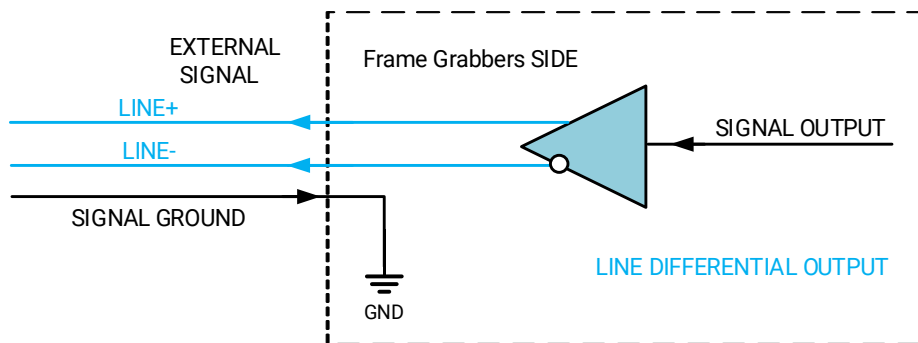


Figure 7-2 Internal Circuit of Differential Output

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

7.2 I/O Wiring

7.2.1 Input Wiring

The frame grabber receives input signals to trigger the camera to acquire images. The input

signals include differential signal and single-ended signal.

Note

- Make sure that the hardware trigger signals have been configured as input signal.
- Wirings may differ by different signal sources.
- Line 0 to Line 6 support 3.3 VDC to 24 VDC, and Line 7 to Line 10 support 3.3 VDC to 12 VDC.

The wiring is shown below if differential signal source provides trigger signal.

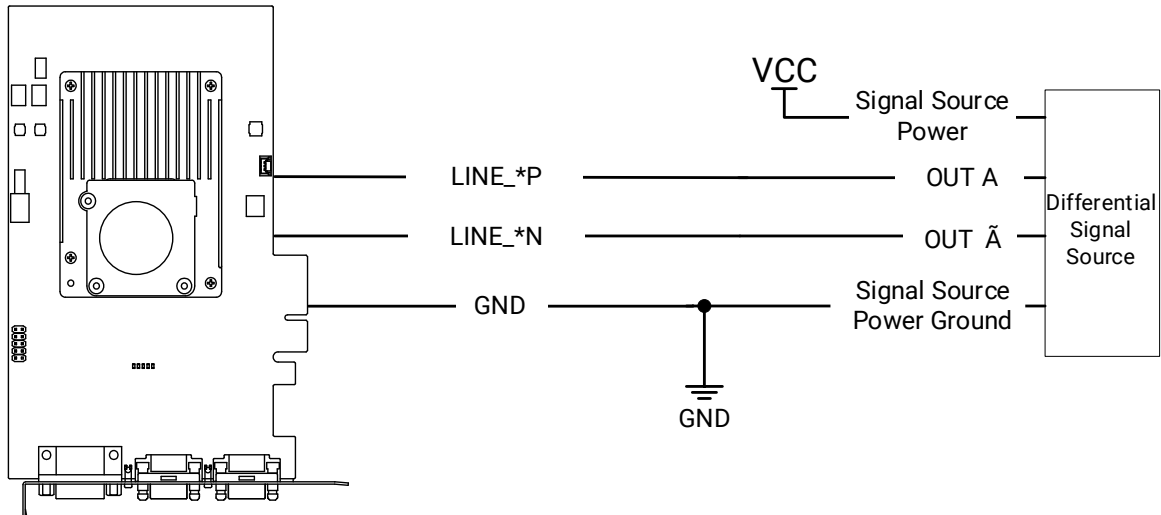


Figure 7-3 Differential Input Wiring

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

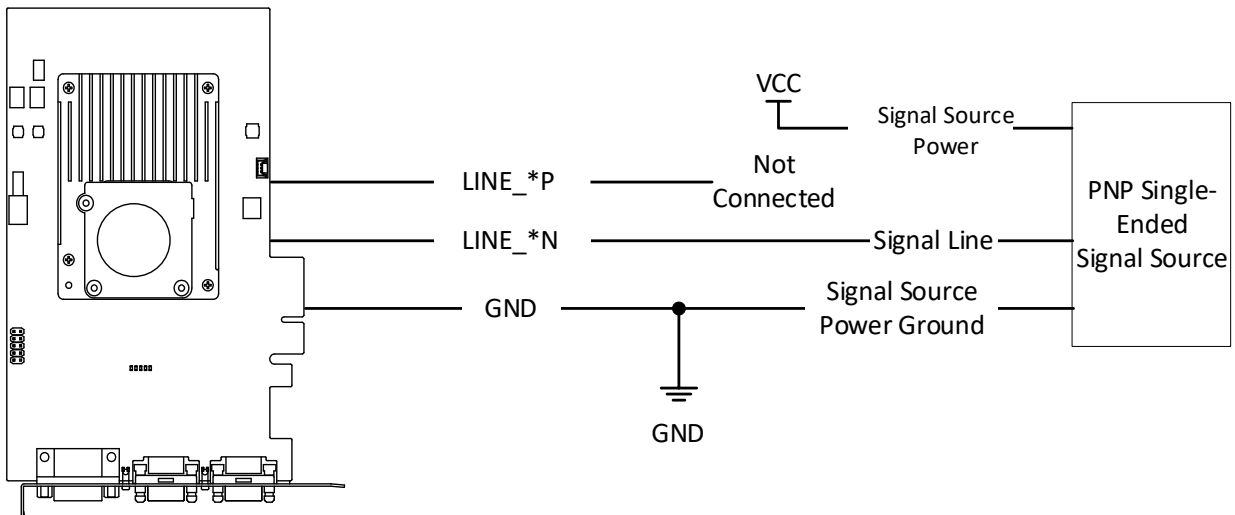


Figure 7-4 PNP Single-Ended Input Wiring (Without Pull-Down Resistor)

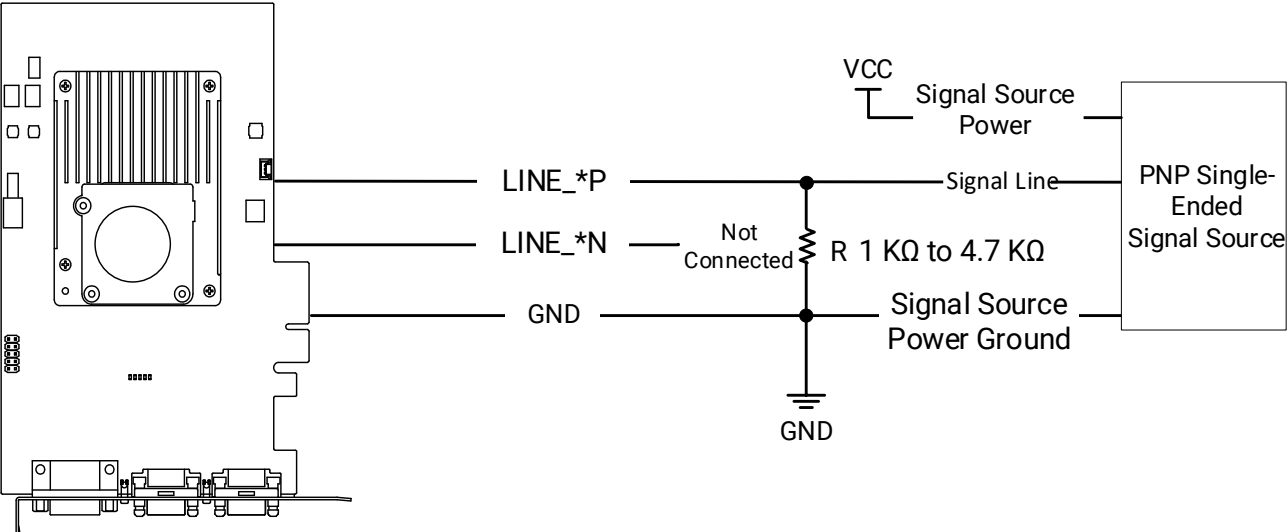


Figure 7-5 PNP Single-Ended Input Wiring (with Pull-Down Resistor)

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

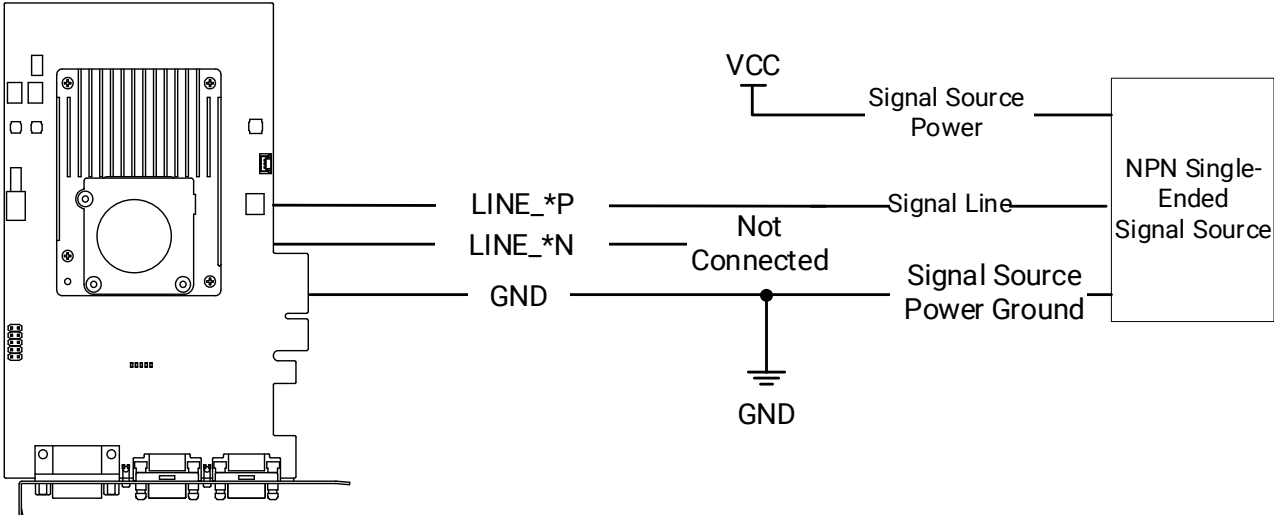


Figure 7-6 NPN Single-Ended Input Wiring (Without Pull-Up Resistor)

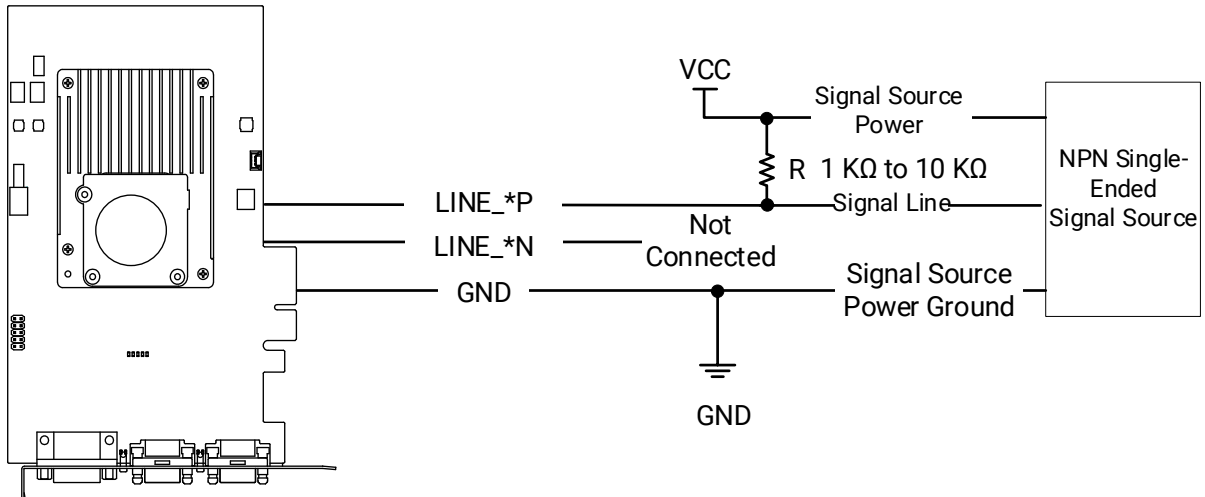


Figure 7-7 NPN Single-Ended Input Wiring (with Pull-Up Resistor)

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.
- MV-GC1102IOL frame grabber is applicable to the first wiring type, while MV-GC1002-V2 is applicable to the second wiring type.

First Wiring Type

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

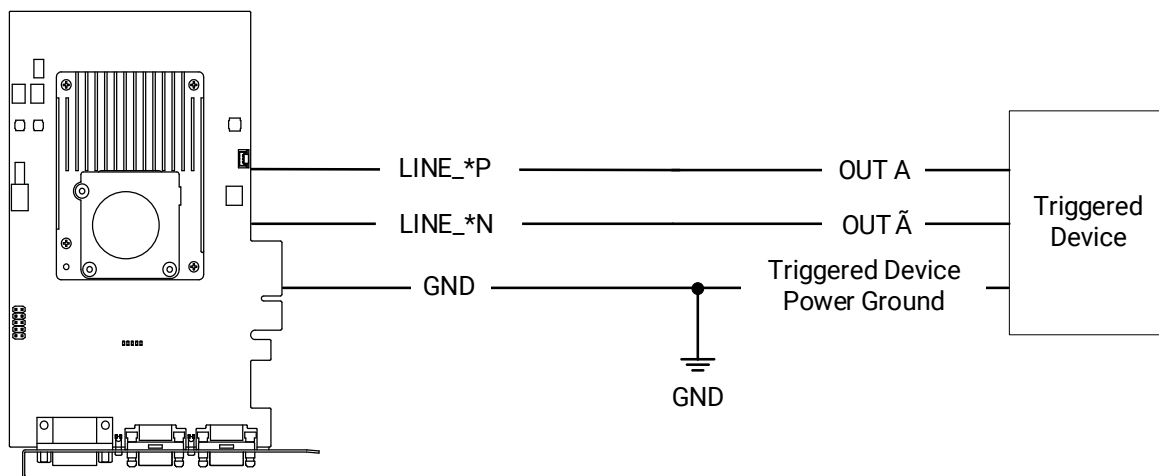


Figure 7-8 Differential Output Wiring

The output voltage is 3.3 V if Line 0/1/4/5/6/7 is configured as single-ended output and the wiring is shown below.

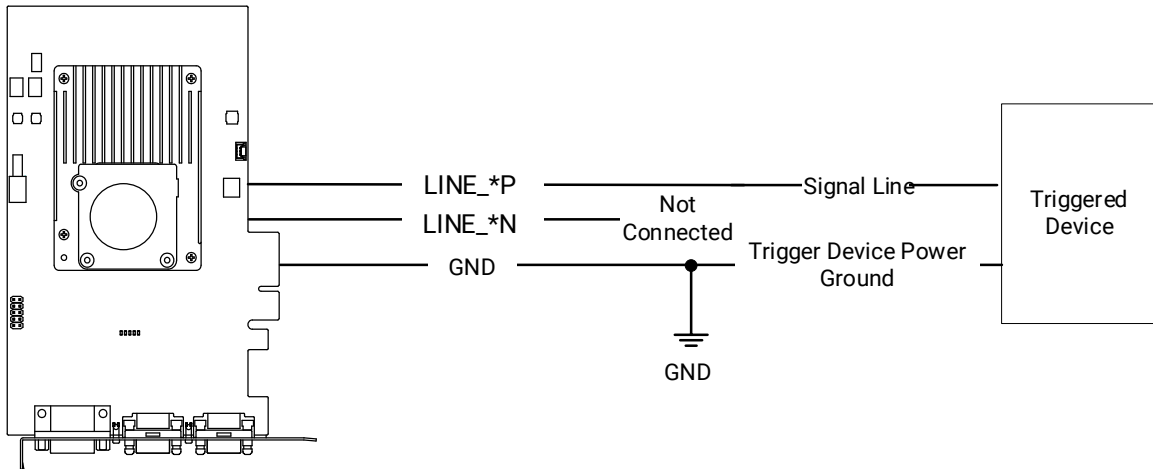


Figure 7-9 Single-Ended Output Wiring (Without Pull-Up Resistor)

Adding pull-up resistor is required if Line 2/3 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.

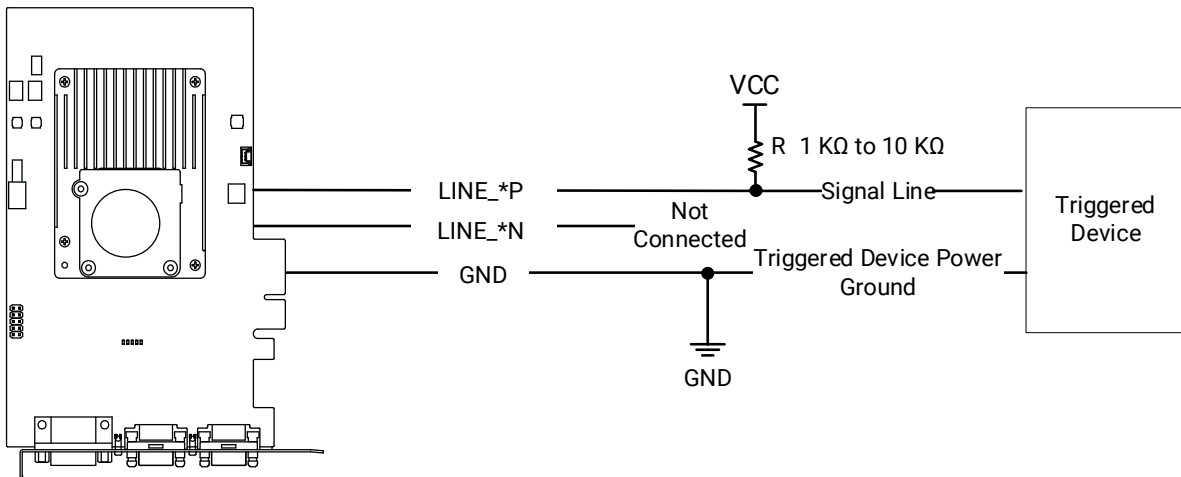


Figure 7-10 Single-Ended Output Wiring (with Pull-Up Resistor)

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

Second Wiring Type

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

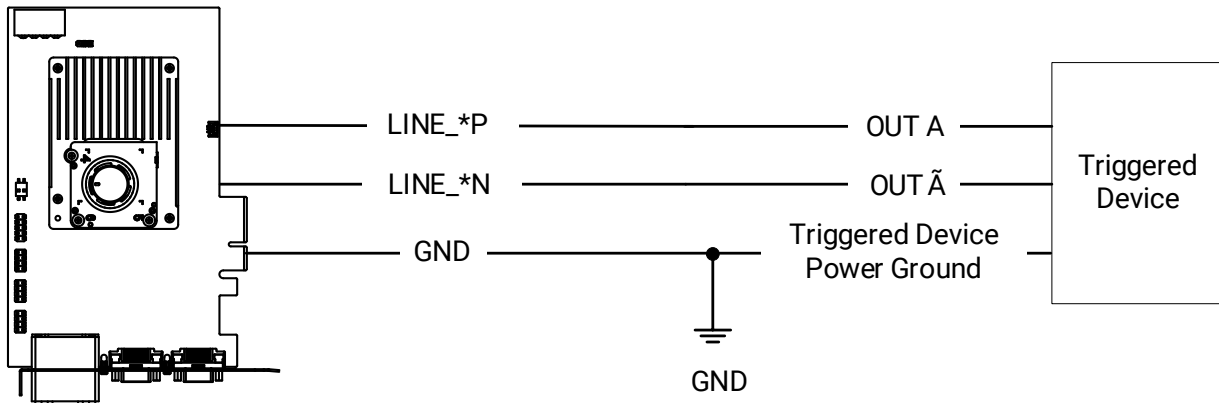


Figure 7-11 Differential Output Wiring

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

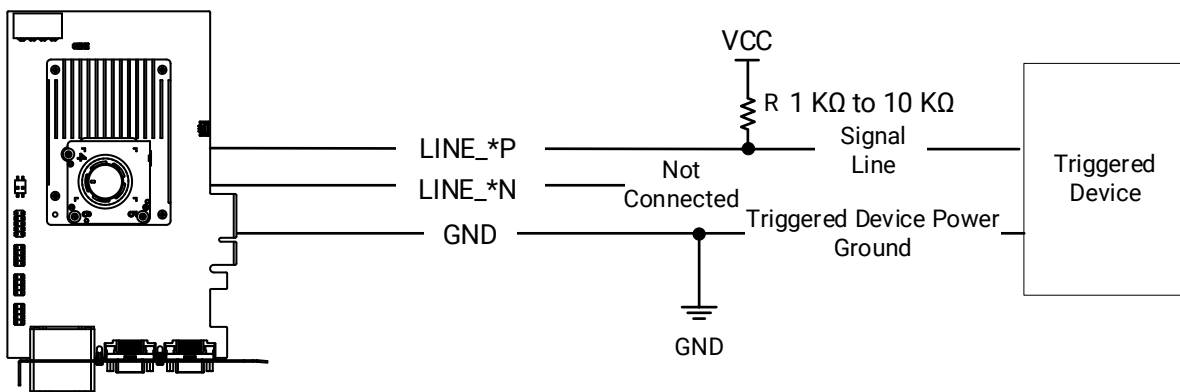


Figure 7-12 Single-Ended Output Wiring (with Pull-Up Resistor)

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

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

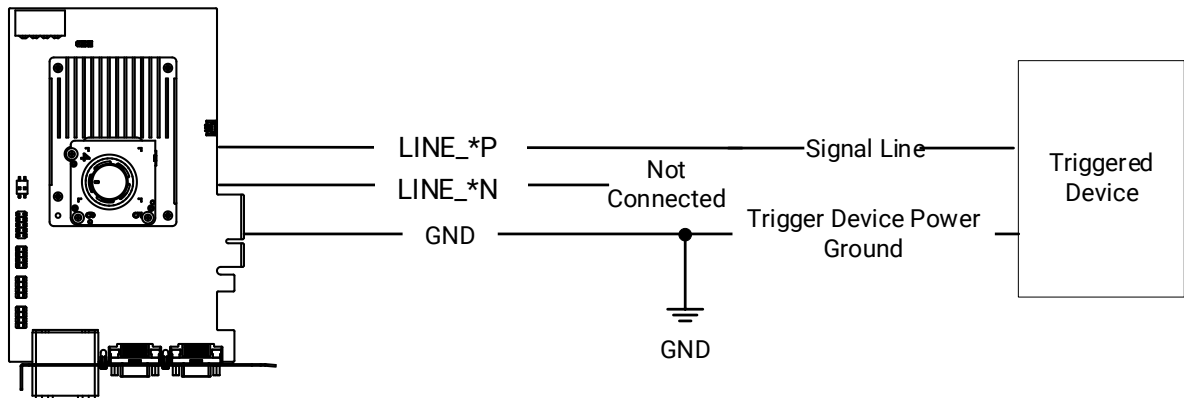


Figure 7-13 Single-Ended Output Wiring (without Pull-Up Resistor)

7.3 Input and Output Signals

The frame grabber has eight configurable differential input/output signals, and you can go to **External Trigger** of the MVS client software to configure them according to actual demands.

- MV-GC1102IOL frame grabber provides 8 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 7) to trigger other devices.
- MV-GC1002-V2 frame grabber provides 11 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 10) to trigger other devices.

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 **Line Selector** according to actual demands.

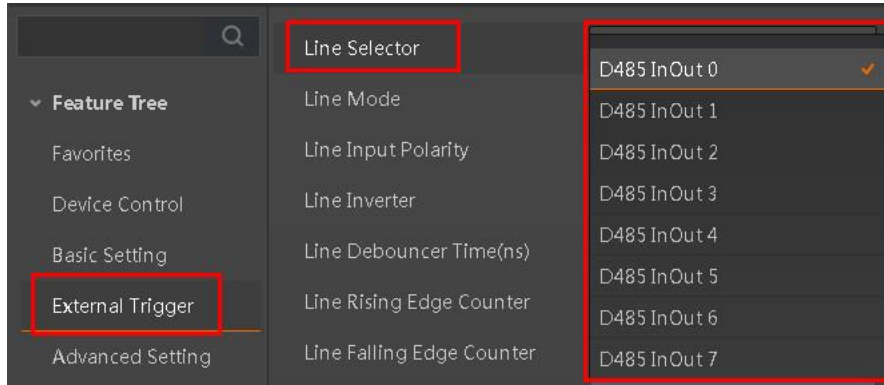


Figure 7-14 Line Selector

2. Select **Input** as **Line Mode**.
3. Set **Line Level** according to actual demands.

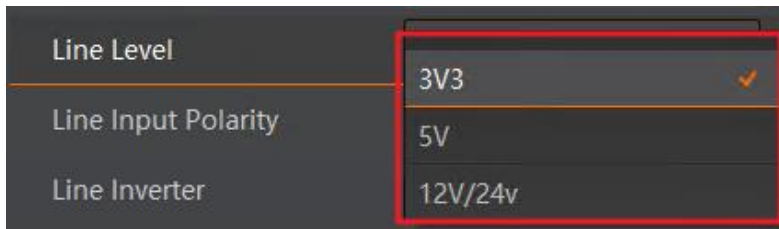


Figure 7-15 Line Level

Note

- Only MV-GC1002-V2 frame grabber supports **Line Level** parameter.
- Only when **Line Selector** is **D485 InOut 0** to **D485 InOut 6**, the **Line Level** parameter can be configured.
- Level thresholds should be set for corresponding external trigger levels.

4. Set **Line Input Polarity** according to actual demands.
 - **SingleEnded**: Receives single-ended input signals.
 - **Differential**: Receives TTL&LVTTTL standard input signals.

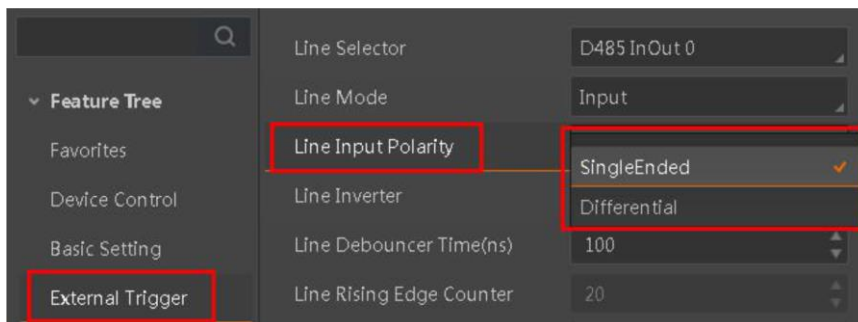


Figure 7-16 Line Input Polarity

Caution

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

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

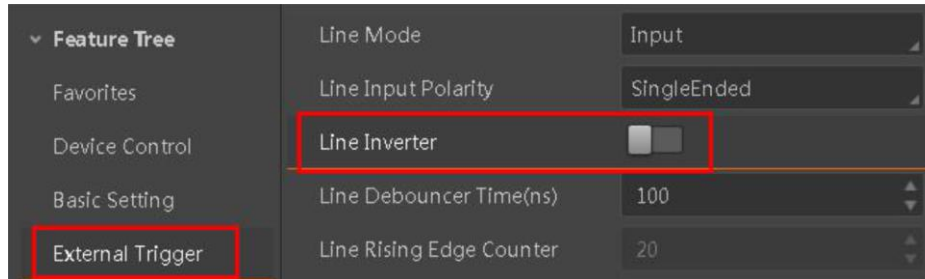


Figure 7-17 Figure 7-17 Enable Line Inverter

Note

The line inverter is disabled by default.

6. (Optional) Set **Line Debouncer Time** 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.

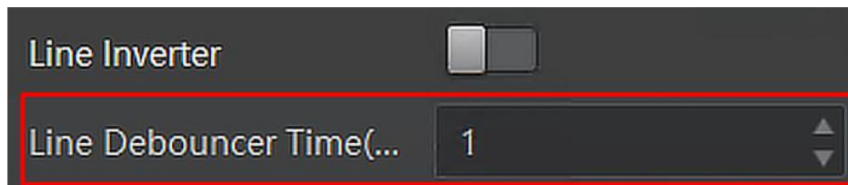


Figure 7-18 Figure 7-18 Set Line Debouncer Time

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.

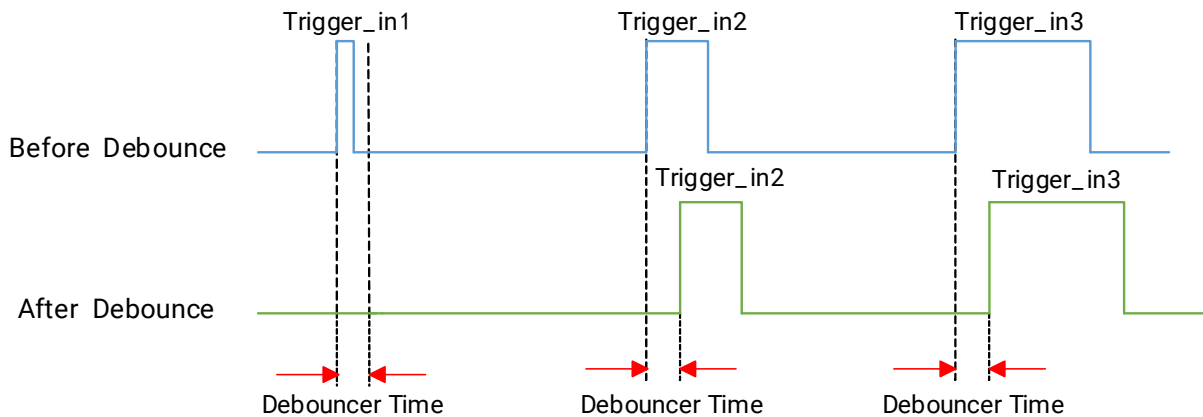


Figure 7-19 Sequence Diagram

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

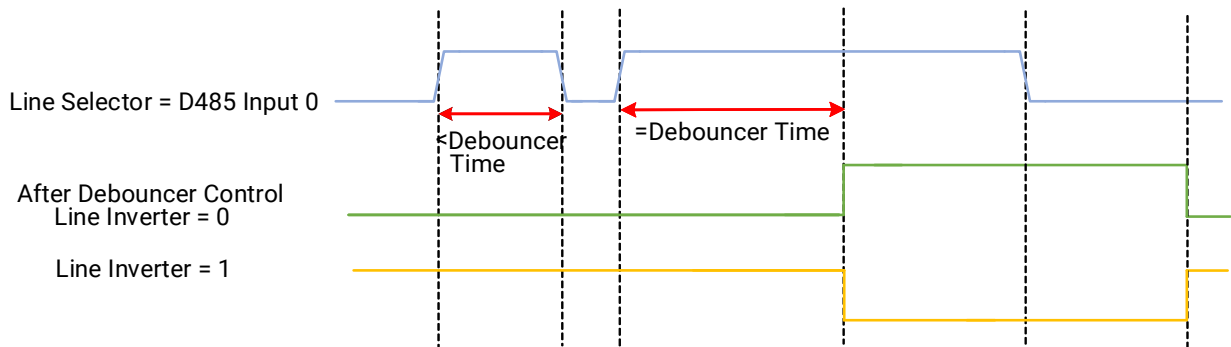


Figure 7-20 Principle

The code below shows the process of setting input signals.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CAMERALINK_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, "LineSelector", "D485InOut0");
MV_CC_SetEnumValueByString(hInterface, "LineMode", "Input");
MV_CC_SetEnumValueByString(hInterface, "LineInputPolarity", "SingleEnded");
MV_CC_SetBoolValue(hInterface, "LineInverter", false);
```

```
MV_CC_SetIntValueEx(hInterface,"LineDebouncerTimeNs",100);
```

```
MV_CC_CloseInterface(hInterface);
```

```
MV_CC_DestroyInterface(hInterface);
```

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.

Note

MV-GC1002-V2 frame grabber supports **Encoder Selector** from **Encoder 0** to **Encoder 3**.

Steps

1. Select **Encoder 0** or **Encoder 1** as **Encoder Selector**.
2. Select corresponding signal sources or off as **Encoder Source A** and **Encoder Source B**.

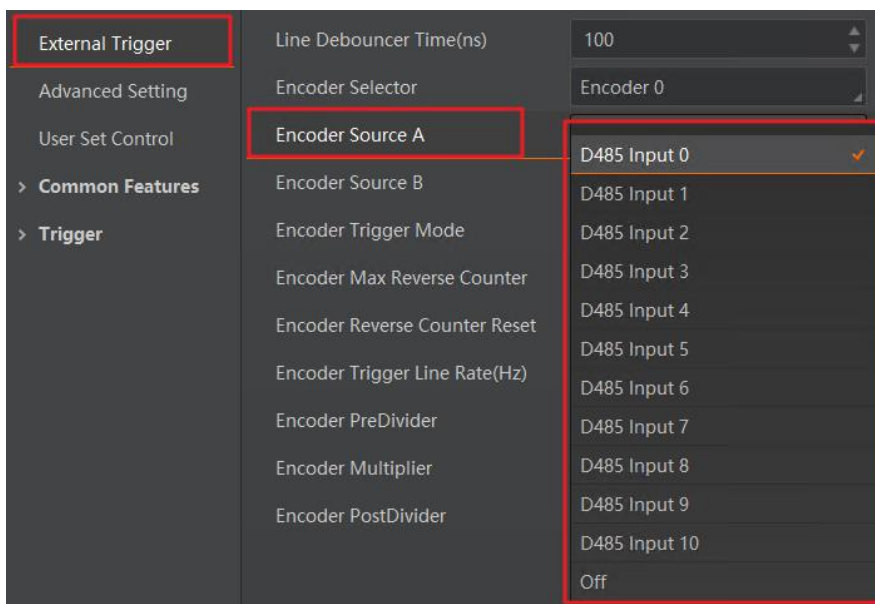


Figure 7-21 Encoder Source

3. Set **Encoder Trigger Mode**.

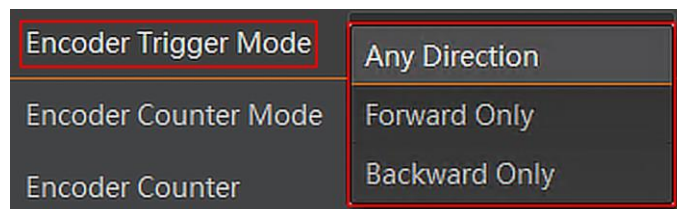


Figure 7-22 Encoder Trigger Mode

- **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.

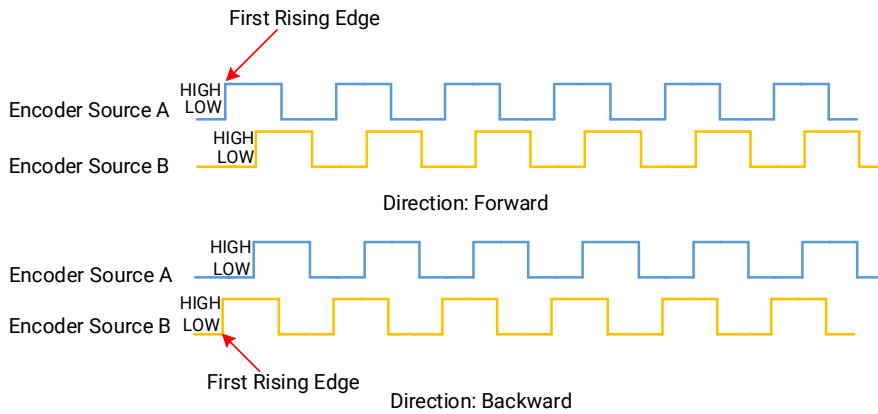


Figure 7-23 Principle

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

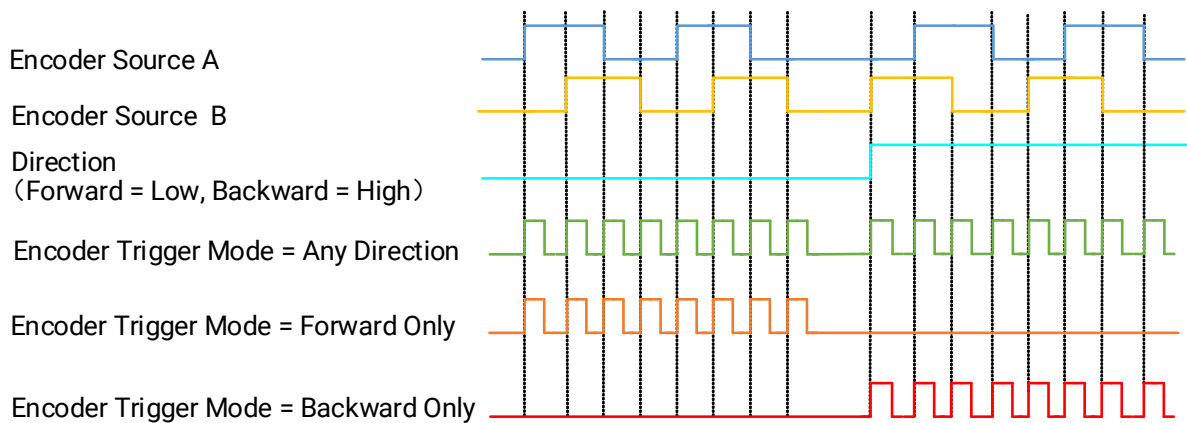


Figure 7-24 Encoder Trigger Signal Mode Principle

4. Set **Encoder Counter Mode**.

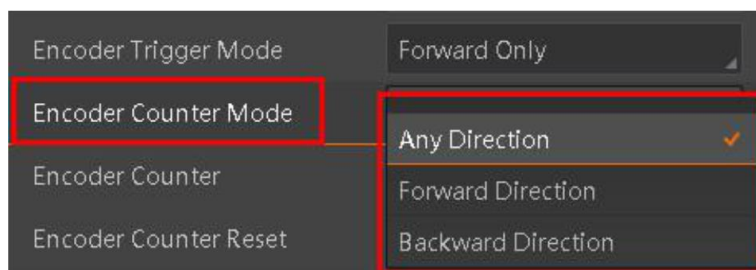


Figure 7-25 Set Encoder Counter Mode

- **Any Direction** means that both forward and backward signals will count.

- **Follow Direction** means that only the forward signal will count.
- **Backward Only** means that only the backward signal will count.

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

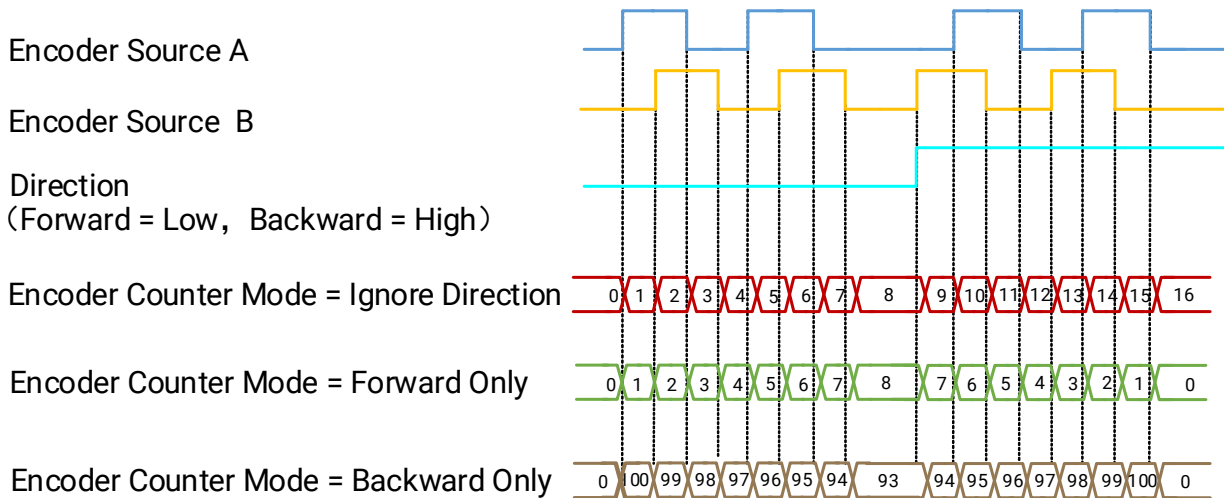


Figure 7-26 Encoder Counter Mode Principle

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 7-27 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.

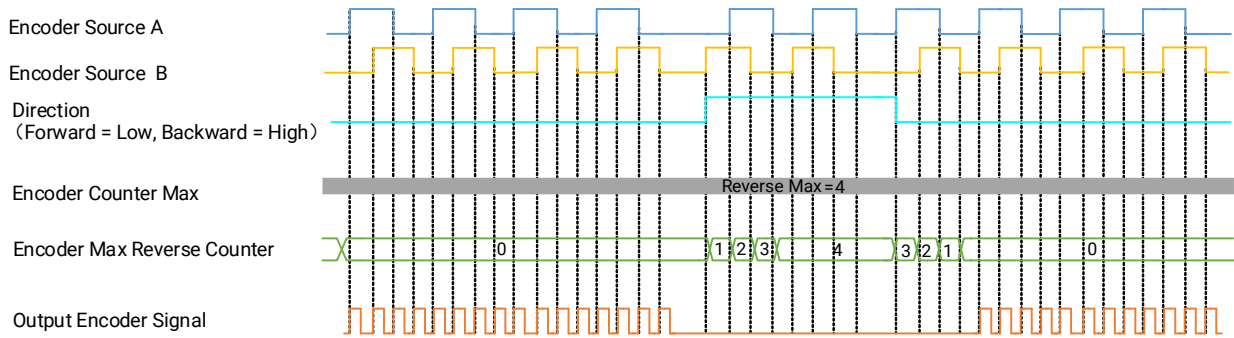


Figure 7-28 Forward Principle

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

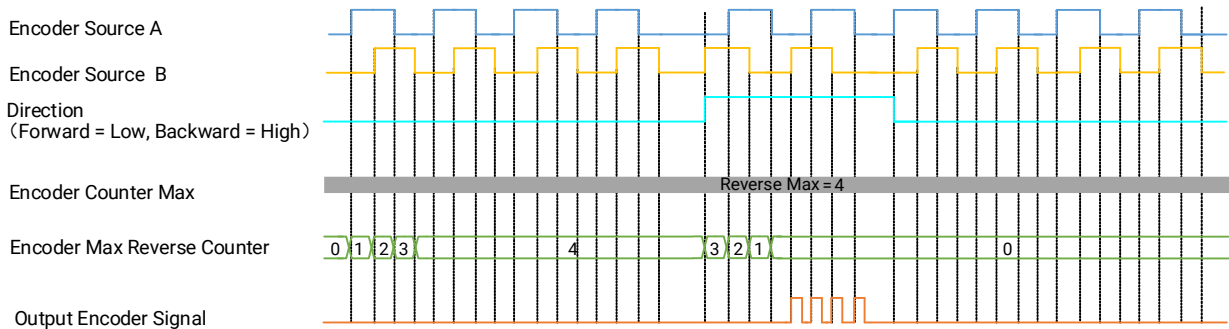


Figure 7-29 Backward Principle

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

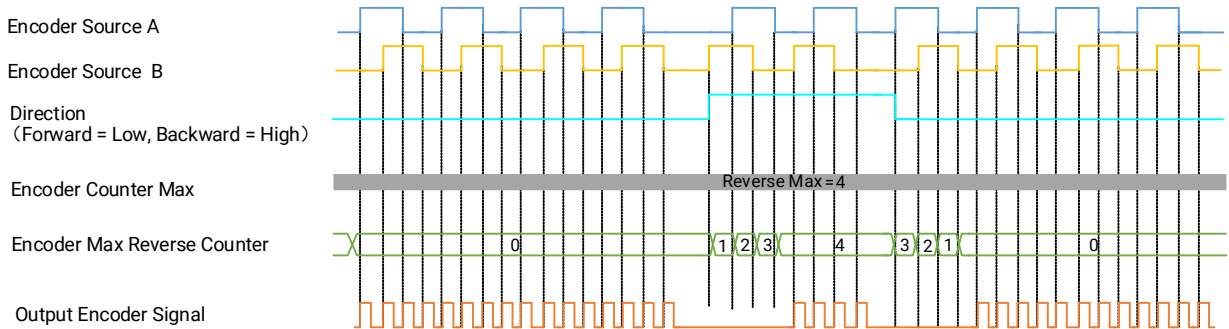


Figure 7-30 Any Direction Principle

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



Figure 7-31 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.

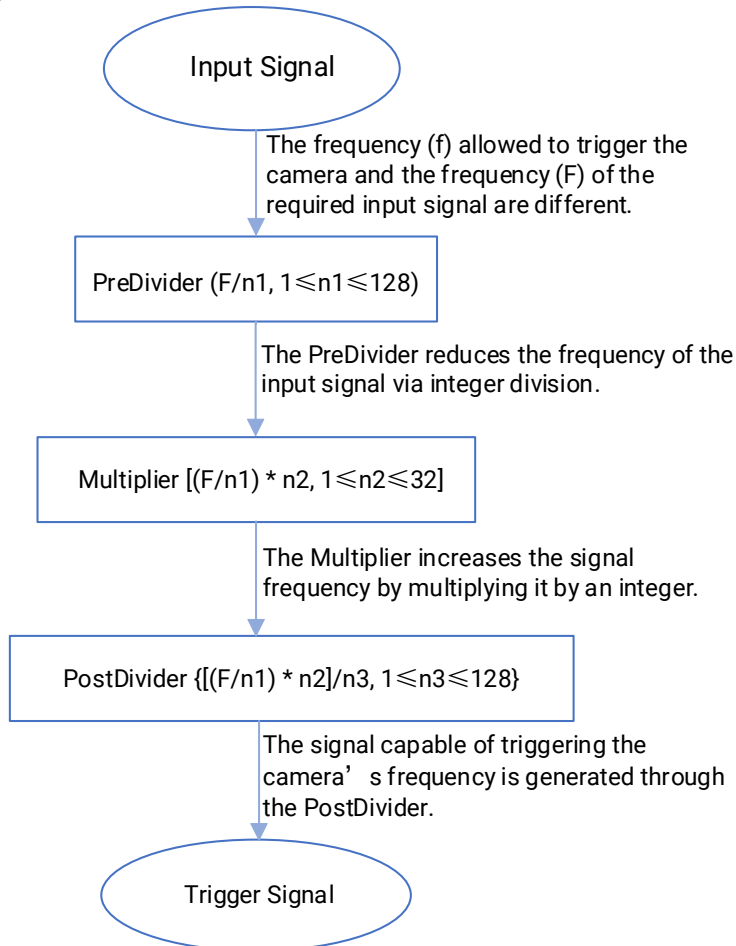


Figure 7-32 Encoder Frequency Converter Control

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.

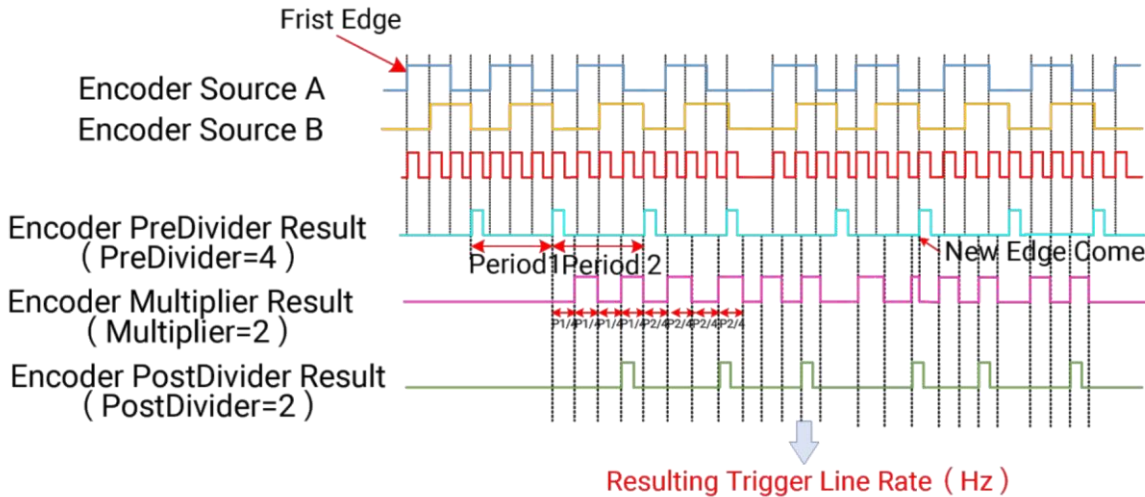


Figure 7-33 Principle of Encoder Frequency Converter

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.

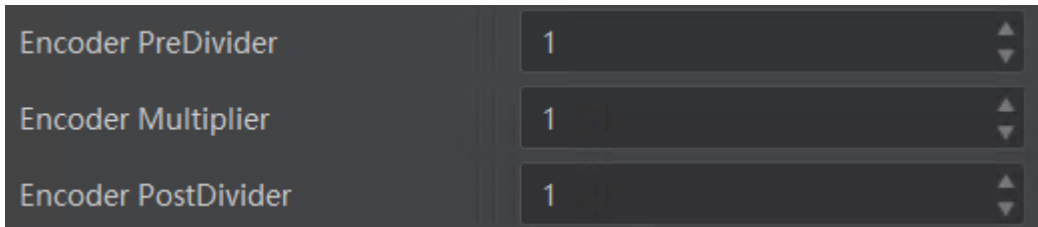


Figure 7-34 Encoder Frequency Converter Control

7.3.4 Timer Control

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

Steps

1. Go to Advanced Setting, and select one timer from **Timer 0** to **Timer 3** as **Timer Selector**.

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

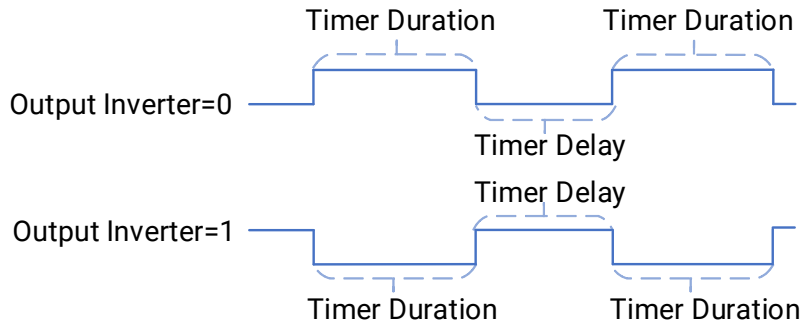


Figure 7-35 Principle of Timer Output

3. Select trigger source from **Timer Trigger Source**.

Note

- If **Continuous** is selected as **Timer Trigger Source**, the frame grabber will output signal continuously according to configured duration. The trigger activation will not impact this process.

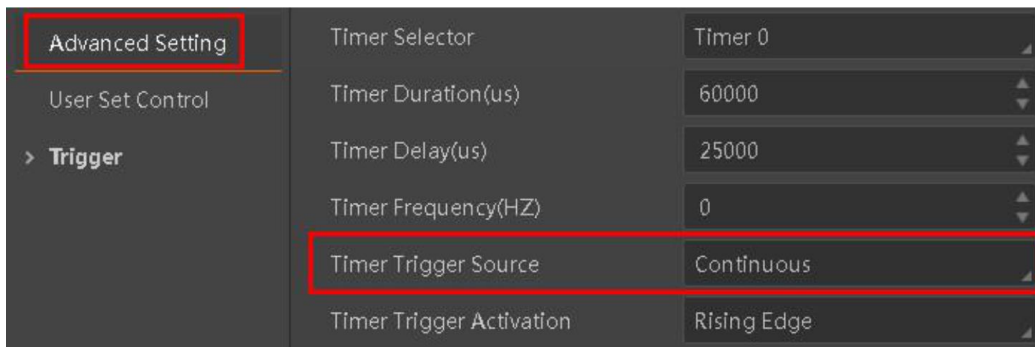


Figure 7-36 Continuous

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

4. 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

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

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.

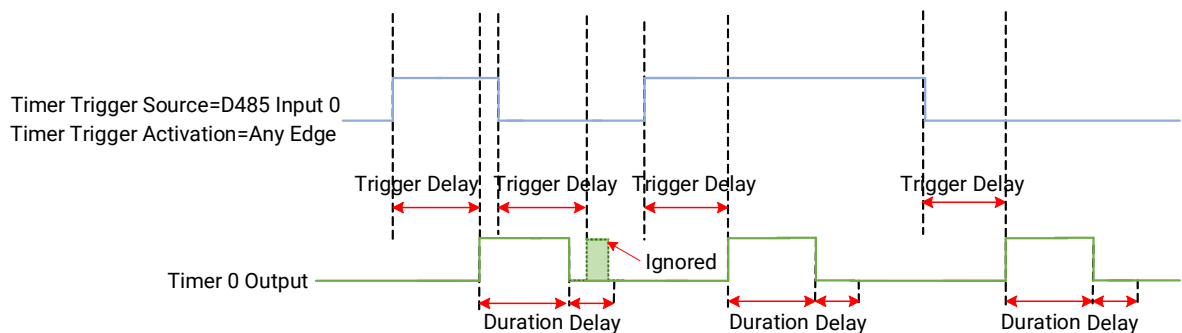


Figure 7-37 Principle

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

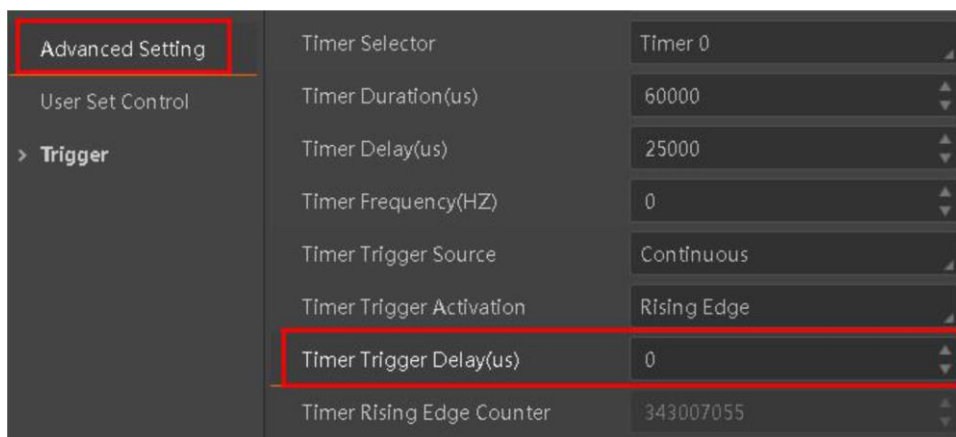


Figure 7-38 Timer Trigger Delay

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.

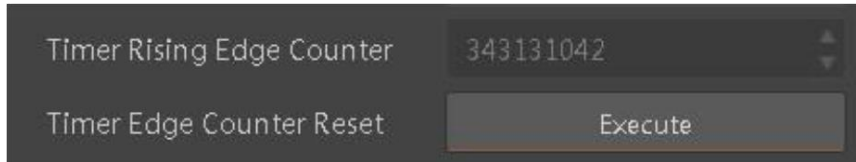


Figure 7-39 Timer Edge Counter

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 Camera Control

When the trigger source of the camera is frame grabber, that is, **Trigger Source** is selected as **CC 1/2/3/4**, the frame grabber can control the input signal of the selected link, and the camera only receives the selected input signal.

Steps

1. Go to **Advanced Setting > CC Selector**, and set **CC Selector** according to actual demands.

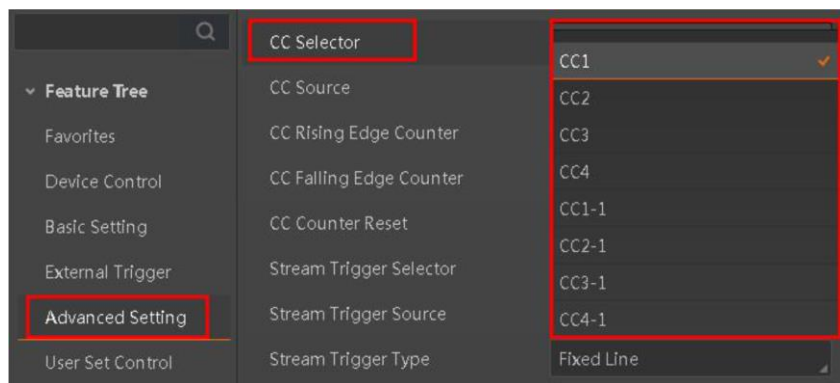


Figure 7-40 Set Camera Control Selector

Note

- If two cameras are connected to the frame grabber, CC1 to CC4 represents the camera connected to the CL1 connector, and CC1-1 to CC4-1 represents the camera connected to the CL2 connector.
- The trigger source on the camera side is displayed as CC1 to CC4. Refer to the user manual of the camera for detailed operations.

2. Select **CC Source** as input source according to actual demands.

Note

- MV-GC1102IOL frame grabber provides 8 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 7) to trigger other devices.
- MV-GC1002-V2 frame grabber provides 11 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 10) to trigger other devices.

- (Optional) View the signal amount of rising edge and falling edge via **CC Rising Edge Counter** and **CC Falling Edge Counter** respectively.



Figure 7-41 View Signal Amount

- (Optional) Click **Execute** in **CC Counter Reset** to reset the counter. The code below shows the process of the frame grabber controls input signals.

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CAMERALINK_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,"CCSelector","CC1");
MV_CC_SetEnumValueByString(hInterface,"CCSource","D485Input0");

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

7.3.6 Signal Countering

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

Steps

- Go to **External Trigger**.
- View the number of rising edge and falling edge in real time via **Line Rising Edge Counter** and **Line Falling Edge Counter**.



Figure 7-42 View Signal Amount

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

7.3.7 Output Signal

The frame grabber supports setting multiple output signals that can be sent to external devices via the frame grabber.

Steps

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

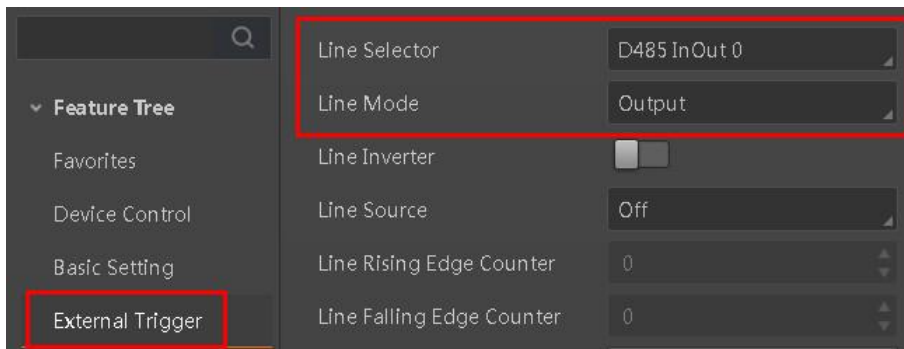


Figure 7-43 Set Output Signal

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

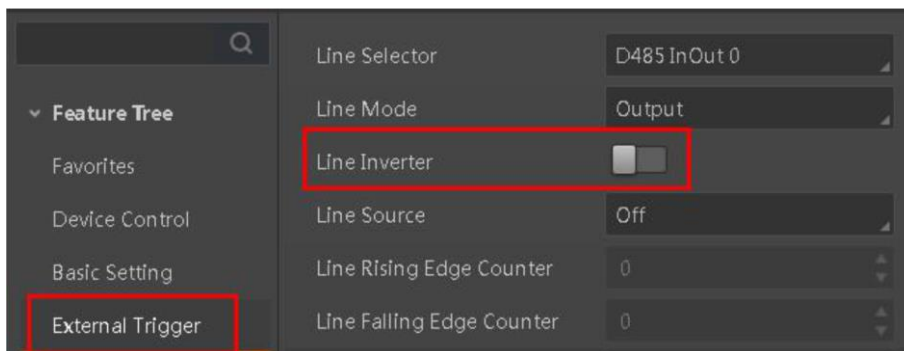


Figure 7-44 Enable Line Inverter

Note

The line inverter is disabled by default.

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

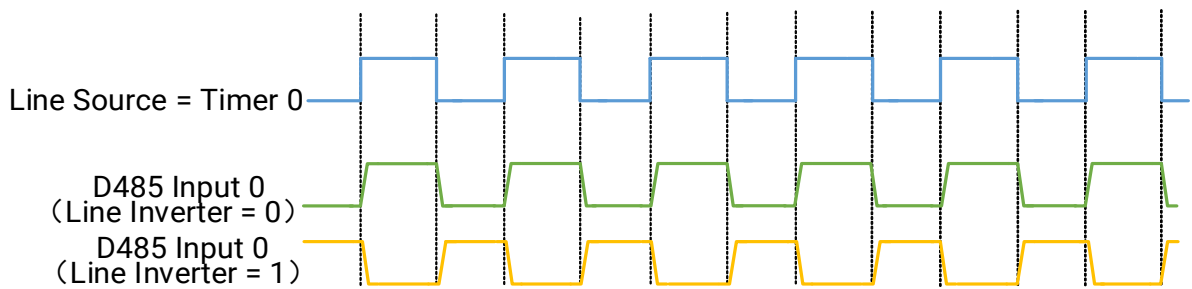


Figure 7-45 Principle

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

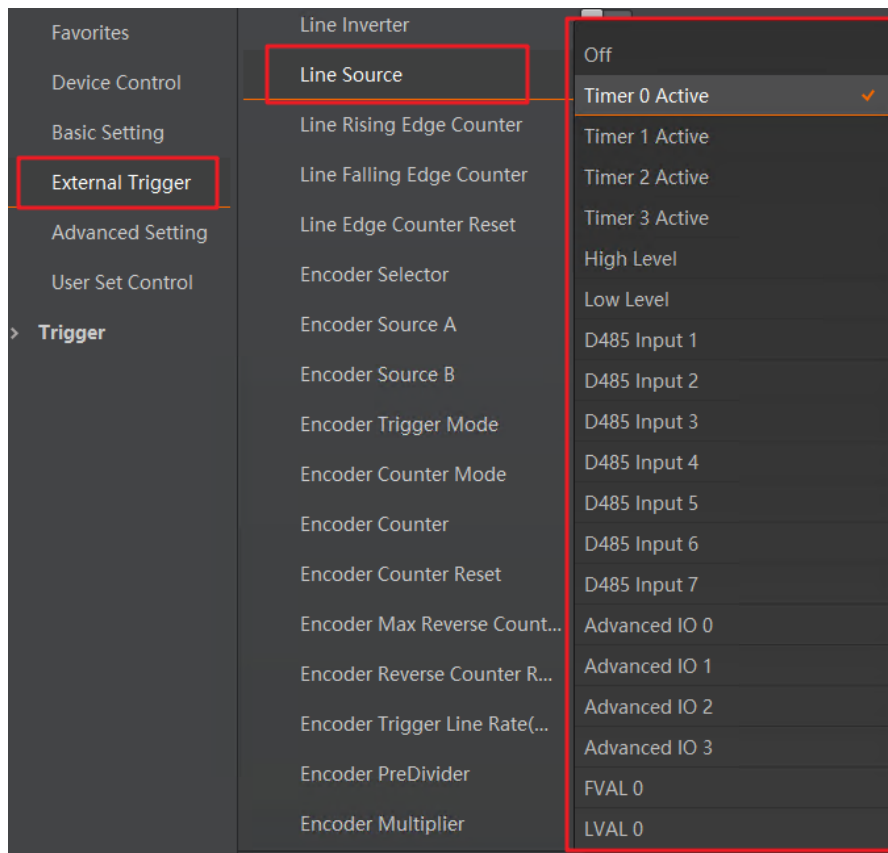


Figure 7-46 Select Line Source

Note

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**.

The code below shows the process of setting output signals.

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

```
MV_CC_EnumInterfaces(MV_CAMERALINK_INTERFACE, &stInterfaceList);  
unsigned int nInterfaceIndex = 0;  
void* hInterface = NULL;  
MV_CC_CreateInterface(&hInterface, stInterfaceList.plInterfaceInfos[nInterfaceIndex]);  
MV_CC_OpenInterface(hInterface, NULL);  
  
MV_CC_SetEnumValueByString(hInterface,"LineSelector","D485InOut0");  
MV_CC_SetEnumValueByString(hInterface,"LineMode","Output");  
MV_CC_SetBoolValue(hInterface,"LineInverter",false);  
MV_CC_SetEnumValueByString(hInterface,"LineSource","Timer0Active");  
  
MV_CC_CloseInterface(hInterface);  
MV_CC_DestroyInterface(hInterface);
```

7.3.8 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.

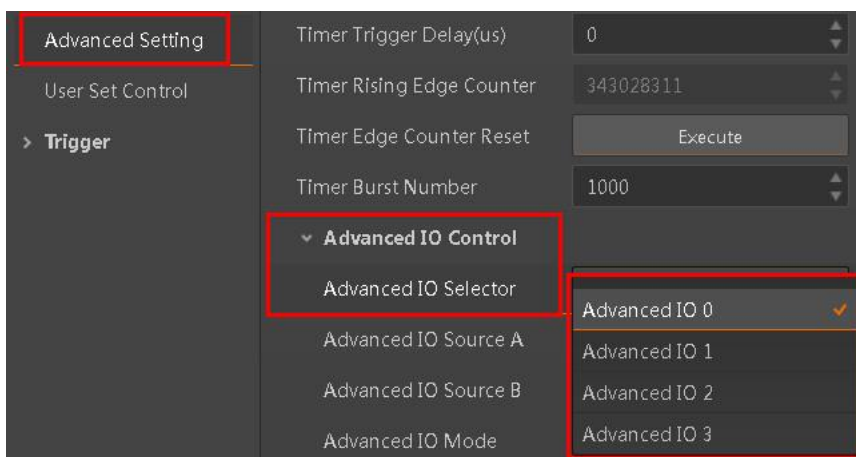


Figure 7-47 Advanced IO Selector

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

 **Note**

- MV-GC1102IOL frame grabber provides 8 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 7) to trigger other devices.
- MV-GC1002-V2 frame grabber provides 11 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 10) to trigger other devices.

4. Set **Advanced IO Mode** according to actual demands.

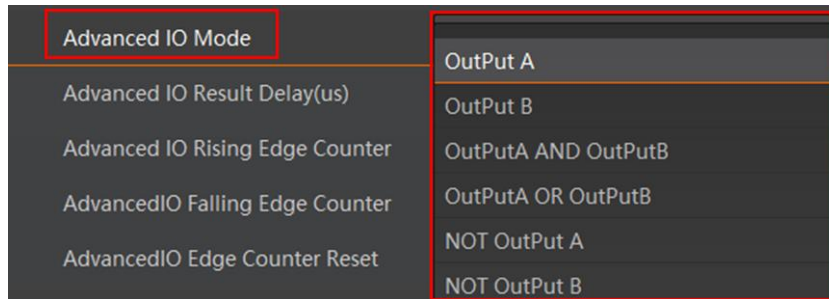


Figure 7-48 Advanced IO Mode

Table 7-5 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.
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.

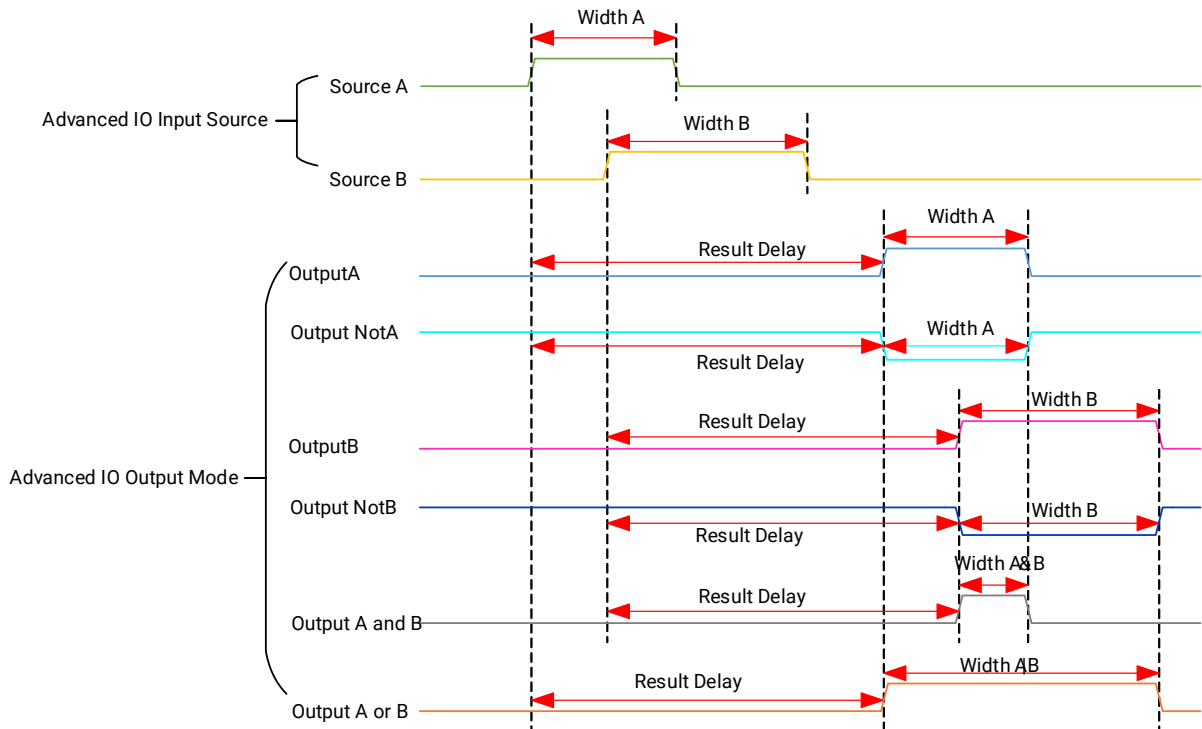


Figure 7-49 Principle of Advanced IO Mode

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

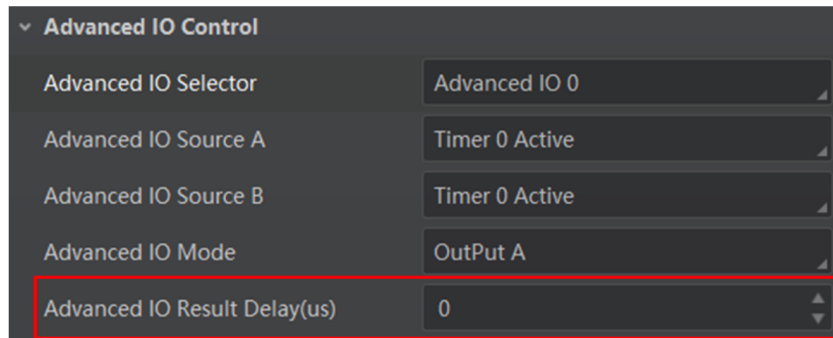


Figure 7-50 Set Advanced IO Result Delay

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



Figure 7-51 View Signal Amount

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

Chapter 8 Frame Grabber Trigger

8.1 Set 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.

Steps

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

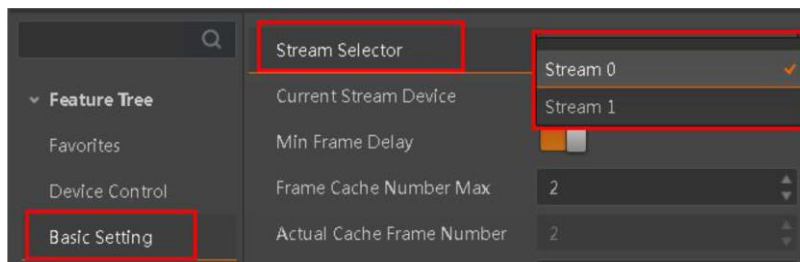


Figure 8-1 Stream Selector

Note

- **Stream 0** corresponds to the camera connected to the frame grabber' CL1 connector and **Stream 1** corresponds to the camera connected to the frame grabber' CL2 connector.
- If only one camera is connected to the frame grabber, the client software displays **Stream 0** only.
- The trigger source on the camera side should be selected as CC1 to CC4. Refer to the user manual of the camera for detailed operations.

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.

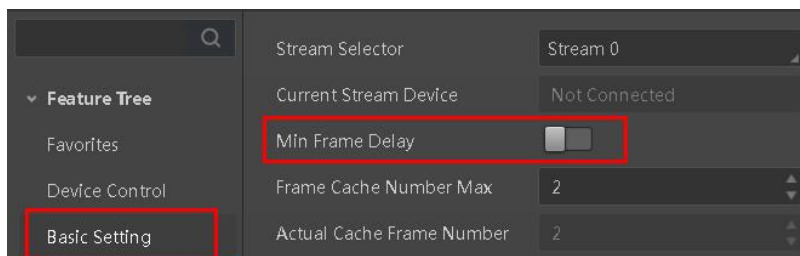


Figure 8-2 Stream Selector

3. (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**.

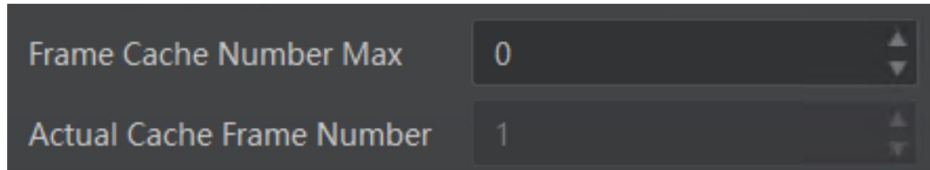


Figure 8-3 Frame Cache Number Max and Actual Cache Frame Number

Note

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

4. Set **Camera Type**, including **Frame Scan** and **Line Scan**.

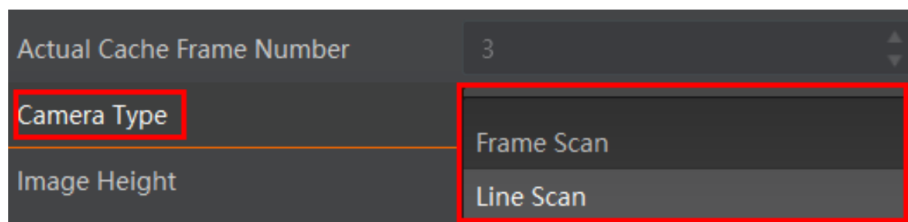


Figure 8-4 Set Camera Type

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

Note

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

5. (Optional) If select **Line Scan** as **Camera Type**, and set **Image Height** to configure the height of outputted images.



Figure 8-5 Set Image Height

6. Enter **Frame Timeout Time(ms)** according to actual demands.
- If the image reaches the configured height (**Image Height**) within the configured frame timeout period, the image is acquired normally.
 - If the image does not reach the configured line height (**Image Height**) within the
-

configured frame timeout period, the image is output according to the selected image output method (step 7).

Note

When **Frame Timeout Time(ms)** is set to **0**, it means that the frame timeout function is not enabled. At this time, if the number of lines output by the camera reaches the configured image height parameter, then one frame image is output. If the number of output lines does not reach the image height, the SDK does not display the image. The SDK waits for the line data until the image height is reached before outputting the image.

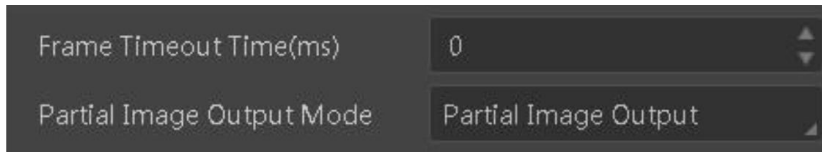


Figure 8-6 Frame Timeout Time

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



Figure 8-7 Partial Image Output Mode

Table 8-1 Partial Image Output Mode Description

Parameter	Description
Partial Image Output	<ul style="list-style-type: none"> • If the number of lines output by the device reaches the configured image height (image height parameter) 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 parameter) within the frame timeout period, the SDK will output the image according to the actual height.
Partial Image Discard	<ul style="list-style-type: none"> • If the number of lines output by the device reaches the configured image height (height parameter) 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 (height parameter) within the frame timeout period, the SDK discards the image.
Partial Image Filled	<ul style="list-style-type: none"> • If the number of lines output by the device reaches the configured image height (height parameter) 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

Parameter	Description
	configured image height (height parameter) within the frame timeout period, SDK will output the image after filling the black according to the height parameter for the remaining part.

8. Set the camera's width and height via **Actual Camera Width** and **Actual Camera Height**.

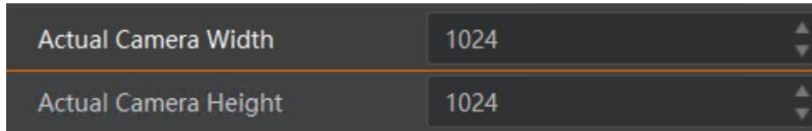


Figure 8-8 Actual Camera Width and Height

Note

- Only MV-GC1002-V2 frame grabber supports parameters of **Actual Camera Width** and **Actual Camera Height**.
- The two parameters should be configured when setting the ROI.

8.2 Set Trigger Source

The trigger source includes software trigger, hardware trigger, encoder trigger, and timer trigger.

Steps

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

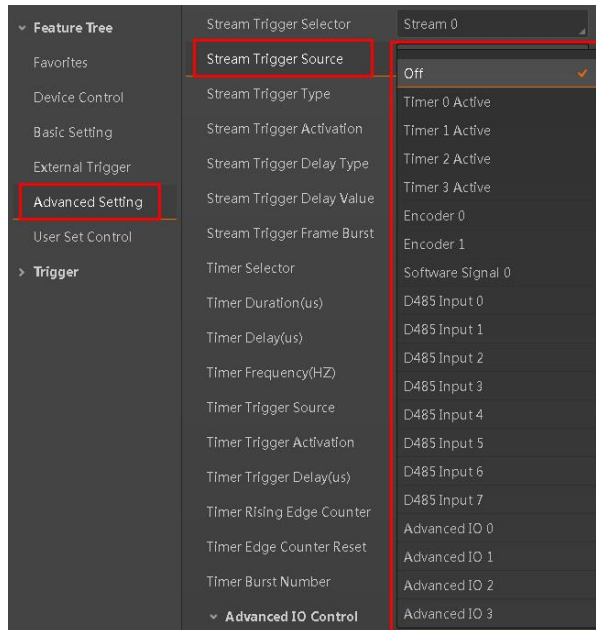


Figure 8-9 Stream Trigger Source

Table 8-2 Stream Trigger Source Description

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

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

- **Fixed Line:** If the frame grabber receives an edge trigger signal, it outputs image data according to the configured line height (Image Height parameter). 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**.

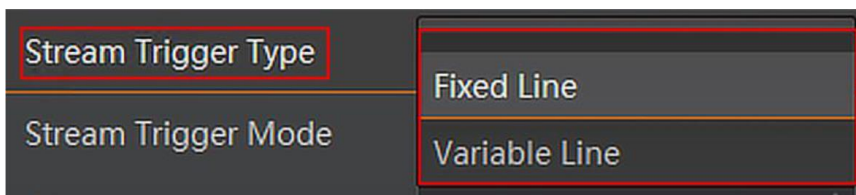


Figure 8-10 Set Stream Trigger Type

8.2.1 Set 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.

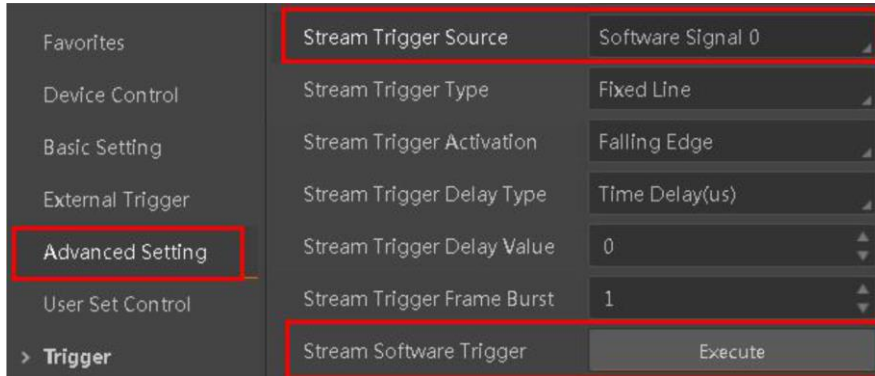


Figure 8-11 Set Software Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CAMERALINK_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", "SoftwareSignal0");
MV_CC_SetCommandValue(hInterface, "StreamSoftwareTrigger");

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

8.2.2 Set Hardware Trigger

The frame grabber provides eight configurable differential input/output signals that can be used as the trigger signal source of the frame grabber.

Note

- MV-GC1102IOL frame grabber provides 8 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 7) to trigger other devices.
- MV-GC1002-V2 frame grabber provides 11 differential signals can be configured as output signals (D485 InOut 0 to D485 InOut 10) to trigger other devices.

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**.

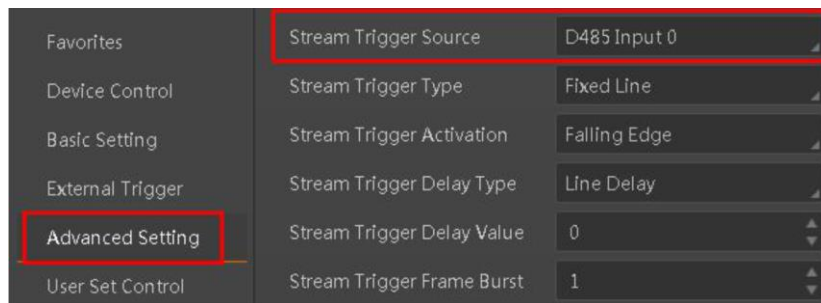


Figure 8-12 Hardware Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CAMERALINK_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", "D485InOut0");

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

8.2.3 Set 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**.

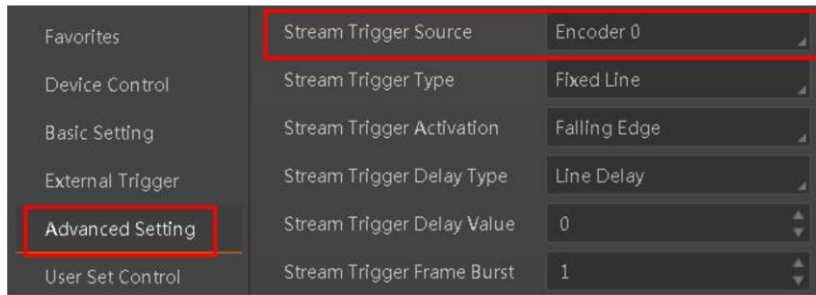


Figure 8-13 Encoder Trigger

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

```
MV_INTERFACE_INFO_LIST stInterfaceList = {0};
MV_CC_EnumInterfaces(MV_CAMERALINK_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","Encoder0");

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

8.2.4 Set 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**.

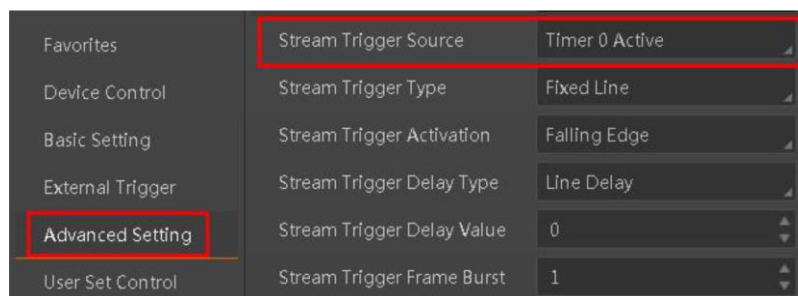


Figure 8-14 Timer Trigger

8.3 Set Trigger Related Parameters

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

8.3.1 Set Trigger Activation

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

Steps

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

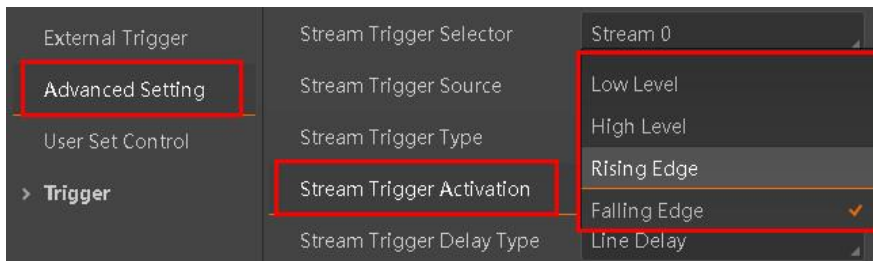


Figure 8-15 Trigger Activation

Table 8-3 Trigger Activation Parameter

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

8.3.2 Set Trigger Delay

Trigger delay means that the frame grabber receives the trigger source, and then sends the

trigger signal to the camera after configured trigger delay time.

Steps

1. Go to **Advanced Setting > 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 Value** 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 8-16 Stream Trigger Delay Type

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

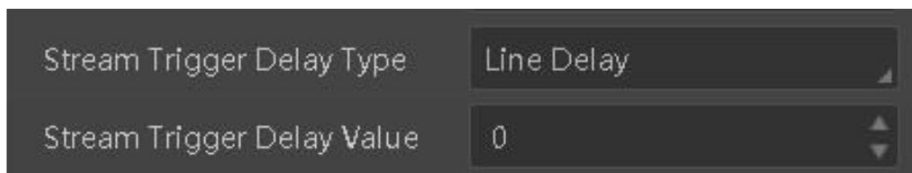


Figure 8-17 Set Stream Trigger Delay Value



Chapter 9 Other Functions

9.1 Camera Pre-Configuration

The camera pre-configuration function can separate the virtual camera from the frame grabber under the condition of connecting the real camera. The virtual camera can connect the third-party client or software without occupying the serial port to realize the image acquisition. The parameters related to the virtual camera need to be synchronized according to the configuration of the real camera, which can be set via **Basic Setting > Camera Info**.

Before You Start: Make sure that the frame grabber is disconnected from the client software.

Steps

1. Run the MVS client software.
2. Click  in **GenTL** in device list, select **Default Load**, and check **Virtual Port** of **MvFGProducerCML**.
3. Click  in **GenTL** to refresh and enable camera pre-configuration function.

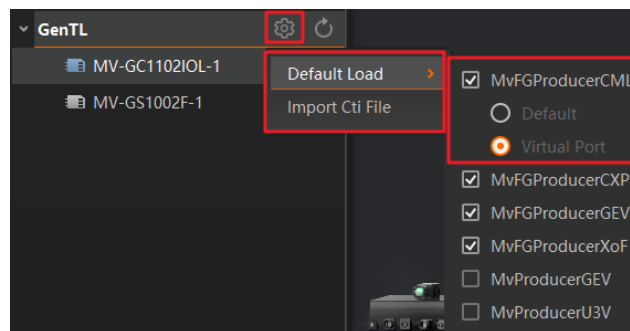


Figure 9-1 Camera Pre-Configuration

4. Go to **Basic Setting > Camera Info** after connecting the frame grabber.
5. Enter parameters of the virtual camera according to the real camera.

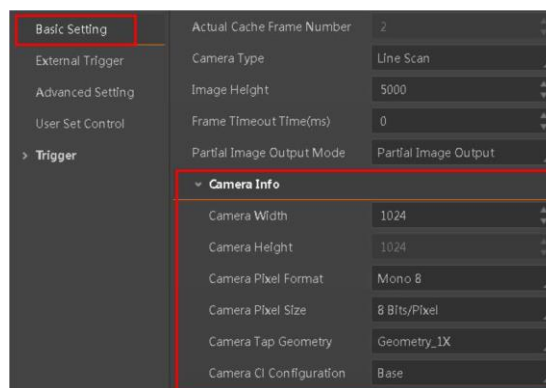



Figure 9-2 Virtual Camera Parameters

Table 9-1 Virtual Camera Parameters

Virtual Camera Parameters	Real Camera Property	Description
Camera Width	Image Format Control	Horizontal resolution of virtual camera images.
Camera Height		The line height of the virtual camera image, that is, the vertical resolution.  Note The line height of the virtual camera image is related to scan mode of the frame grabber. <ul style="list-style-type: none"> • If the Camera Type is Frame Scan, then the Camera Height takes effect. • If the Camera Type is Line Scan, then the configured Image Height takes effect.
Camera Pixel Format		Pixel format of virtual camera.
Camera Pixel Size		Pixel size of virtual camera.
Camera Tap Geometry		Transport Layer Control
Camera CI Configuration	The configuration mode of virtual camera.	

The code below shows the process of camera pre-configuration.

```

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

MV_CC_SetBoolValue(hInterface,"CameraDeviceEnable",true);
MV_CC_SetEnumValueByString(hInterface,"CameraType","LineScan");
MV_CC_SetIntValueEx(hInterface,"ImageHeight",1024);
MV_CC_SetIntValueEx(hInterface,"CameraWidth",1024);
MV_CC_SetEnumValueByString(hInterface,"CameraPixelFormat","Mono8");
MV_CC_SetEnumValueByString(hInterface,"CameraPixelSize","Bpp8");
MV_CC_SetEnumValueByString(hInterface,"CameraTapGeometry","Geometry_1X");
MV_CC_SetEnumValueByString(hInterface,"CameraCIConfiguration","Base");
    
```

```
MV_CC_SetBoolValue(hInterface,"CameraDeviceEnable",false);
```

```
MV_CC_CloseInterface(hInterface);
```

```
MV_CC_DestroyInterface(hInterface);
```

9.2 ROI

When you are only interested in some details in the image, you can use Region of Interest (ROI) function. ROI can be done on the basis of the original image and according to the preset width and height of the frame grabber and the offsets in the X and Y directions.

Note

Only MV-GC1002-V2 frame grabber supports ROI function.

Steps

1. Go to **Basic Setting > ISP Control**, and enable **ROI Enable**.
2. Set following parameters.
 - **Width**: It stands for horizontal width in original image.
 - **Offset X**: It stands for horizontal offset.
 - **Height**: It stands for vertical height in original image.
 - **Offset Y**: It stands for vertical offset.

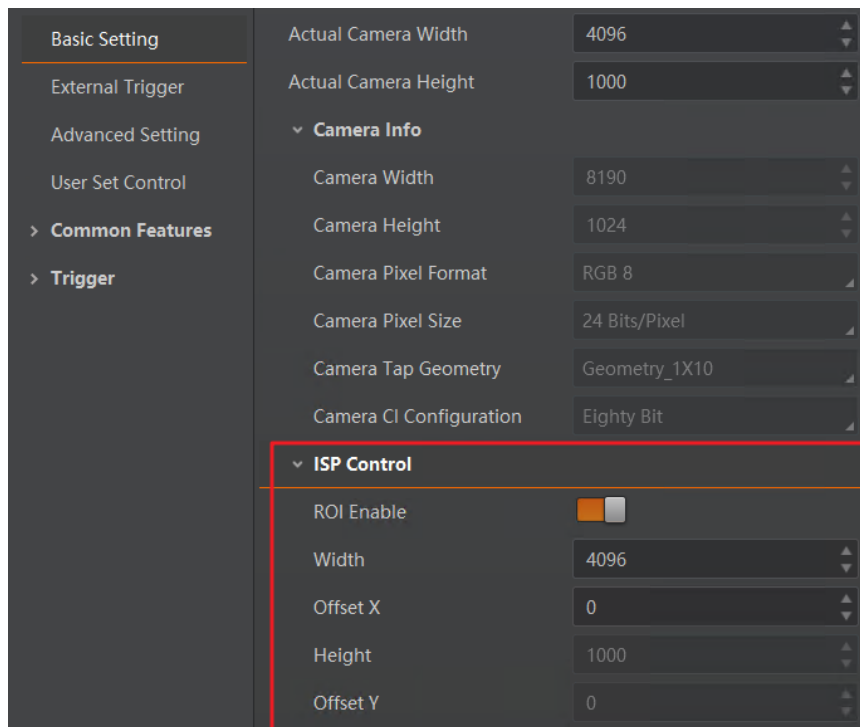


Figure 9-3 ROI Parameters

When setting ROI, you can also set the camera's image width and height connected to the frame grabber via **Basic Settings**.

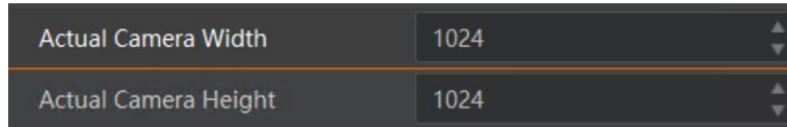


Figure 9-4 Actual Camera Width/Height

- **Actual Camera Width:** It refers to the width of the camera's original image.
- **Actual Camera Height:** It refers to the height of the camera's original image.

9.2 Power over Camera Link (PoCL)

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

Steps

1. Go to **Device Control**, and select frame grabber connector in **PoCL Selector**.

Note

0 and 1 corresponds to CL1 and CL2 connector of the frame grabber.

2. Enable **PoCL Enable** to let the connector selected in **PoCL Selector** support PoCL.

Note

The PoCL function of the frame grabber is disabled by default.

3. Check whether the camera has normal power supply via **PoCL Status**.
 - **Auto** means that the camera is powered via PoCL.
 - **Off** means that the PoCL function is not used.
4. View power consumption via **PoCL Power** when using PoCL, and the unit is mW.

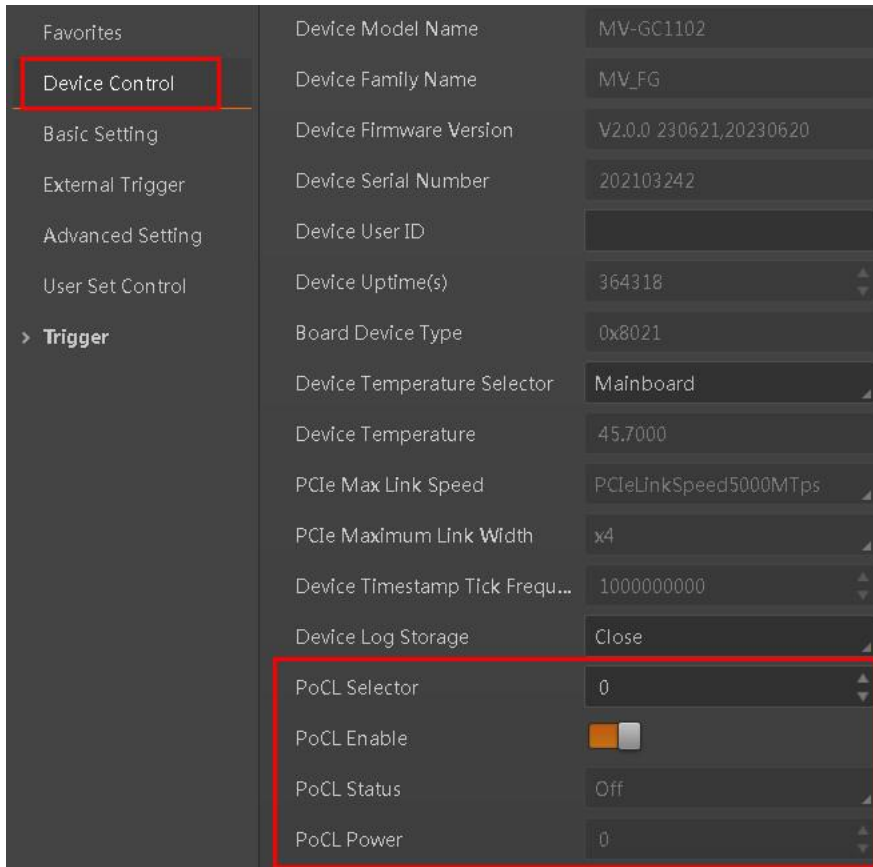


Figure 9-5 PoCL

9.3 Device Control

In **Device Control**, you can view the frame grabber’s information.

Table 9-2 Device Control Parameter Description

Parameter	Read/Write	Description
Firmware Version Type	Read Only	It is the firmware version type.
Device Vendor Name	Read Only	It is the name of device manufacturer.
Device Model Name	Read Only	It is the device model.
Device Family Name	Read Only	It is the device version.
Device Firmware Version	Read Only	It is the device firmware version.
Device Serial Number	Read Only	It is the device serial number.
Device User ID	Read & Write	Device name and it is empty by default. You can set according to your preference. <ul style="list-style-type: none"> ● If User ID is empty, the client software

Parameter	Read/Write	Description
		displays the device model. <ul style="list-style-type: none"> 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 Selector	Read & Write	It selects what the device components you want to display its temperature in Device Temperature .
Device Temperature	Read Only	It displays the real-time temperature of the device components you selected in Device Temperature Selector .
PCIe Max Link Speed	Read Only	It is the max. link speed that PCIe supports.
PCIe Maximum Link Width	Read Only	It is the max. link width that PCIe supports.
Device Timestamp Tick Frequency (Hz)	Read Only	It is the device timestamp tick frequency.
Device Log Storage	Read & Write	It is the device log storage.

9.4 Update Firmware

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

Note

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

Steps

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

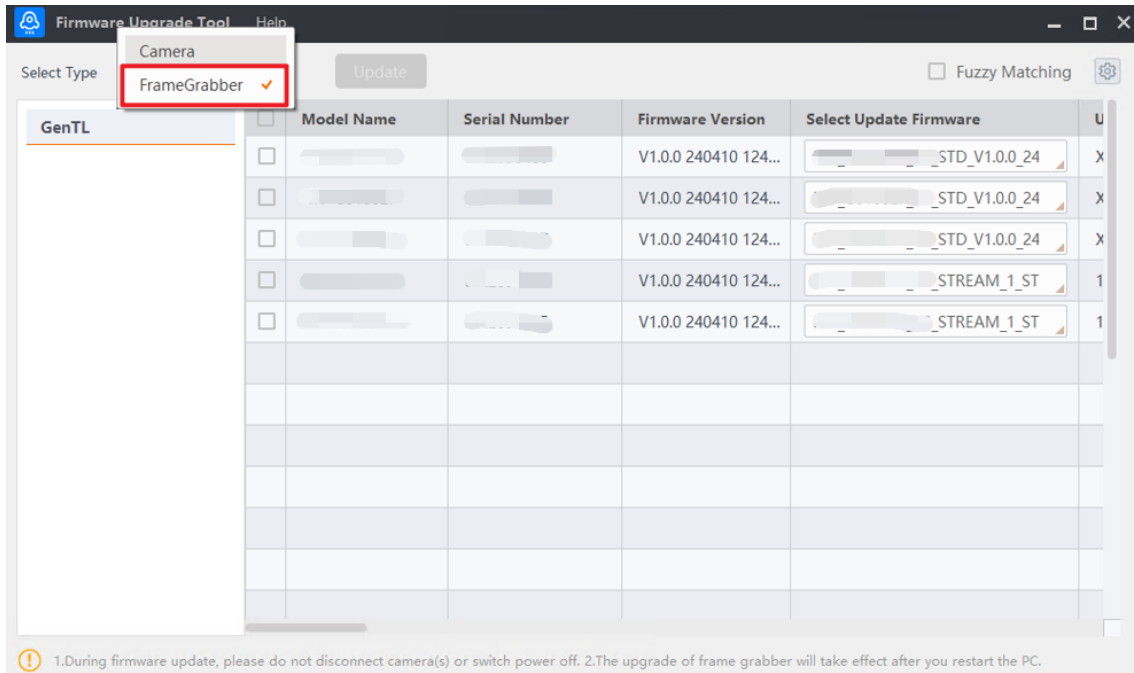


Figure 9-6 Select Frame Grabber

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

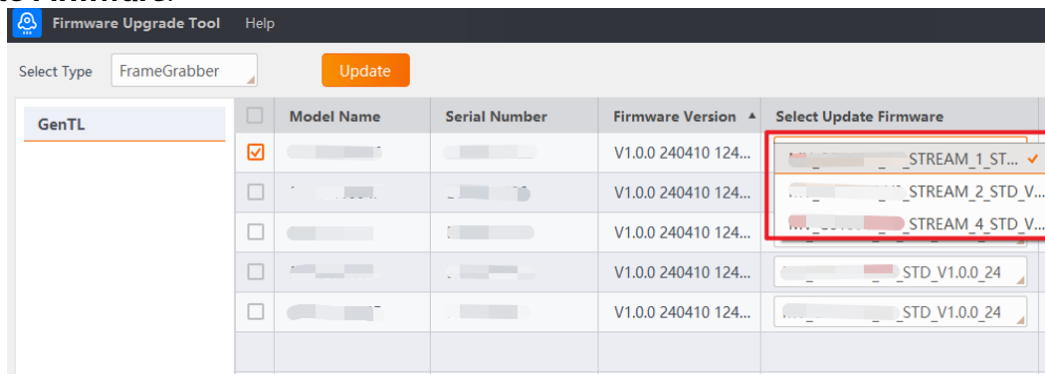


Figure 9-7 Update Firmware

5. Click **Update** to start updating.

Note

- The used firmware package varies depending on the number of cameras connected to the frame grabber. The firmware package with Base in file name supports connecting two cameras, and supports connecting one camera without Base.
- Do not power off the frame grabber during updating.
- Restart the computer to check the frame grabber's function after updating.

9.5 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.

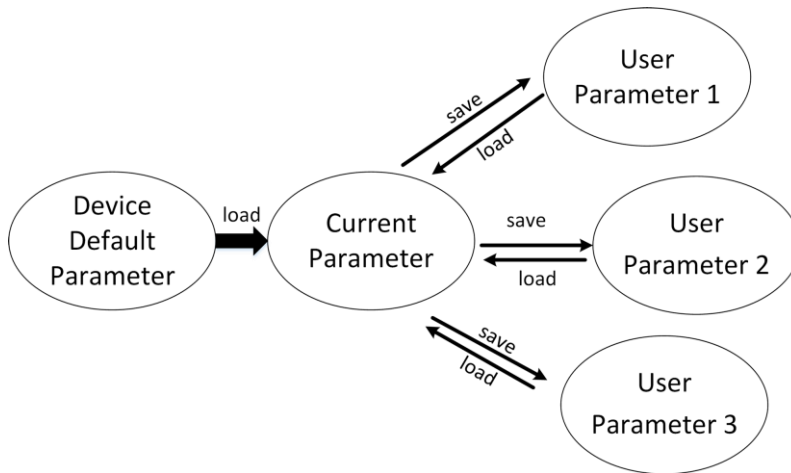


Figure 9-8 Parameter Relation

9.5.1 Save User Set

Steps

1. Click **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.

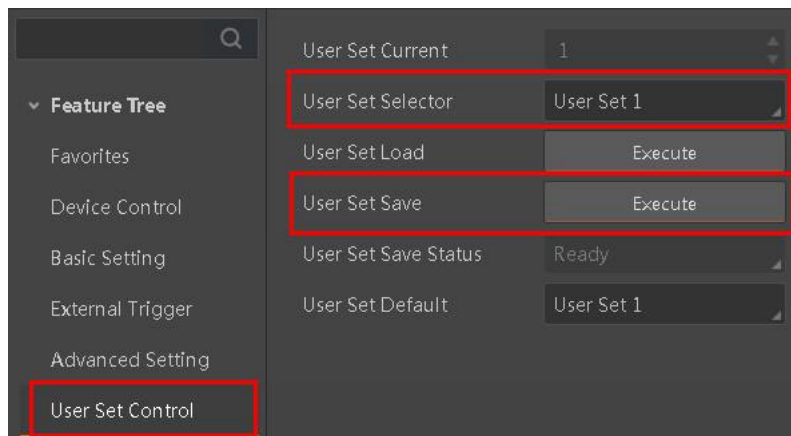


Figure 9-9 Save User Set

9.5.2 Load User Set

Steps

1. Click **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.

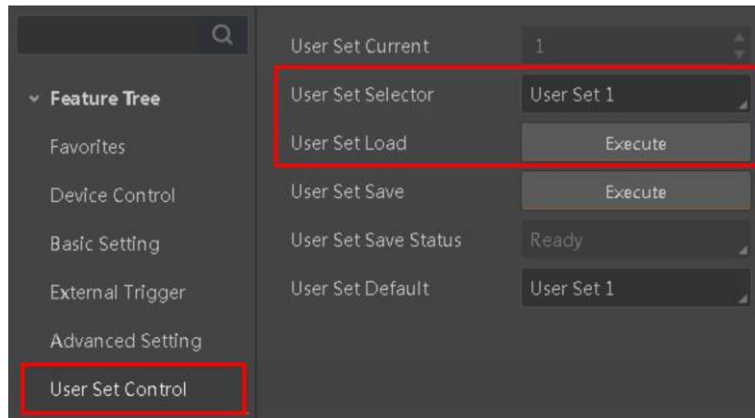


Figure 9-10 Load User Set

9.5.3 Set User Default

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

Note

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

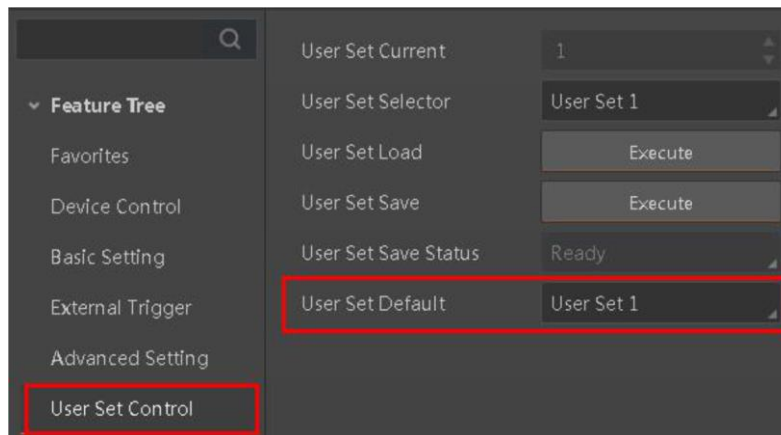


Figure 9-11 Set User Default

The code below shows the process of setting user set control.

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

9.6 File Access Control

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

Note

License Notice and **Log File** do not support importing.

Steps

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

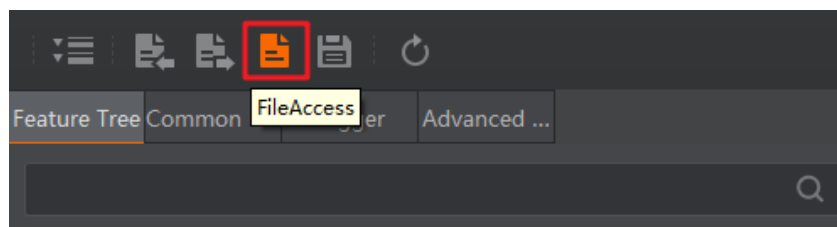


Figure 9-12 File Access

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

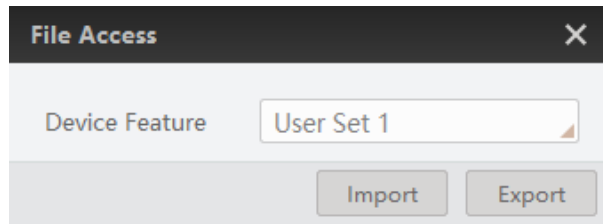


Figure 9-13 Import or Export

- Import function: Select a MFA file from local PC to import.
- Export function: Select a saving path and enter file name to save and export.

Note

- Importing and exporting the device feature among the same model of the frame grabber are supported.
- If User Set 1/2/3 is selected as device feature, you need to load the corresponding user set you selected to take effect.
- If the imported device feature is License Notice and Log File, they take effect immediately after importing. License Notice represents the open source information license statement and Log File represents the saved log file.

The code below shows the process of importing or exporting device feature via file access.

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

MV_CC_FILE_ACCESS stFileAccess={0};
stFileAccess.pUserFileName = "UserSet1.mfa";
stFileAccess.pDevFileName = "UserSet1";
MV_CC_FileAccessRead(hInterface, &stFileAccess);
MV_CC_FileAccessWrite(hInterface, &stFileAccess);

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

9.7 Event Control

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

Note

- The event control function may differ by device model.
- The MVS Tool Kit is installed by default when you install the MVS client software.
- For abnormal events, you should go to C:\Windows\Temp\MvSDKLog and view the device SDK file.
- The specific event category and event selector may differ by device model.

Steps

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

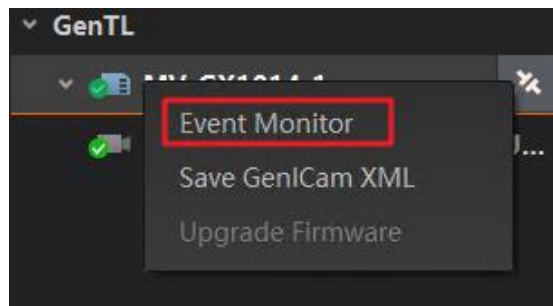


Figure 9-14 Select Event Monitor

3. Select **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.

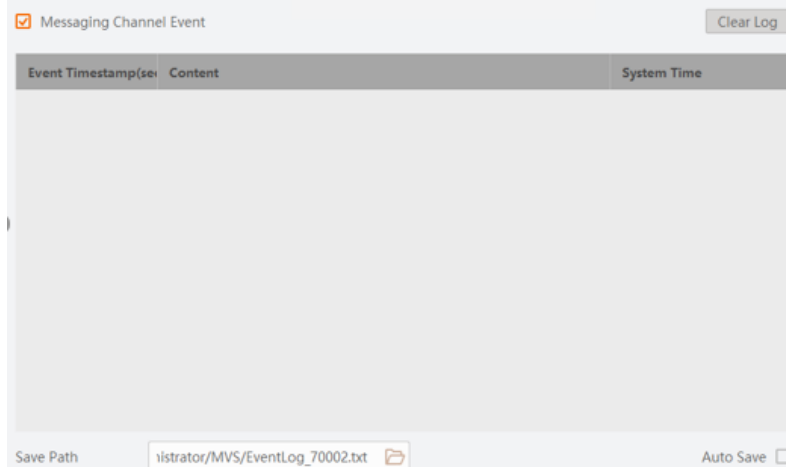


Figure 9-15 Event Monitor

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

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

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

MV_CC_RegisterEventCallBackEx(hInterface, "TimerRisingEdge0", EventCallBack, NULL);
MV_CC_EventNotificationOn(hInterface, " TimerRisingEdge0");

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

Chapter 10 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.

10.1 Why the frame grabber cannot be enumerated?

Table 10-1 Question 1

Possible Cause	Solution
Improper installation of the driver.	<ul style="list-style-type: none"> • Make sure that MVS 3.4.1 or later is installed correctly. If the MVS 3.4.1 or later is installed correctly, uninstall and reinstall it. • Anti-virus software or firewall may intercept the driver. You can disable the firewall and uninstall the anti-virus software. If it is required to enable the firewall and anti-virus software, make sure that the MVS client software is on the allowlist before uninstalling and reinstalling it.
The MVS client software or other software is using the frame grabber.	<p>Close the MVS client software or other software that is using the frame grabber.</p> <p>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.</p>
Improper installation of the frame grabber.	<p>You can try to unplug and plug the frame grabber again after powering off the PC, and ensure that the frame grabber fixing screws are tightened and fixed on the PC.</p>
The PC is not restarted after the firmware of the frame grabber is updated.	<p>Make sure that the PC is restarted after the firmware of the frame grabber is updated.</p>

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

Table 10-2 Question 2

Possible Cause	Solution
The camera is not working normally.	Check whether the camera is working normally and check the power supply.
Improper wiring of the data cable.	Check whether the cable is connected normally, and check whether the CL1 connector of the camera is connected to the CL1 connector of the frame grabber, and the CL2 connector of the camera is connected to the CL2 connector of the frame grabber.
Improper installation of the serial port driver.	Uninstall and reinstall the MVS client software.
The device is occupied or virtual serial port is occupied.	Release other occupied processes, and Camera Link and GenTL cannot be used in the same.
Some brands of the cameras do not support GenlCam function.	Use the serial port tool provided by the camera manufacturer to edit the camera parameters, and use the virtual serial port to open the frame grabber. Set the relevant parameters of the frame grabber according to the camera parameters.

10.3 Why the frame grabber cannot acquire images?

Table 10-3 Question 3

Possible Cause	Solution
The camera or the frame grabber enables trigger mode.	Go to Advanced Setting > Stream Trigger Source , and set Off as Stream Trigger Source to disable the trigger mode of the camera and frame grabber.
Use Full mode to acquire images under Base mode.	When the frame grabber is in the Base firmware or only one cable is connected between the camera and the frame grabber, the frame grabber cannot use the Full mode to acquire images. You can upgrade the frame grabber's firmware to Full mode or check if two cables are connected.
Camera or cable exception.	Check if the camera or cable is normal.

10.4 Why the camera frame rate is not stable?

Table 10-4 Question 4

Possible Cause	Solution
Insufficient PCIe bandwidth.	<ul style="list-style-type: none"> ● Check if the parameter PCIe Max Link Speed is 5000M and if the parameter PCIe Maximum Link Width is X4 in Device Control ● Replace PCIe slot to meet PCIe 2.0 x 4 bandwidth. It should be noted that some PCIe slots designed by the PC share a bandwidth for several slots, which may cause insufficient bandwidth. If the ROI can meet the application requirements, you can use the ROI function to increase the frame rate.
Low CPU performance.	Use high performance CPU.

Chapter 11 Revision History

Table 11-1 Revision History

Version	Document No.	Date	Revision Details
V2.1.1	UD42831B	May. 7, 2025	<ul style="list-style-type: none"> ● Adjust the structure of section FAQ (Frequently Asked Questions). ● Edit sample codes in section Input Signal. ● Edit sample codes in section Camera Control. ● Edit sample codes in section Output Control. ● Edit sample codes in section Set Software Trigger. ● Edit sample codes in section Set Hardware Trigger. ● Edit sample codes in section Set Encode Trigger. ● Edit sample codes in section Camera Pre-Configuration. ● Edit sample codes in section Save User Set. ● Edit sample codes in section File Access Control. ● Edit sample codes in section Event Control. ● Edit the section Update Firmware. ● Add event fields and event sources in Appendix B Frame Grabber Fields.
V2.1.0	UD35296B	Oct. 12, 2023	<ul style="list-style-type: none"> ● Modify section Appearance, Connector and Indicator. ● Modify section I/O Wiring. ● Modify section Input and Output Signal. ● Modify section Frame Grabber Trigger. ● Add section ROI.
V2.0.0	UD34214B	Jul. 12, 2023	Modify the whole user manual.
V1.1.0	UD28124B	Apr. 15, 2022	<ul style="list-style-type: none"> ● Modify section Install MVS Client Software. ● Add section Basic Operation of MVS Client Software. ● Modify section Stream. ● Modify section Power over Camera Link (PoCL). ● Add section File Access Control. ● Add section User Set Control. ● Modify section Update Firmware.
V1.0.0	UD27358B	Feb. 28, 2022	Original version.

Appendix A Frame Grabber Accessories

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

Camera Link Cable

The Camera Link cable is used to establish the data transmission between the frame grabber and the camera. It can provide seven lengths of 3 m, 5 m, 7 m, 8 m, 10 m, 15 m and 20 m, which can be selected as required.



Figure A-1 Camera Link Cable

Note

Refer to the datasheet of the corresponding product for the specific size and parameter of the Camera Link cable.

Camera Link Fiber Data Cable

The Camera Link fiber data cable is used to transmit data for Camera Link cameras. It can provide seven lengths of 8 m, 10 m, 15 m, and 20 m, which can be selected as required.



Figure A-2 Camera Link Fiber Data Cable

First Type of I/O Trigger Cable

The first type of I/O trigger cable (DB9F to open) is used for I/O trigger signal wiring of DB9M connector of the frame grabber, as shown below. Refer to the following table for pin definition. The cable has shielding protection, providing three lengths of 3 m, 5 m, 7 m, which can be selected as required.



Figure A-3 First Type of I/O Trigger Cable

Note

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

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

Pin No.	Cable Color	Signal	Pin No.	Cable Color	Signal
1	White/Green	LINE_0P	6	White/Brown	LINE_2P
2	Green	LINE_0N	7	Brown	LINE_2N
3	White/Orange	LINE_1P	8	White/Blue	LINE_3P
4	Orange	LINE_1N	9	Blue	LINE_3N
5	Black	GND	/	/	/

Second Type of I/O Trigger Cable

The second type of I/O trigger cable (DB15F to open) is used for I/O trigger signal wiring of DB15M connector of the frame grabber, as shown below. Refer to the following table for pin definition. The cable has shielding protection, providing three lengths of 3 m, 5 m, 7 m and 10 m, which can be selected as required.

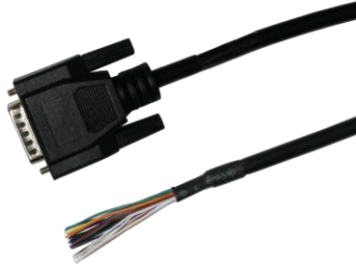


Figure A-4 Second Type of I/O Trigger Cable

Table A-2 Pin Definition of Second Type of I/O Trigger Cable

Pin No.	Cable Color	Signal	Pin No.	Cable Color	Signal
5	White/Green	LINE_0P	1	White/Red	LINE_4P
10	Green	LINE_0N	6	Red	LINE_4N
4	White/Orange	LINE_1P	15	White/Yellow	LINE_5P
9	Orange	LINE_1N	14	Yellow	LINE_5N
3	White/Brown	LINE_2P	13	White/Purple	LINE_6P
8	Brown	LINE_2N	12	Purple	LINE_6N
2	White/Blue	LINE_3P	11	Black	GND
7	Blue	LINE_3N	/	/	/

I/O Adapter Cable

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

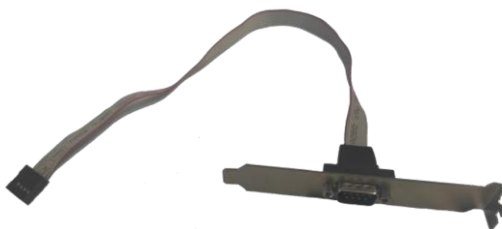


Figure A-5 I/O Adapter Cable

Appendix B Frame Grabber Fields

B.1 Event Fields

The event-related nodes in the client have been deleted. Use the event configuration tool in the toolkit for event node configuration. This section introduces the configurable event fields and event sources for secondary development.

Table B-1 Event Fields

Field Name	Field Type	Enumerated Value	Value Name	Description
EventCategory	Enum	1	SoftEvent	Soft event.
		2	LinkEvent	Link event.
		3	StreamEvent	Stream event.
		4	PCIEEvent	PCIE event.
		5	IOEvent	Digital I/O event.
EventIOType	Enum	0	Timer	Select I/O type.
		4	Encoder	
		5	D485	
		6	AdvancedIO	
ChannelSelector	Enum	0 to 10	Channel 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	Description
Soft Event	140	CardPacketReceived0	Channel for receiving data packet.
	141	CardPacketReadDone0	Data packet reading completion channel.
	142	CardAckPacketReceived0	Channel for receiving data response packet.
	143	CardAckPacketReadDone0	Data response packet reading completion channel.
Link Event	108	LockedEvent0	Channel 0, device connection channel.
	109	LockedEvent1	Channel 1, device connection channel.
	110	LockedEvent2	Channel 2, device connection channel.
	111	LockedEvent3	Channel 3, device connection channel.
	112	UnlockedEvent0	Channel 0, device disconnection channel.
	113	UnlockedEvent1	Channel 1, device disconnection channel.
	114	UnlockedEvent2	Channel 2, device disconnection channel.
	115	UnlockedEvent3	Channel 3, device disconnection channel.
	168	CC1RisingEdge0	Channel 0 CC1, rising edge channel.
	169	CC1RisingEdge1	Channel 1 CC1, rising edge channel.
	170	CC1RisingEdge2	Channel 2 CC1, rising edge channel.
	171	CC1RisingEdge3	Channel 3 CC1, rising edge channel.
	172	CC1FallingEdge0	Channel 0 CC1, falling edge channel.

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Event Type	Enumerated Value	Value Name	Description
	173	CC1FallingEdge1	Channel 1 CC1, falling edge channel.
	174	CC1FallingEdge2	Channel 2 CC1, falling edge channel.
	175	CC1FallingEdge3	Channel 3 CC1, falling edge channel.
Link Event	176	CC2RisingEdge0	Channel 0 CC2, rising edge channel.
	177	CC2RisingEdge1	Channel 1 CC2, rising edge channel.
	178	CC2RisingEdge2	Channel 2 CC2, rising edge channel.
	179	CC2RisingEdge3	Channel 3 CC2, rising edge channel.
	180	CC2FallingEdge0	Channel 0 CC2, falling edge channel.
	181	CC2FallingEdge1	Channel 1 CC2, falling edge channel.
	182	CC2FallingEdge2	Channel 2 CC2, falling edge channel.
	183	CC2FallingEdge3	Channel 3 CC2, falling edge channel.
	184	CC3RisingEdge0	Channel 0 CC3, rising edge channel.
	185	CC3RisingEdge1	Channel 1 CC3, rising edge channel.
	186	CC3RisingEdge2	Channel 2 CC3, rising edge channel.
	187	CC3RisingEdge3	Channel 3 CC3, rising edge channel.
	188	CC3FallingEdge0	Channel 0 CC3, falling edge channel.
	189	CC3FallingEdge1	Channel 1 CC3, falling edge channel.
	190	CC3FallingEdge2	Channel 2 CC3, falling edge channel.

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Event Type	Enumerated Value	Value Name	Description
	191	CC3FallingEdge3	Channel 3 CC3, falling edge channel.
Link Event	192	CC4RisingEdge0	Channel 0 CC4, rising edge channel.
	193	CC4RisingEdge1	Channel 1 CC4, rising edge channel.
	194	CC4RisingEdge2	Channel 2 CC4, rising edge channel.
	195	CC4RisingEdge3	Channel 3 CC4, rising edge channel.
	196	CC4FallingEdge0	Channel 0 CC4, falling edge channel.
	197	CC4FallingEdge1	Channel 1 CC4, falling edge channel.
	198	CC4FallingEdge2	Channel 2 CC4, falling edge channel.
	199	CC4FallingEdge3	Channel 3 CC4, falling edge channel.
	Stream Event	84	ReceiveImageFrameStart0
85		ReceiveImageFrameStart1	Channel 1, receive image frame start.
88		ReceiveImageFrameEnd0	Channel 0, receive image frame end.
89		ReceiveImageFrameEnd1	Channel 1, receive image frame start.
92		TransmitImageBlockStart0	Channel 0, transmit image frame start.
93		TransmitImageBlockStart1	Channel 1, transmit image frame start.
96		TransmitImageBlockEnd0	Channel 0, transmit image frame end.
97		TransmitImageBlockEnd1	Channel 1, transmit image frame end.
Stream Event	200	TheFirstLineInFrame0	Channel 0, image frame first line channel.

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Event Type	Enumerated Value	Value Name	Description
	201	TheFirstLineInFrame1	Channel 1, image frame first line channel.
	204	TheLastLineInFrame0	Channel 0, image frame last line channel.
	205	TheLastLineInFrame1	Channel 1, image frame last line channel.
PCIE Event	76	PCIEDMAStart0	Channel 0, PCIE DMA transmission start channel.
	77	PCIEDMAStart1	Channel 1, PCIE DMA transmission start channel.
	80	PCIEDMAEnd0	Channel 0, PCIE DMA transmission end channel.
	81	PCIEDMAEnd1	Channel 1, PCIE DMA transmission end channel.
IO Event	0	TimerRisingEdge0	Channel 0, timer rising edge.
	1	TimerRisingEdge1	Channel 1, timer rising edge.
	2	TimerRisingEdge2	Channel 2, timer rising edge.
	3	TimerRisingEdge3	Channel 3, timer rising edge.
	4	TimerFallingEdge0	Channel 0, timer falling edge.
	5	TimerFallingEdge1	Channel 1, timer falling edge.
	6	TimerFallingEdge2	Channel 2, timer falling edge.
IO Event	7	TimerFallingEdge3	Channel 3, timer falling edge.
	8	EncoderRisingEdge0	Channel 0, encoder rising edge.

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Event Type	Enumerated Value	Value Name	Description
	9	EncoderRisingEdge1	Channel 1, encoder rising edge.
	244	EncoderRisingEdge2	Channel 2, encoder rising edge.
	245	EncoderRisingEdge3	Channel 3, encoder rising edge.
	10	EncoderFallingEdge0	Channel 0, encoder falling edge.
	11	EncoderFallingEdge1	Channel 1, encoder falling edge.
	246	EncoderFallingEdge2	Channel 2, encoder falling edge.
	247	EncoderFallingEdge3	Channel 3, encoder falling edge.
	60	D485InRisingEdge0	Channel 0, D485 input rising edge.
	61	D485InRisingEdge1	Channel 1, D485 input rising edge
	62	D485InRisingEdge2	Channel 2, D485 input rising edge
	63	D485InRisingEdge3	Channel 3, D485 input rising edge
	64	D485InRisingEdge4	Channel 4, D485 input rising edge
	65	D485InRisingEdge5	Channel 5, D485 input rising edge
	66	D485InRisingEdge6	Channel 6, D485 input rising edge
IO Event	67	D485InRisingEdge7	Channel 7, D485 input rising edge
	232	D485InRisingEdge8	Channel 8, D485 input rising edge
	233	D485InRisingEdge9	Channel 9, D485 input rising edge
	234	D485InRisingEdge10	Channel 10, D485 input rising edge

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Event Type	Enumerated Value	Value Name	Description
	68	D485InFallingEdge0	Channel 0, D485 input falling edge
	69	D485InFallingEdge1	Channel 1, D485 input falling edge
	70	D485InFallingEdge2	Channel 2, D485 input falling edge
	71	D485InFallingEdge3	Channel 3, D485 input falling edge
	72	D485InFallingEdge4	Channel 4, D485 input falling edge
	73	D485InFallingEdge5	Channel 5, D485 input falling edge
	74	D485InFallingEdge6	Channel 6, D485 input falling edge
	75	D485InFallingEdge7	Channel 7, D485 input falling edge
	235	D485InFallingEdge8	Channel 8, D485 input falling edge
	236	D485InFallingEdge9	Channel 9, D485 input falling edge
	237	D485InFallingEdge10	Channel 10, D485 input falling edge
	144	D485OutRisingEdge0	Channel 0, D485 output rising edge
	IO Event	145	D485OutRisingEdge1
146		D485OutRisingEdge2	Channel 2, D485 output rising edge
147		D485OutRisingEdge3	Channel 3, D485 output rising edge
148		D485OutRisingEdge4	Channel 4, D485 output rising edge
149		D485OutRisingEdge5	Channel 5, D485 output rising edge
150		D485OutRisingEdge6	Channel 6, D485 output rising edge

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Event Type	Enumerated Value	Value Name	Description
	151	D485OutRisingEdge7	Channel 7, D485 output rising edge
	238	D485OutRisingEdge8	Channel 8, D485 output rising edge
	239	D485OutRisingEdge9	Channel 9, D485 output rising edge
	240	D485OutRisingEdge10	Channel 10, D485 output rising edge
	152	D485OutFallingEdge0	Channel 0, D485 output falling edge
	153	D485OutFallingEdge1	Channel 1, D485 output falling edge
	154	D485OutFallingEdge2	Channel 2, D485 output falling edge
	155	D485OutFallingEdge3	Channel 3, D485 output falling edge
	156	D485OutFallingEdge4	Channel 4, D485 output falling edge
	157	D485OutFallingEdge5	Channel 5, D485 output falling edge
IO Event	158	D485OutFallingEdge6	Channel 6, D485 output falling edge
	159	D485OutFallingEdge7	Channel 7, D485 output falling edge
	241	D485OutFallingEdge8	Channel 8, D485 output falling edge
	242	D485OutFallingEdge9	Channel 9, D485 output falling edge
	243	D485OutFallingEdge10	Channel 10, D485 output falling edge

B.2 Other Fields

Table B-1 Other Fields

Field Name	Field Type	Enumerated Value	Value Name	Description
Frame grabber trigger				
StreamSelector	Enum	0	Stream0	Stream selector
		1	Stream1	
CurrentStreamDevice	String	/	/	Current stream device
MinFrameDelay	Boolean	/	/	Min. frame delay
CameraType	Enum	0	FrameScan	Scanning type
		1	LineScan	
ImageHeight	Integer	/	/	Image height; range: 1 to 4294967295
FrameTimeoutTime	Integer	/	/	Frame timeout; unit: ms; range: 0 to 40000
PartialImageOutputMode	Enum	1	PartialImageOutput	Partial image output
		2	PartialImageDiscard	
		3	PartialImageFilled	
StreamTriggerSource	Enum	255	Off	Trigger source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		64	Encoder0	
		65	Encoder1	
		66	Encoder2	
		67	Encoder3	
80	SoftwareSignal0			

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Field Name	Field Type	Enumerated Value	Value Name	Description
		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			
StreamTriggerType	Enum	0	FixedLine	Triger type
		1	VariableLine	
StreamTriggerActivation	Enum	0	LowLevel	Trigger activation
		1	HighLevel	
		2	RisingEdge	
		3	FallingEdge	
		4	AnyEdge	
StreamTriggerDelayType	Enum	0	FrameDelay	Trigger delay type
		1	LineDelay	
		2	TimeDelay	
StreamTriggerDelayValue	Integer	/	/	Trigger delay value, range: 0 to 10000
StreamTriggerFrameBurst	Integer	/	/	Trigger frame

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Field Name	Field Type	Enumerated Value	Value Name	Description
				counting, range: 1 to 4294967295
StreamSoftwareTrigger	Command	/	/	Set software trigger
Encoder control				
EncoderSelector	Enum	0	Encoder0	Select encoder
		1	Encoder1	
		2	Encoder2	
		3	Encoder3	
EncoderSourceA	Enum	0	OptoCoupledInput0	Select encoder input source (PHASE_A)
		1	OptoCoupledInput1	
		2	OptoCoupledInput2	
		3	OptoCoupledInput3	
		16	RS422diffInput0	
		17	RS422diffInput1	
		18	RS422diffInput2	
		19	RS422diffInput3	
		32	TTLInput0	
		33	TTLInput1	
		34	TTLInput2	
		35	TTLInput3	
		48	D485Input0	
		49	D485Input1	
		50	D485Input2	
		51	D485Input3	
52	D485Input4			
53	D485Input5			
54	D485Input6			
55	D485Input7			

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Field Name	Field Type	Enumerated Value	Value Name	Description
		56	D485Input8	
		57	D485Input9	
		58	D485Input10	
		127	Off	
EncoderSourceB	Enum	0	OptoCoupledInput0	Select encoder input source (PHASE_B)
		1	OptoCoupledInput1	
		2	OptoCoupledInput2	
		3	OptoCoupledInput3	
		16	RS422diffInput0	
		17	RS422diffInput1	
		18	RS422diffInput2	
		19	RS422diffInput3	
		32	TTLInput0	
		33	TTLInput1	
		34	TTLInput2	
		35	TTLInput3	
		48	D485Input0	
		49	D485Input1	
		50	D485Input2	
		51	D485Input3	
		52	D485Input4	
		53	D485Input5	
		54	D485Input6	
		55	D485Input7	
56	D485Input8			
57	D485Input9			
58	D485Input10			
127	Off			

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Field Name	Field Type	Enumerated Value	Value Name	Description
EncoderTriggerMode	Enum	0	AnyDirection	Encoder trigger mode
		1	ForwardOnly	
EncoderCounterMode	Enum	0	AnyDirection	Encoder counter mode
		1	ForwardDirection	
		2	BackwardDirection	
EncoderCounter	Integer	/	/	Encoder counter; range: 0 to 4294967295
EncoderCounterReset	Command	/	/	Encoder counter reset
EncoderMaxReverseCounter	Integer	/	/	Encoder reverse counter, range: 0 to 32767
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

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Field Name	Field Type	Enumerated Value	Value Name	Description
Input/output signal				
LineSelector	Enum	24	D485Input0	Select line
		25	D485Input1	
		26	D485Input2	
		27	D485Input3	
		28	D485Input4	
		30	D485Input6	
		31	D485Input7	
		32	D485Input8	
		33	D485Input9	
		34	D485Input10	
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 40000000
LineSource	Enum	255	Off	Line source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		64	HighLevel	
		65	LowLevel	
		80	D485Input0	
81	D485Input1			

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Field Name	Field Type	Enumerated Value	Value Name	Description
		82	D485Input2	
		83	D485Input3	
		84	D485Input4	
		85	D485Input5	
		86	D485Input6	
		87	D485Input7	
		88	D485Input8	
		89	D485Input9	
		90	D485Input10	
		96	AdvancedIO0	
		97	AdvancedIO1	
		98	AdvancedIO2	
		99	AdvancedIO3	
		112	Fval_0	
		113	Fval_1	
		128	LVAL_0	
		129	LVAL_1	
Timer control				
Timer Selector	Enum	0	Timer0	Select timer
		1	Timer1	
		2	Timer2	
		3	Timer3	
TimerDuration	Integer	/	/	Timer duration; range: 0 to 34000000
TimerDelay	Integer	/	/	Timer delay; range: 0 to 34000000
TimerFrequency	Integer	/	/	Timer frequency; range: 0 to 1000000

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Field Name	Field Type	Enumerated Value	Value Name	Description
TimerTriggerSource	Enum	255	Off	Timer trigger source
		48	Timer0Active	
		49	Timer1Active	
		50	Timer2Active	
		51	Timer3Active	
		64	Encoder0	
		65	Encoder1	
		66	Encoder2	
		67	Encoder3	
		80	SoftwareSignal0	
		90	SoftwareSignal1	
		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			

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Field Name	Field Type	Enumerated Value	Value Name	Description
		129	ReceiveImageFrameStart1	
		130	ReceiveImageFrameStart2	
		131	ReceiveImageFrameStart3	
		144	ReceiveImageFrameEnd0	
		145	ReceiveImageFrameEnd1	
		146	ReceiveImageFrameEnd2	
		147	ReceiveImageFrameEnd3	
		160	Fval_0	
		161	Fval_1	
		176	LVAL_0	
		177	LVAL_1	
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

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Field Name	Field Type	Enumerated Value	Value Name	Description
UserSetDefault	Enum	0	Default	Default user set
		1	UserSet1	
		2	UserSet2	
		3	UserSet3	
PoCL power supply				
PoCLConnectionSelector	Integer	/	/	Select PoCL connection
PoCLEnable	Boolean	/	/	Enable PoCL switch
PoCLStatus	Enum	0	Off	Display PoCL switch status
		1	Auto	
PoCLPower	Integer	/	/	PoCL power, unit: mW, range: 0 to 4294967295
Camera control				
CCSelector	Enum	0	CC1	Camera control
		1	CC2	
		2	CC3	
		3	CC4	
		4	CC5	
		5	CC6	
		6	CC7	
		7	CC8	
CCSource	Enum	255	Off	Camera control signal source
		48	Timer0	
		49	Timer1	
		50	Timer2	
		51	Timer3	

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Field Name	Field Type	Enumerated Value	Value Name	Description
CCSource	Enum	64	HighLevel	Camera control signal source
		65	LowLevel	
		80	D485Input0	
		81	D485Input1	
		82	D485Input2	
		83	D485Input3	
		84	D485Input4	
		85	D485Input5	
		86	D485Input6	
		87	D485Input7	
		88	D485Input8	
		89	D485Input9	
		90	D485Input10	
		96	Encoder0	
		97	Encoder1	
		112	AdvancedIO0	
113	AdvancedIO1			
114	AdvancedIO2			
115	AdvancedIO3			



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