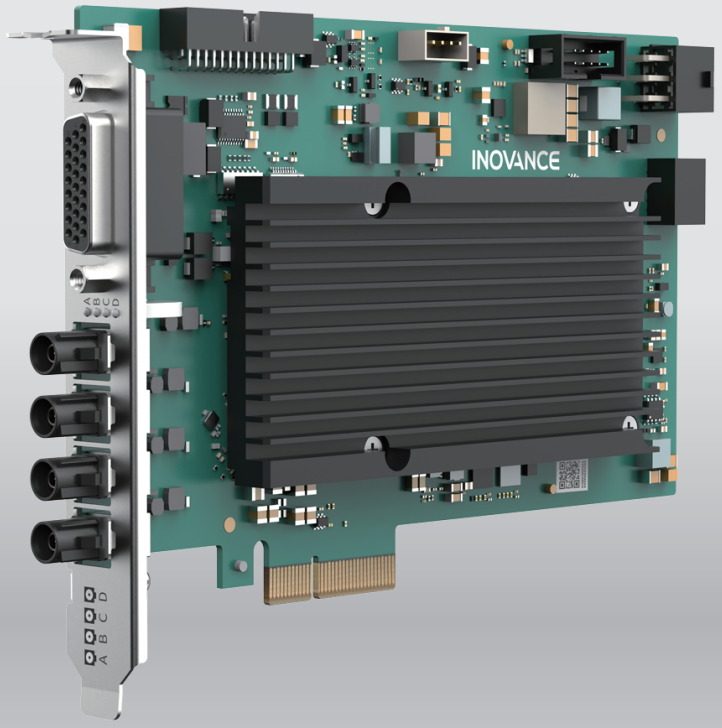
INOVANCE

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S2.0 Series
Image Frame Grabber

User Guide

Industrial Automation | New Energy Vehicle | Intelligent Elevator | Intelligent Robot | Digital Energy | Rail Transit

Data code PS00018308A03

Legal Information

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Due to continuous updates and improvements of products and technologies, the content of this documentation may not fully match the actual products. In the event of any discrepancies, the actual products shall prevail.

The contents are subject to change without notice due to product upgrade.

Waste Disposal

The storage, use, and disposal of this product (including optional accessories) must comply with local laws and regulations.

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel can identify the risks of the product/system and prevent possible dangers.

Proper Use of the Product

Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

Introduction

The S2.0 series image frame grabber is specifically designed for the S2.0 series camera, serving as an ideal solution for efficient data transmission. It is typically applied in industries such as 3C, semiconductors, PCBs, lithium batteries, and silicon crystals.

This document introduces the product information, hardware installation, and software control information of the S2.0 series image frame grabber, including the technical specifications, hardware installation, connection, software installation and commissioning on clients, maintenance, and common faults. This manual also includes safety precautions, electromagnetic interference prevention, warranty statements, nameplate description, and component description.

More documents

Name	Data code	Description
S2.0 Series Area Scan Camera User Guide	PS00018348	Describes the technical specifications, installation, usage and maintenance information of the S2.0 series area scan camera.
S2.0 Series Micro Area Scan Camera User Guide	PS00018248	Describes the technical specifications, installation, usage and maintenance information of the S2.0 series micro area scan camera.
INOMV Image Acquisition and Commissioning Software SDK Installation Guide	19012919	Describes the INOMV operating environment requirements, software installation, and so on.
INOMV Image Acquisition and Commissioning Software SDK User Guide	19012910	Describes the INOMV environment configuration, interface, and functions, including device management, device properties control, data acquisition and preview, and tools.
S2.0 Series Image Frame Grabber User Guide (this guide)	PS00018308	Describes the product information, hardware installation, and software control information of the S2.0 series image frame grabber.

Revision history

Date	Version	Description of change(s)
January 2026	A03	• Updated *"2.2 Model and Nameplate" on page 12*. • Updated *"4.1.3 Compatible Devices" on page 23*.
September 2025	A02	**Updated sections:** • Updated *" I/O Interface" on page 18*. • Updated *"3.6 Sync Interface" on page 20*. • Updated *"4.1.2 Installing the Image Frame Grabber" on page 22*. • Updated *"5.5.2.5 Error Statistics" on page 53*. • Updated *"5.5.3.3 Error Statistics" on page 56*. • Added KC certification to *"9.1 CE, RoHS, and KC Certification" on page 84*. **Added sections:** • Added *"4.1.3 Compatible Devices" on page 23*. • Added *"4.2.1 Cable Selection" on page 24*. • Added *"4.2.2 Wire Colors and Corresponding Signals" on page 24*. • Added *" Trigger Principles and Cases" on page 58*.
April 2025	A01	• Updated *"2.5 Technical Specifications" on page 14*. • Updated *"3.3 S2.0 Interface" on page 17*. • Updated *"4.2.5 DO Interface" on page 28*.
April 2025	A00	First release.

Access to the guide

The guide is not delivered with the product. Download the PDF file in the following ways:

- Visit *https://www.inovance.com/global*, choose Service&Support > **Support** > Documentation Download.
- Scan the **QR code** on the product with your smartphone.
- Scan the QR code below to install **My Inovance app**, where you can search for and download the guide.

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Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is caused by proper operation of the user. Maintenance will be charged after the warranty expires.

Within the warranty period, maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, and unusual voltage
- Damage caused by using the product for unintended functions
- Damage caused by using the product outside the specified scope
- Secondary damage caused by force majeure (natural disasters, earthquakes and lightning strikes)

When applicable, relevant maintenance fee will be charged according to the latest Price List of Inovance. If otherwise agreed upon, the agreed terms and conditions shall prevail.

For details, see the Warranty Card.

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1 Safety Instructions

1.1 Safety Precautions

Safety Disclaimer

- This section presents essential safety precautions for proper use of the product. Before use, read through the user guide and comprehend all the safety precautions. Failure to comply with the safety instructions may result in damage to equipment, serious injury, or even death.
- "CAUTION", "WARNING", and "DANGER" messages in the document are supplementary only and do not cover all safety precautions.
- Use this product in environments meeting the design and specification requirements; otherwise, a fault may occur. Noncompliance-caused malfunction or damage to parts are not covered in product quality warranty.
- Inovance shall not be held liable for any physical injuries or property damage caused by improper use.

Safety Levels and Definitions



indicates that failure to comply with the notice will result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in minor or moderate physical injuries or damage to the equipment.

Fundamental Safety Instructions

- Some drawings in this guide show the product without covers or protective guards to display more details. Be sure to install the covers and protective guards before using the product and operate the product in accordance with this guide.
- Product illustrations in this guide are for reference only. Actual products may vary.

Unpacking



- Do not install the product when you find that the product and its accessories have any damage or corrosion or they have been used.
- Do not install the product when there is water inside the product or any of its parts is missing or damaged.
- Do not install the product when the product name is inconsistent with that in the packing list.



- Check whether the packing is intact and whether there is damage, water seepage, dampness, or deformation before unpacking.
- Unpack the product layer by layer. Do not strike the package violently.
- Check the surface of the equipment and accessories for any damage, rust, and scratches.
- Check the equipment, accessories, and materials in the package against the packing list.

Storage and Transportation



- Package the product strictly before transporting it, and use an enclosed container for long-distance transportation.
- Avoid storage and transportation in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid product and component dropping and strong vibration during transportation.
- Never transport this product with materials that harm or have negative impacts on this product.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.

Installation



- The product installation process must strictly comply with all electrical safety regulations of the country and region of use.
- Installation can be performed only by professionals with a qualification certificate or experience in installing and maintaining low-voltage systems and experience and qualifications in related work, or professionals with basic knowledge and operational skills in low-voltage wiring and low-voltage electronic circuit connections. Non-professionals are not allowed to operate on the equipment.
- Never install indoor products in environments where they may be exposed to rain or moisture. Failure to comply may result in fires or electric shocks.
- Place the products in a location without direct sunlight, away from heat sources such as heaters and flames.



- Read through the guide and safety instructions before installation.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not modify the product.

Wiring



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Be sure to use a power adapter provided by a reputable manufacturer. The power adapter must comply with limited power source (LPS) requirements of the safety specifications. For specific requirements, see the product's technical specifications.



- Wiring cables must meet diameter and shielding requirements.
- To avoid electric shock and product damage, make sure that all cables are correctly connected without being exposed and no screws or washers are fallen.
- Reasonably assess the wiring space and do not pull the cables.
- Shield the cables properly or do not route the product cable together with high-power equipment cables.
- To avoid electric shock and product damage, make sure that all cables are correctly connected without being exposed and no screws or washers are fallen.
- During wiring, follow proper electrostatic discharge (ESD) proceduresand wear an antistatic wrist strap. Failure to comply will result in damage to the equipment or internal product circuits.

Power-On



- Before power-on, make sure that the product is installed properly with reliable wiring.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or fire.

Operation



- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in electric shocks.
- Do not touch any heatsink components of the product to check temperature. Failure to comply may result in burns.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment while power is on. Failure to comply will result in electric shocks.



- Do not directly touch the image sensor. When cleaning it, use a soft and clean cloth slightly dampened with alcohol to wipe the sensor.
- Attach the dust cover to the equipment not in use to prevent contamination of the image sensor.
- Perform routine and periodic inspection and maintenance on the equipment and keep a maintenance record.

Repair
DANGER . Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. . Do not repair the equipment while power is on. Failure to comply may result in electric shock.
WARNING . The equipment must be troubleshooted and repaired by professionals in accordance with the maintenance instructions. The repair person must maintain maintenance records. . Replace quick-wear parts of the product according to the replacement instructions. . After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal
WARNING . Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, physical injuries, or even death. . Recycle retired equipment in accordance with waste disposal standards of the industry to avoid environmental pollution.

Electromagnetic Interference Prevention Precautions

This product may cause radio interference in life. In this case, users may need to take practical measures to address the interference.

Warning

- Do not place the product in any place with electromagnetic interference.
- When using shielded cables, ensure the integrity.
- Product control lines and industrial light source power cables must be wired separately to prevent bundled wiring.
- Product power cables must be wired separately from data cables and signal cables.
- If the product is frequently powered on and off, enhance voltage stabilization and isolation.
- Insulate any unused cables of the product.
- During product installation and use, prevent high-voltage leakage and similar phenomena.
- Use network cables with the shielding function to connect to the product.

1.2 Industrial Information Security

This product provides an interface to connect to the network and transmit data through the network interface. To protect factories, systems, machines, and networks from cyber attacks, appropriate industrial information security protection mechanisms need to be implemented to ensure the safe operation of factories, systems, machines, and networks.

The customer is responsible for providing and continuously ensuring a secure connection between the product and the customer's network or any other network, to prevent unauthorized access to their factory, systems, machines, and networks. The system or machine may only be connected to

the corporate network or the Internet when a secure connection is established and proper security measures are in place (for example, using antivirus software and installing firewalls).

INOVANCE continuously develops and improves its products and solutions to enhance safety. It is strongly recommended that you update your products promptly and always use the latest product versions.



Malware (such as viruses, Trojans, and worms) can bring the device into an unsafe operating state, resulting in death, serious injury, and property damage. Observe the following precautions strictly:

- Always use the latest software version. If the product version is no longer supported or the latest program version is not applied, customers are at increased risk of cyberattacks.
- Implement and maintain appropriate security measures (including but not limited to deploying anti-virus software, firewall, WAF, IPS/IDS, situational awareness system, ID verification, and data encryption) to prevent files in the removable storage device from being damaged by malware and to protect products, networks, systems, and interfaces from unauthorized access, disruption, intrusion, data leakage, or information theft.
- Check all safety-related interfaces and settings after commissioning.

2 Product Information

2.1 Product Introduction

The S2.0 series image frame grabber is specifically designed for the S2.0 series camera, serving as an ideal solution for efficient data transmission. This image frame grabber adopts a PCIe Gen3 x 4 bus structure, with a single camera channel supporting a maximum bandwidth of 6 Gbit/s, ensuring the high-speed data processing capability. It fully supports the standard S2.0 protocol, is equipped with four interfaces, and features excellent transmission stability, significantly reducing the risk of disconnection and frame loss, ensuring high reliability in data acquisition. The image frame grabber also provides multiple I/O interfaces, integrating multiple input and output channels for flexible configuration and system function expansion.

In addition, the S2.0 series image frame grabber provide I/O logs to support fault diagnosis and allow users to quickly locate faults, thereby reducing downtime and improving work efficiency.

The S2.0 interface (GMSL2.0 interface) image frame grabber uses the high-speed Serdes technology, with the following features:

- PCIe Gen3 x 4 bus, up to 6 Gbit/s bandwidth per camera channel
- Standard S2.0 protocol transmission, four interfaces, stable transmission, reliable connection, and no frame loss
- Multiple I/O interfaces, integrating multiple input and output channels
- Providing I/O logs for fault diagnosis and rapid location
- CPU occupation less than 2%
- Real-time feedback of frame grabber status by channel indicator

2.2 Model and Nameplate

Model description

VG 10-S2-4-*
① ② ③ ④ ⑤

① **Product family** VA: Intelligent camera VC: Industrial camera VG: Vision components	④ **Number of interfaces** 2: Two interfaces 4: Four interfaces
② **Product series** 10: Frame grabber 20: Capture box 30: Distribution box	⑤ **Version** INT: International version
③ **Interface type** CL: CameraLink CXPII: CoaXPress 2.0 S2: S2.0 standard protocol	-

Nameplate



2.3 Components

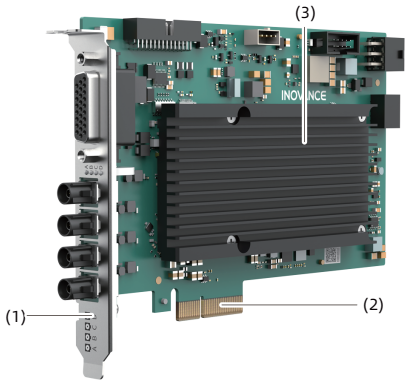


Figure 2-1 Components

No.	Component
(1)	Frame grabber baffle
(2)	Circuit board
(3)	Heatsink component

2.4 Product Dimensions

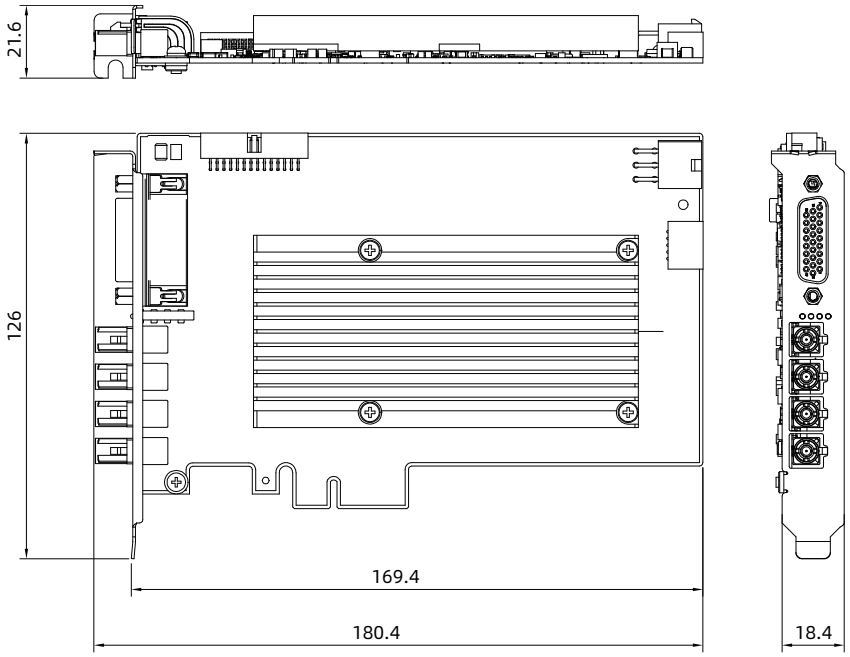


Figure 2-2 Product dimensions (unit: mm)

2.5 Technical Specifications

Item		VG10-S2-4
Memory	Board memory size	8 Gb DDR4
Host interface	Bus interface	PCI-E Gen3 x 4
	Total bandwidth	32 Gbps
Camera interface	Standard	S2.0
	Number of interfaces	4
	Number of cameras supported	1/2/3/4 elevators
	Interface transmission rate	6 Gbps per interface, total bandwidth 24 Gbps
	Number of channel indicators	4
General I/O	I/O function	• TTL I/O: 2 • Differential input: 2 • Isolated input: 4 • Isolated output: 4
	Connector	D-Sub 26-pin female connector
Electrical characteristics	Full load power consumption	< 15 W (excluding 4-channel camera output)
	GMSL2.0 interface single channel Max. output power consumption	6 W
	Power Supply	PCI-E + 6-pin PEG auxiliary power supply
Structure	Outline dimensions	180.4 mm x 126 mm x 18.4 mm

Item		VG10-S2-4
Operating environment	Temperature	Operating temperature: 0°C to 50°C; storage temperature: –30°C to +70°C
	Humidity	Relative humidity: ≤ 95% RH (30°C), without condensation
General specifications	Software	INOMV
	Operating system	Windows 10
	Certification	CE, RoHS, and KC

Note

Models with the "-INT" suffix are international versions; their technical specifications are identical to the standard models without the suffix.

3 Image Frame Grabber Hardware

3.1 Image Frame Grabber Interfaces

The following figure shows the image frame grabber interfaces.

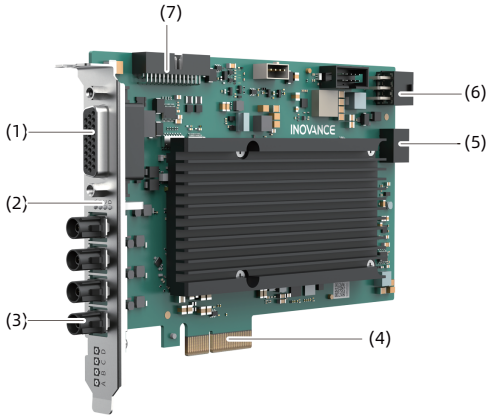
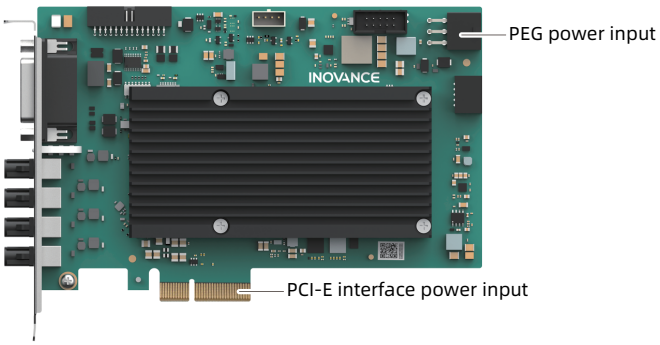


Figure 3-1 Interfaces

No.	Interface	Description
(1)	I/O interface	D-Sub 26-pin female connector, used to connect to I/O signals of the frame grabber
(2)	LED	4 camera indicators, showing the camera status
(3)	GMSL2.0 interface	Four-channel GMSL2.0 interfaces, supporting Fakra connectors and supplying power for the camera through POC
(4)	PCIe interface	Gen3 x 4 interface
(5)	Sync interface	Used to transmit sync signals between multiple grabbers
(6)	PEG power supply interface	PEG 6-pin power supply interface: 12 V
(7)	In-board I/O interface	Reserved interface used to connect to I/O signals of the frame grabber, which is generally the D-Sub 26-pin interface

3.2 Power Supply



A frame grabber requires two power inputs:

- PCIe slot power input, sourced from the motherboard of the industrial personal computer, with a current carrying capacity of no less than 2 A.

- PEG 6-pin power input, which is the ATX power supply interface, primarily used to supply power to POC. The following figure shows the input cable.

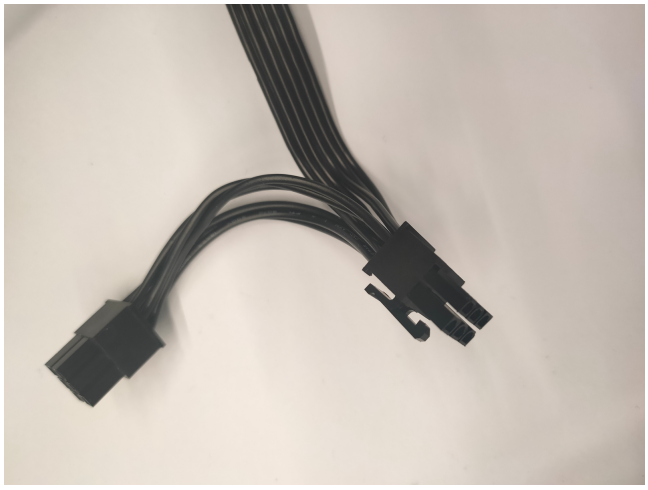
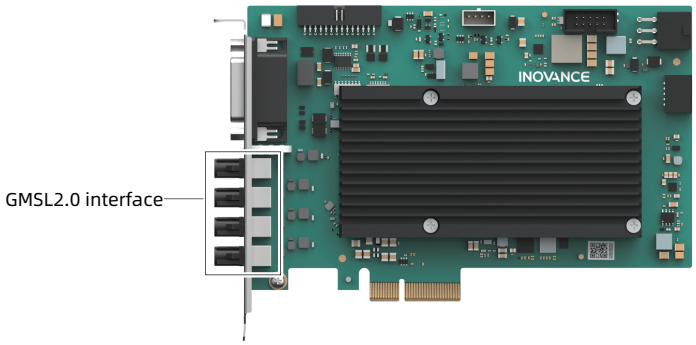


Figure 3-2 PEG power input cable

3.3 S2.0 Interface

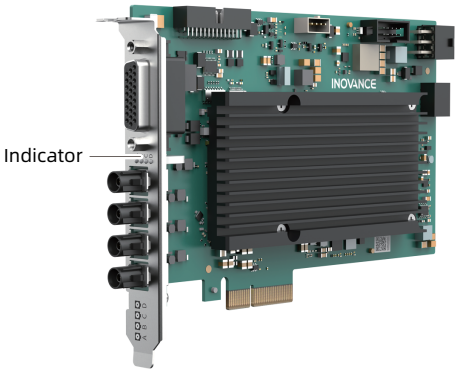


The GMSL2.0 interface is a Fakra coaxial cable interface, which provides a high transmission bandwidth of up to 6 Gbit/s, with strong anti-interference capability. This interface can be used to supply power to the camera



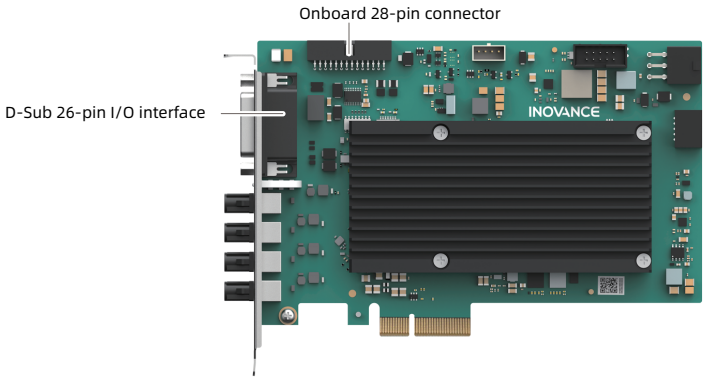
Figure 3-3 GMSL2.0 cable

3.4 Indicator



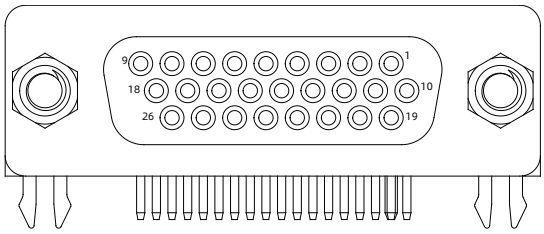
Item	Specification			
Description	Camera1 (A)	Camera2 (B)	Camera3 (C)	Camera4 (D)
Support quantity	4 PCS (monochromatic indicator)			
LED color	Green			
Display mode	• Upon startup: On 1s and then displayed based on the camera status • Camera not inserted: Steady OFF • Camera inserted: ▪ Idle: Steady ON ▪ Transmitting: Flashing at 1 Hz/50% ▪ Error: Flashing at 10 Hz/50%			

3.5 I/O Interface



26-pin I/O interface

The following table describes the pin definitions of the D-Sub 26-pin female I/O connector.

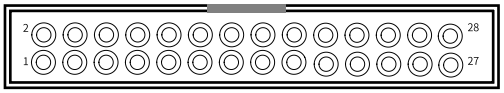


Pin No.	Interface Definition	Software Parameter	Property
1	Differential input 1+	RS485_IN0	Non-isolated
2	Differential input 2+	RS485_IN1	Non-isolated
3	Reserved	-	-
4	Differential input GND	-	Non-isolated
5	DI_X0	DI0	Isolated
6	DI_X2	DI2	Isolated
7	DO_Y0	DO0	Isolated
8	DO_Y2	DO2	Isolated
9	DC_24V	-	Isolated
10	Differential input 1-	RS485_IN0	Non-isolated
11	Differential input 2-	RS485_IN1	Non-isolated
12	Reserved	-	-
13	Differential input GND	-	Non-isolated
14	DI_X1	DI1	Isolated
15	DI_X3	DI3	Isolated
16	DO_Y1	DO1	Isolated
17	DO_Y3	DO3	Isolated
18	0 V	-	Isolated
19	TTL I/O_IO1	TTL1	Non-isolated
20	TTL I/O_IO0	TTL0	Non-isolated
21	TTL I/O_GND	-	Non-isolated
22	Differential input GND	-	Non-isolated
23	DI_SS0	-	Isolated
24	DO_COM	-	Isolated
25	DO_COM	-	Isolated
26	DO_COM	-	Isolated

For details about the cables and wire colors for the D-Sub 26-pin I/O interface, see *"4.2.2 Wire Colors and Corresponding Signals" on page 24*.

28-pin I/O interface

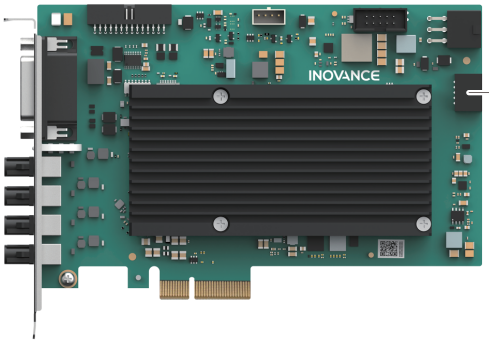
The following table defines the I/O signals of the on-board 28-pin box header connector.



Pin No.	Interface Definition	Pin No.	Interface Definition
1	DC_12V	15	DI_X1
2	DC_12V	16	DI_X0
3	DC_GND	17	DI_X3
4	DC_GND	18	DI_X2
5	Differential input GND	19	DI_SS0

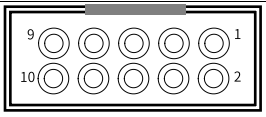
Pin No.	Interface Definition	Pin No.	Interface Definition
6	DC_GND	20	DO_COM
7	TTL I/O_IO1	21	DO_COM
8	TTL I/O_IO0	22	DO_COM
9	Differential input 3- (reserved)	23	DO_Y3
10	Differential input 3+ (reserved)	24	DO_Y2
11	Differential input 2-	25	DO_Y1
12	Differential input 2+	26	DO_Y0
13	Differential input 1-	27	0 V
14	Differential input 1+	28	DC_24V

3.6 Sync Interface



The Sync interface is a board-to-board synchronization interface, which is used to transmit sync signals between multiple grabbers. It adopts a 10-pin box header connector, with the level standard and signal definitions listed in the table below.

Item	Specification
Expansion interface 1	10-pin box header right-angle connector (female)
Level type	TTL_3.3V GPIO



Pin No.	Interface Definition	Signal Type	Input Delay	Pin No.	Interface Definition	Signal Type	Input Delay
1	BoardSync1	Supported for I/O software	30 ns	6	GND	-	-
2	BoardSync0	Supported for I/O software	30 ns	7	RSVD	-	-
3	BoardSync2	Supported for I/O software	30 ns	8	RSVD	-	-
4	BoardSync3	Supported for I/O software	30 ns	9	RSVD	-	-
5	GND	-	-	10	RSVD	-	-

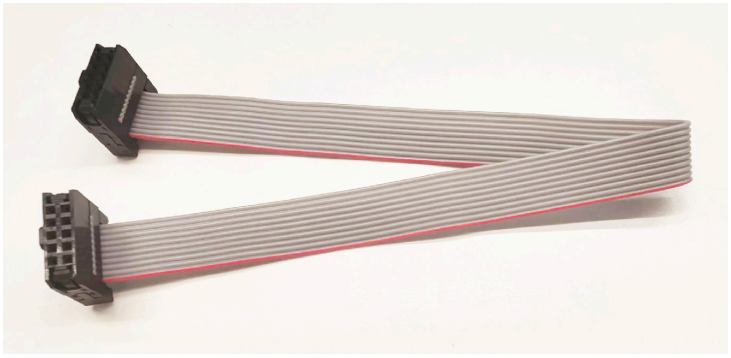


Figure 3-4 Sync interface cable

4 Image Frame Grabber Installation and Connection

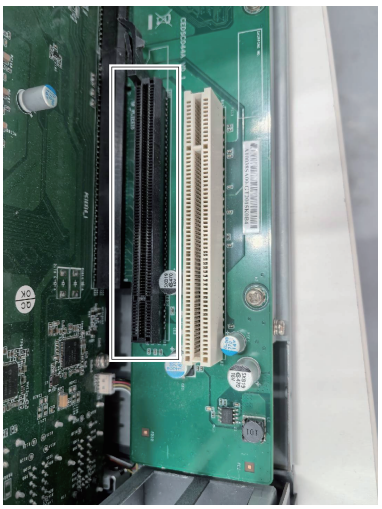
4.1 Operating Environment and Conditions

4.1.1 Operating Environment Requirements

Item	Requirement
Operating temperature	0°C to 50°C Make sure enough space surrounding the control card has been reserved for heat dissipation.
Operating humidity	20% to 95% RH, no condensing
Transportation and storage temperature	-20°C to +70°C (non-freezing)
Transportation and storage humidity	20% to 95% RH, no condensing
Altitude	≤ 2000 m
Pollution degree	2
Vibration resistance	• Sinusoidal vibration: 5 Hz to 8.4 Hz, 3.5 mmp;• 8.4 Hz to 200 Hz, 1 g;• Three axes: X, Y, and Z; 10 sweeps/axis • Random vibration: 5 Hz to 100 Hz, 0.01 g^2/Hz• 200 Hz, 0.001 g^2/Hz• Grms = 1.14 g• Three axes: X, Y, and Z; 30 minutes/axis
Shock resistance	15 g, 11 ms, 3 times per direction, 18 times in total

4.1.2 Installing the Image Frame Grabber

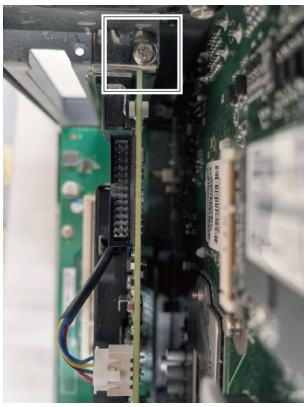
1. Prepare an industrial personal computer or vision controller with a PCIe Gen3 x 4 interface. The following figure shows the slot positions.



2. After unpacking the grabber, remove the protective tape from the edge connector of the grabber.
3. Disassemble the cabinet and find the proper PCIe slots. Take the keying slot of the edge connector as the reference to insert the card into the slot directly, and snap the fastener clip if there is any.



4. Tighten up the screws in the front panel.



5. Check whether the screws in the front panel are tightened up, and whether the edge connector is installed properly. If yes, assemble the cabinet properly to finish installation.

Caution

Ensure that the industrial personal computer is powered off before installing the image frame grabber. Failure to comply may result in damage to the image frame grabber.

4.1.3 Compatible Devices

- Industrial personal computers: The S2.0 series image frame grabber is compatible with 3U and 4U full-height cabinets, such as VB6287-32G01T-2.
- Cameras: The S2.0 series image frame grabber is compatible with S-interface area scan cameras. The following table lists the compatible camera models.

Resolution	Black-white	Color
0.4MP	VC21-004SM-450-X	VC21-004SC-450-X
0.4MP	VC21-004SM-450-D	VC21-004SC-450-D
1.6MP	VC21-016SM-246-X	VC21-016SC-246-X
1.6MP	VC21-016SM-246-D	VC21-016SC-246-D
2MP	VC21-020SM-120-X	VC21-020SC-120-X
2MP	VC21-020SM-120-D	VC21-020SC-120-D
5MP	VC21-050SM-060-X	VC21-050SC-060-X
5MP	VC21-050SM-073-D	VC21-050SC-073-D
6MP	VC21-060SM-060-X	VC21-060SC-060-X
6MP	VC21-060SM-060-D	VC21-060SC-060-D

Resolution	Black-white	Color
8MP	VC21-080SM-050-X	VC21-080SC-050-X
8MP	VC21-080SM-050-D	VC21-080SC-050-D
12MP	VC21-120SM-030-X	VC21-120SC-030-X
12MP	VC21-120SM-030-D	VC21-120SC-030-D
12MP	VC21-120SM-030B-D	VC21-120SC-030B-D
20MP	VC21-200SM-020-D	VC21-200SC-020-D

For details about the cameras, see the S2.0 Series Area Scan Camera User Guide and S2.0 Series Micro Area Scan Camera User Guide.

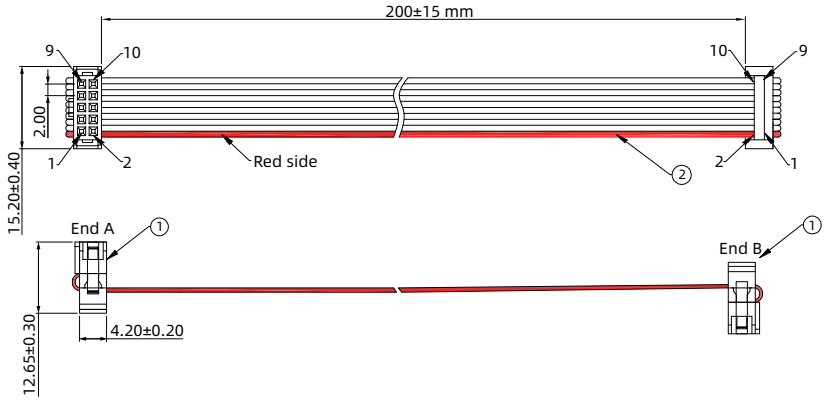
4.2 I/O Electrical Characteristics and Wiring

4.2.1 Cable Selection

The following table lists the five cable models supported for the S2.0 series grabber.

No.	Model	Type	Length (m)	Supported Terminal
1	VG01-DB26-03L-S	DB26 cable	3	DI, DO, TTL, and RS485
2	VG01-DB26-07L-S	DB26 cable	7	DI, DO, TTL, and RS485
3	VG01-DB14-03L-S	DB14 cable	3	DI and DO
4	VG01-DB14-05L-S	DB14 cable	5	DI and DO
5	VG01-DB14-07L-S	DB14 cable	7	DI and DO

The grabber is equipped with a cable for synchronization between boards. The cable model is F20026510200001. The following figure shows this cable.



4.2.2 Wire Colors and Corresponding Signals

Table 4–1 Signal mapping for the 26-core cable VG01-DB26-xxL-S

Pin No.	Color	Interface Definition	Software Parameter	Property
1	Black/blue	Differential input 1+	RS485_IN0	Non-isolated
2	Yellow/blue	Differential input 2+	RS485_IN1	Non-isolated
3	Brown/blue	Reserved	-	-
4	Red/blue	Differential input GND	-	Non-isolated
5	Blue/white	DI_X0	DI0	Isolated
6	Black/white	DI_X2	DI2	Isolated

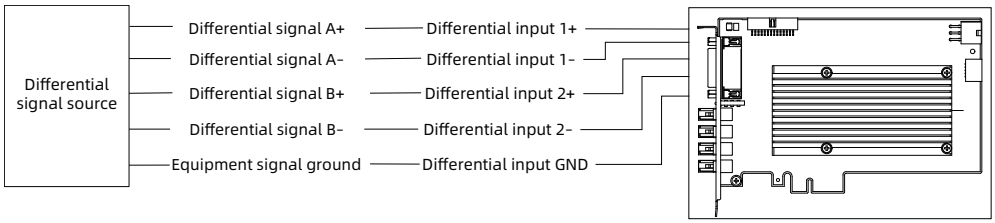
Pin No.	Color	Interface Definition	Software Parameter	Property
7	Blue	DO_Y0	DO0	Isolated
8	Black	DO_Y2	DO2	Isolated
9	Thick white	DC_24V	-	Isolated
10	Red	Differential input 1-	RS485_IN0	Non-isolated
11	Yellow	Differential input 2-	RS485_IN1	Non-isolated
12	Gray	Reserved	-	-
13	Brown	Differential input GND	-	Non-isolated
14	Purple/white	DI_X1	DI1	Isolated
15	Green/white	DI_X3	DI3	Isolated
16	Purple	DO_Y1	DO1	Isolated
17	Thin green	DO_Y3	DO3	Isolated
18	Thick green	0 V	-	Isolated
19	Orange/Blue	TTL I/O_IO1	TTL1	Non-isolated
20	Brown/white	TTL I/O_IO0	TTL0	Non-isolated
21	Pink/white	TTL I/O_GND	-	Non-isolated
22	Orange	Differential input GND	-	Non-isolated
23	Thin white	DI_SS0	-	Isolated
24	Pink	DO_COM	-	Isolated
25	Orange/white	DO_COM	-	Isolated
26	Red/White	DO_COM	-	Isolated

Table 4–2 Signal mapping for the 14-core cable VG01-DB14-xxL-S

Pin No.	Color	Interface Definition	Software Parameter	Property
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	Green	DI_X0	DI0	Isolated
6	Blue	DI_X2	DI2	Isolated
7	Gray	DO_Y0	DO0	Isolated
8	Purple	DO_Y2	DO2	Isolated
9	Brown	DC_24V	-	Isolated
10	-	-	-	-
11	-	-	-	-
12	-	-	-	-
13	-	-	-	-
14	Orange	DI_X1	DI1	Isolated
15	Pink	DI_X3	DI3	Isolated
16	Green/white	DO_Y1	DO1	Isolated
17	Blue/white	DO_Y3	DO3	Isolated
18	Black	0 V	-	Isolated
19	-	-	-	Non-isolated
20	-	-	-	Non-isolated
21	-	-	-	Non-isolated
22	-	-	-	Non-isolated
23	Gray/white	DI_SS0	-	Isolated
24	Purple/white	DO_COM	-	Isolated
25	Orange/white	DO_COM	-	Isolated
26	Pink/white	DO_COM	-	Isolated

4.2.3 Differential Input Interface

The differential input interface complies with the TIA/EIA-485-A electrical standard. The following figure shows the connection.



4.2.4 DI Interface

The following table lists the electrical specifications for four-channel DI interfaces.

Item	Specification
Supported quantity	4 channels
Hardware interface	D-Sub 26-pin
Input mode	Source (PNP) and sink (NPN)
Interface definition	For details, see . *" I/O Interface" on page 18*
Input voltage	24 VDC
Maximum input frequency	200 kHz
Input impedance	1.5 kΩ
Input current at ON	> 19 mA (24 VDC) > 4 mA (5 VDC)
Input current at OFF	< 15 mA (24 VDC) < 2 mA (5 VDC)
Voltage at ON	≥ 5 VDC
Voltage at OFF	≤ 0.8 VDC
Hardware response time (ON/OFF)	≤ 2μs
Isolation mode	Isolation for integrated chip

Note

When the cable length exceeds 3 m, the DI frequency must not exceed 100 kHz. If 200 kHz is required, a resistor of no more than 500 Ω must be connected in parallel at the DI port to accelerate loop voltage discharge.

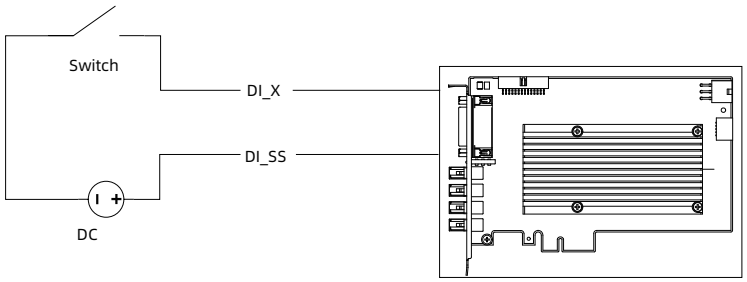


Figure 4-1 DI wiring switch diagram

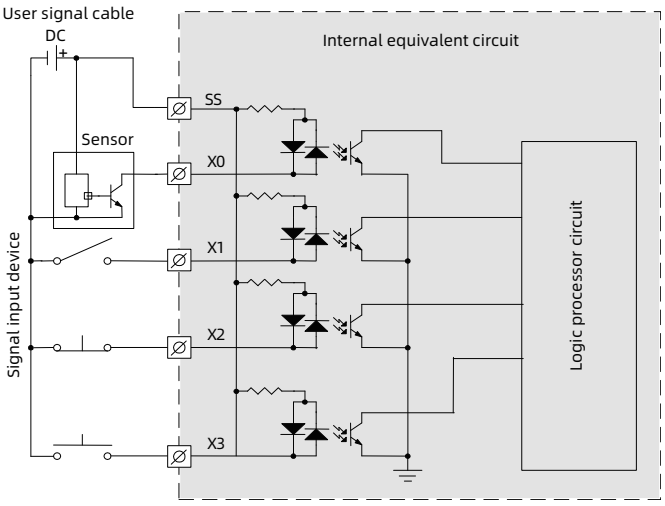


Figure 4-2 Sink (NPN) input terminal circuit diagram

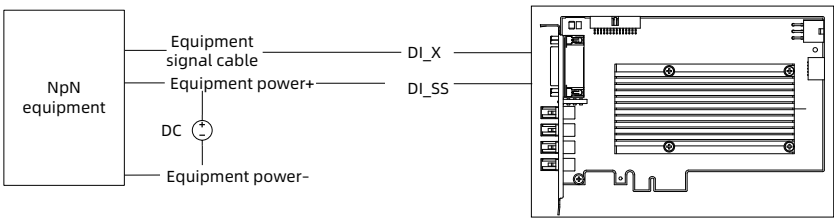


Figure 4-3 Sink (NPN) input connection diagram

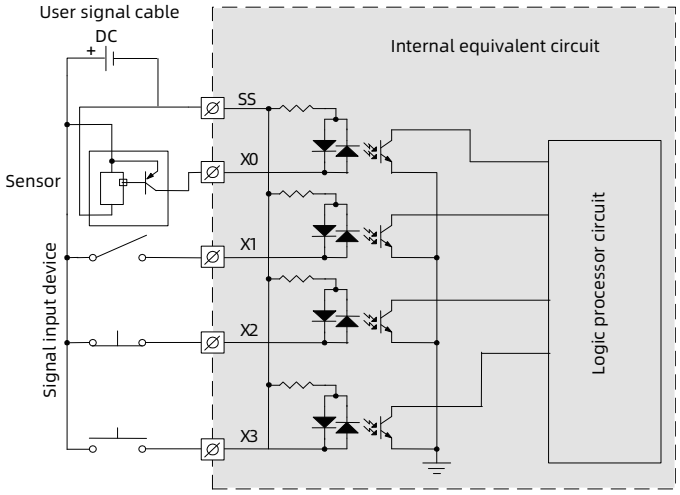


Figure 4-4 Source (PNP) input terminal circuit diagram

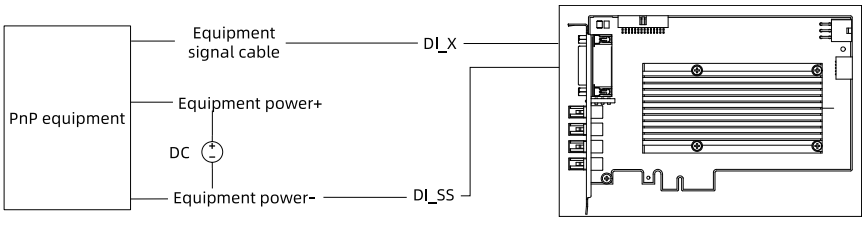


Figure 4-5 Source (PNP) input connection diagram 1

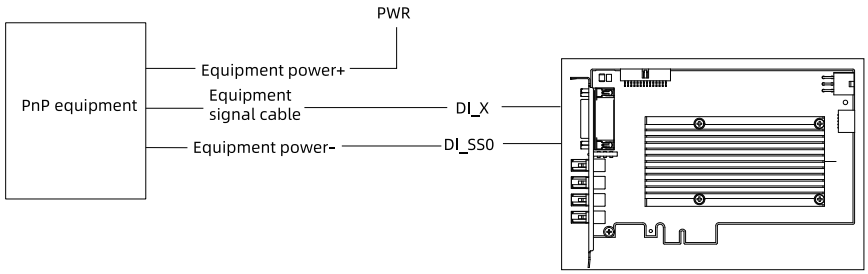


Figure 4-6 Source (PNP) input connection diagram 2

4.2.5 DO Interface

The following table lists the electrical specifications for four-channel DO interfaces.

Item	Specification
Supported quantity	4 channels
Hardware interface	D-Sub 26-pin female
Output type	Transistor NPN
Interface definition	For details, see . *" I/O Interface" on page 18*
Output voltage range	12 VDC to 24 VDC±10%
Maximum output frequency	• Resistive load: 200 kHz • Inductive load: 0.5 Hz • Lamp load: 10 Hz
Resistive output load	0.5 A/channel
Inductive output load	7.2 W/channel (24 VDC) 3.6 W/channel (12 VDC)
Lamp output load	5 W/channel (24 VDC) 2.5 W/channel (12 VDC)
Hardware response time (ON/OFF)	< 1 μs (OFF to ON) < 2 μs (ON to OFF)
Leakage current of signal OFF	< 30 μA (24 VDC)
Maximum residual voltage during ON	< 0.5 VDC
Isolation mode	Digital isolator
Short-circuit protection	Support for thermal protection

Note

- The output load current is related to the D-Sub 26-pin male cable. When the output load current is equal to or greater than 200 mA, it is recommended that a cable with a wire diameter of AWG26 or thicker be used.
- Flywheel diode is required when an external inductive load is connected.
- Currently, the 3 m and 7 m cables are available for selection. If a high-speed I/O interface with a frequency above 200 kHz is required, it is recommended that the 3 m cable be used.

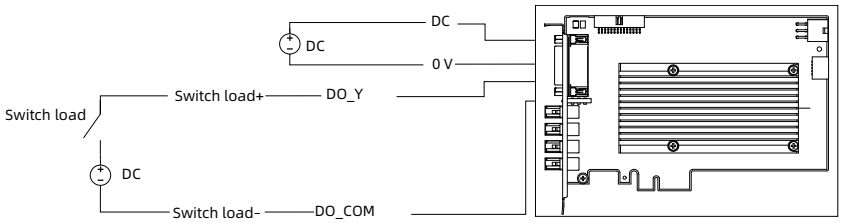


Figure 4-7 DO switch load connection diagram

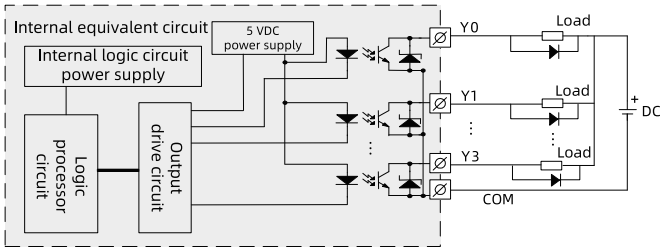


Figure 4-8 DO terminal circuit diagram

4.2.6 IO_TTL Interface

The following table lists the electrical specifications for two-channel TTL interfaces.

Item	Specification
Supported quantity	2 channels
Hardware interface	D-Sub 26-pin female
Interface definition	For details, see . *" I/O Interface" on page 18*
Specification	TTL_5V
Maximum frequency	1MHz
VIH	≥ 2.4 VDC
VIL	≤ 0.4 VDC
VOH	≥ 4.4 VDC
VOL	≤ 0.4 VDC
Output driver current	8 mA Max

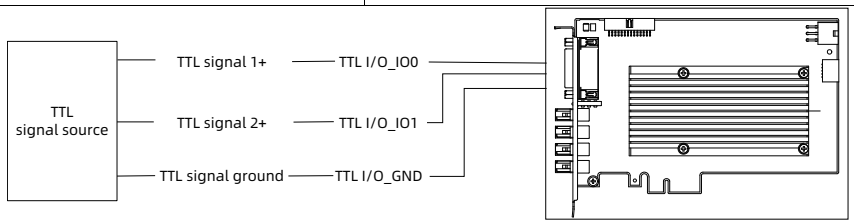


Figure 4-9 TTL signal input diagram

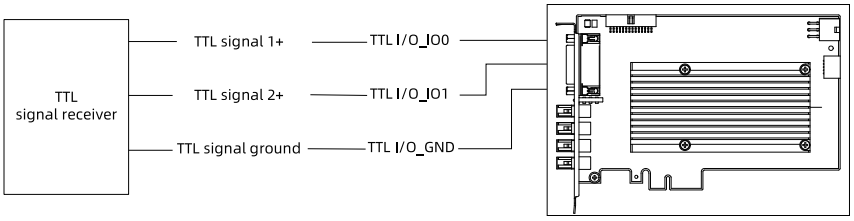


Figure 4-10 TTL signal output diagram

5 Installation and Commissioning on Client

5.1 System Overview

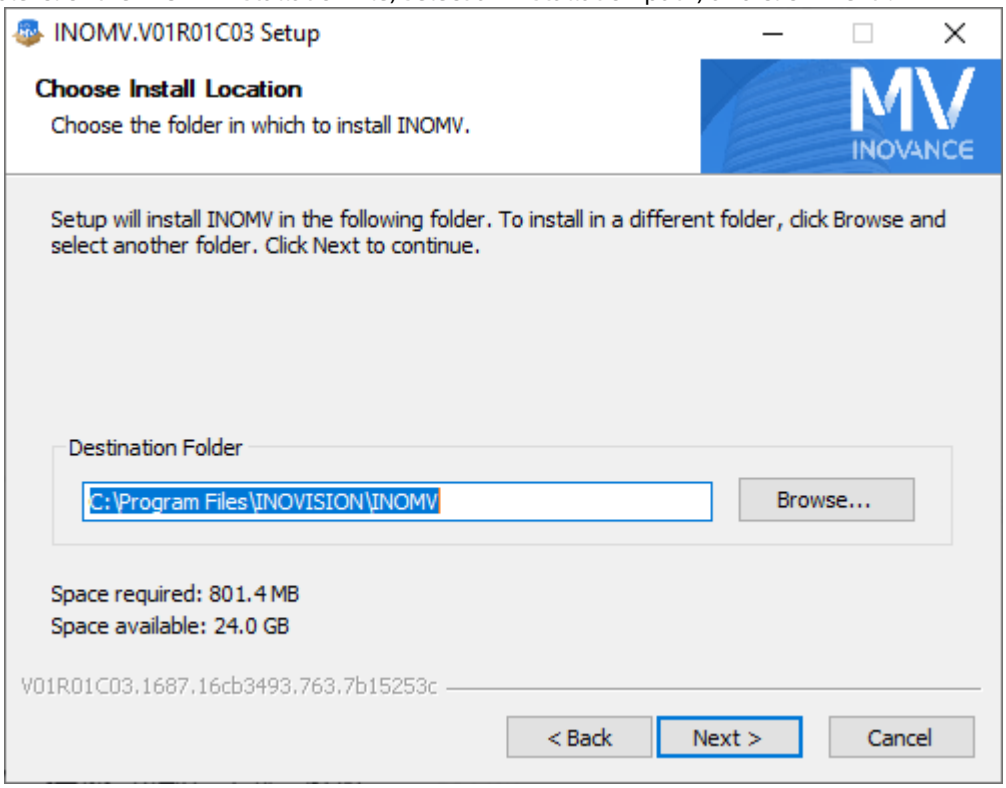
The INOMV client software supports Windows 10 and later. INOMV.V1R01C02 and later versions support S frame grabbers.

To install the INOMV client software, you must install the following three parts:

1. INOMV GUI software
2. Driver installer
3. INOMV SDK secondary development kit

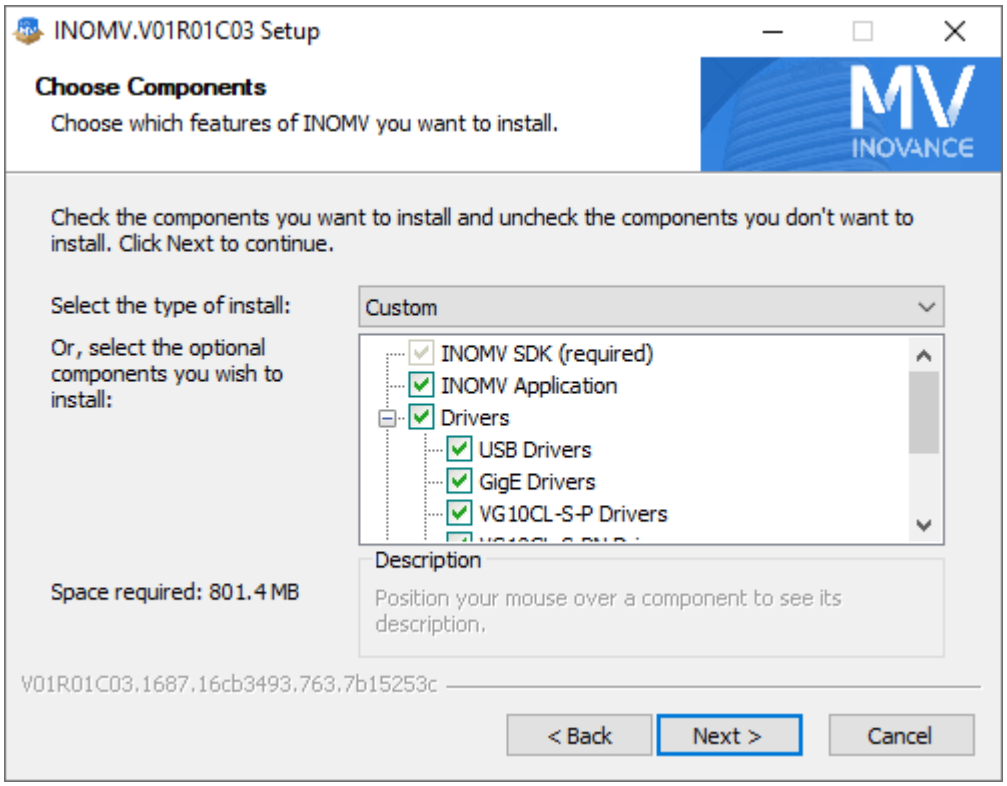
5.2 Installation on Client

1. Double-click the INOMV installation file, select an installation path, and click "Next".

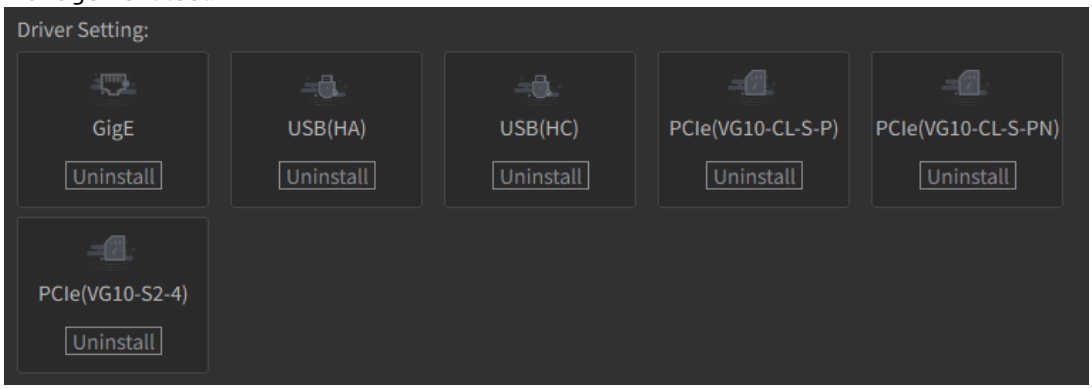


2. Select the INOMV components to be installed.

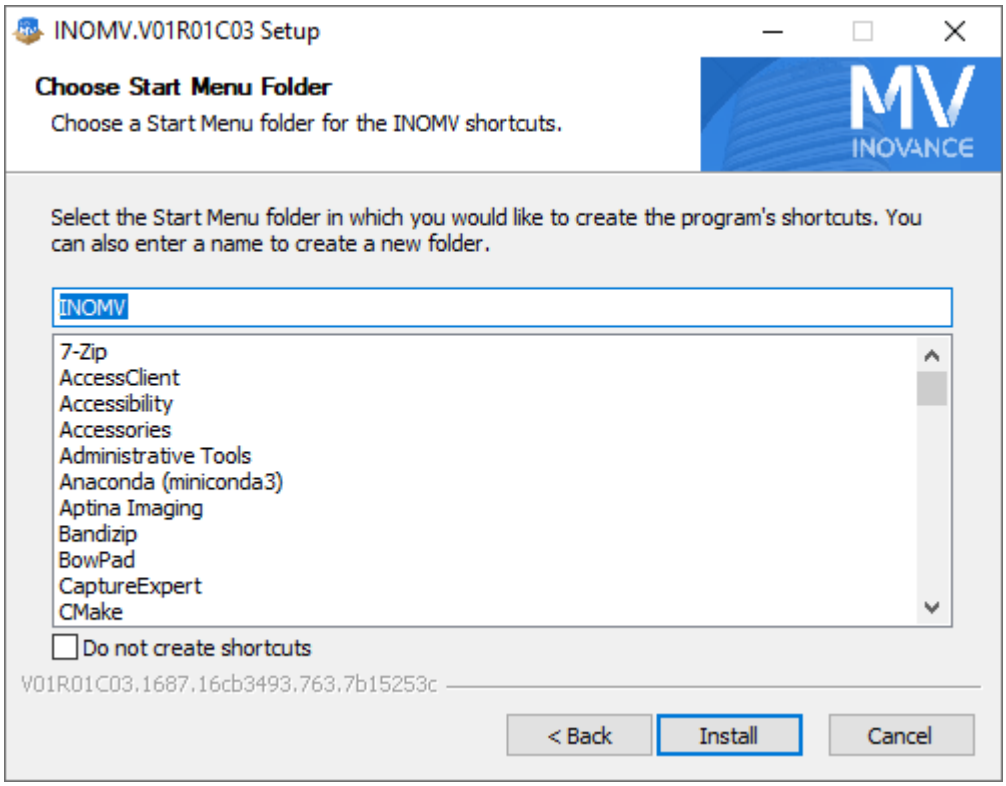
- On the component selection page, select "INOMV Application" and "VG10-S2" (if not selected, see the driver installation section in the INOMV Image Collection Commissioning Software SDK Installation User Guide), and then click "Next".



- The VG10-S2 driver is dedicated for S frame grabbers. By default, this driver is installed together with INOMV. You can verify whether this driver has been installed in the driver management tool.



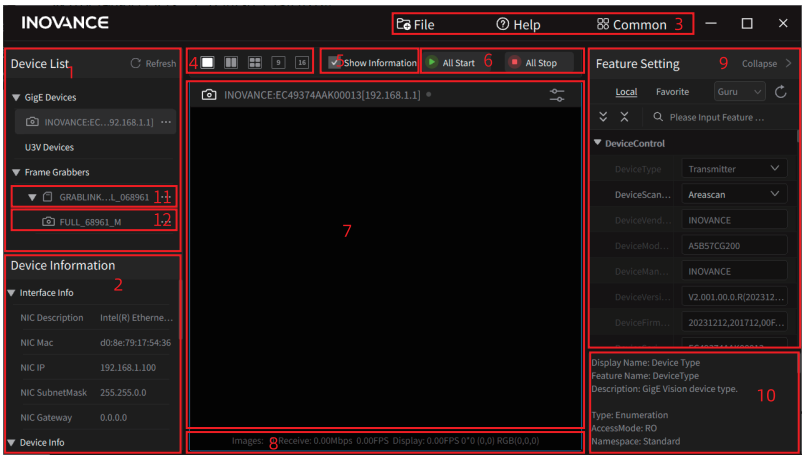
3. Select a start menu folder, select to create a shortcut, and click "Install".



4. If an earlier version of the software exists in the system, select "Add/Reinstall components" or "Uninstall before installing".
5. After installation is complete, you can find the corresponding shortcuts in the "Start" menu and on the desktop.

5.3 Using Client Software

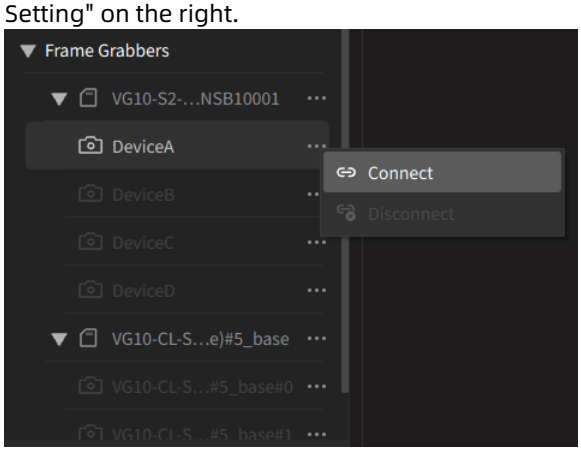
After INOMV is started, the software main screen is displayed, as shown in the following figure. The following table lists the functions of each area.



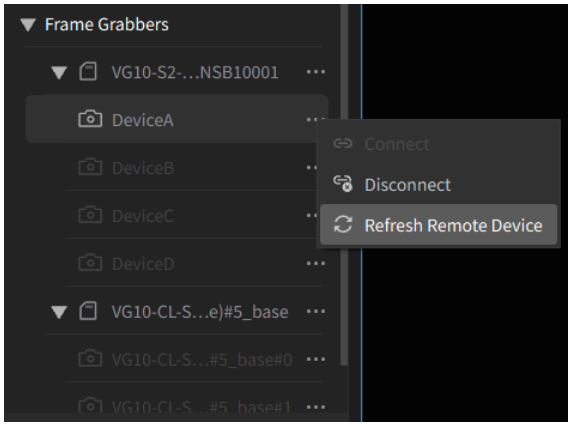
Area	Function
1	Device list
2	Device information
3	Menu bar
4	Image window quantity setting

Area	Function
5	Image information display setting
6	Collection start/stop button
7	Image display area
8	Image information area
9	Property setting area
10	Property information area
11	Frame grabber port
12	Frame grabber local device

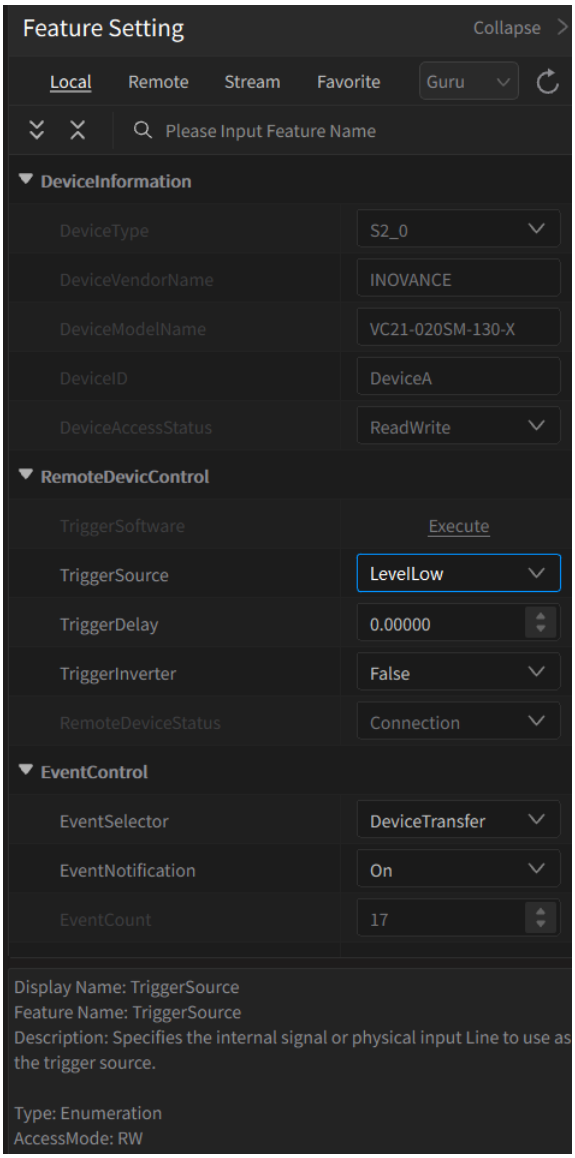
- When only frame grabbers are connected, choose "Device List" > "Frame Grabbers", right-click a local device, and click "Connect". After a successful connection, you can set the frame grabber parameters in "Feature Setting" on the right.



- When both the frame grabber and camera are connected, after connecting the frame grabber, right-click a local device and click "Refresh Remote Device" to connect to the camera.



After a successful connection, you can set the frame grabber and camera parameters in "Feature Setting" on the right.



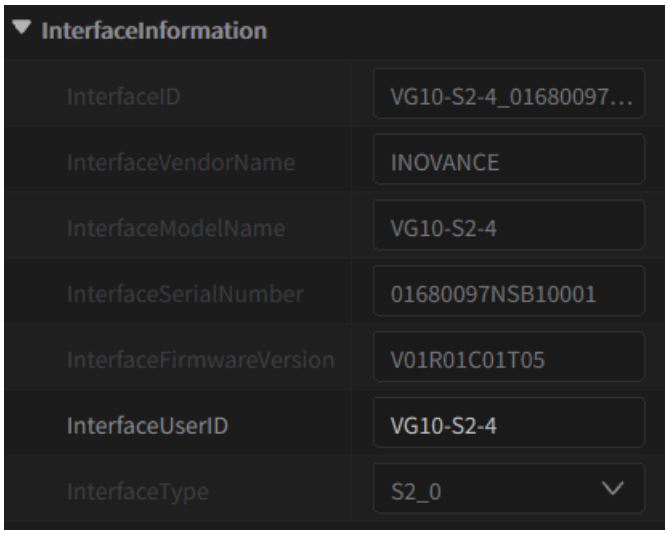
5.4 SDK Commissioning

For details about SDK interface and usage, see the INOMV Image Collection Commissioning Software SDK Installation User Guide.

5.5 Basic Functions

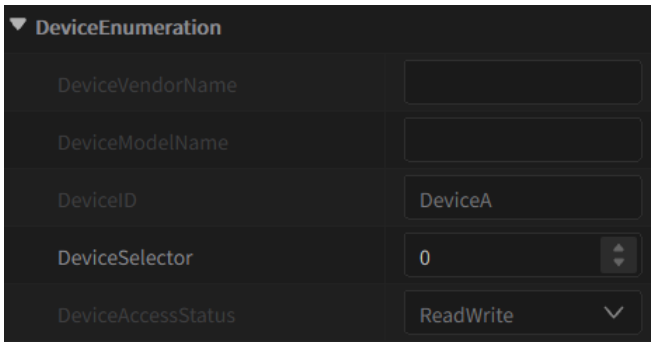
5.5.1 Property Setting for Image Frame Grabber Interfaces

5.5.1.1 Interface Information



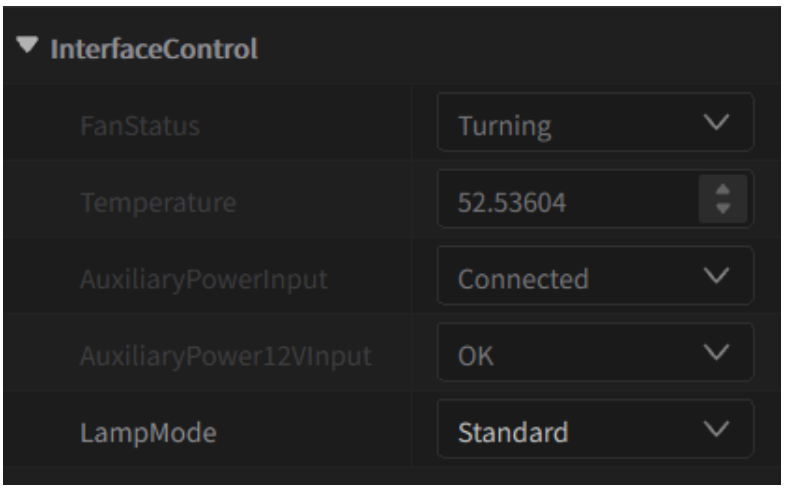
Parameter	Description	Modifiable	Type	Value Range
InterfaceID	ID of a frame grabber.	No	String	A 64-byte value
InterfaceVendorName	Supplier name of a frame grabber.	No	String	A 64-byte value
InterfaceModelName	Model name of a frame grabber.	No	String	A 64-byte value
InterfaceSerialNumber	Serial number of a frame grabber.	No	String	A 64-byte value
InterfaceFirmwareVersion	Firmware version of a frame grabber.	No	String	A 64-byte value
InterfaceUserID	User-defined name of a frame grabber.	Yes	String	A 64-byte value
InterfaceType	Interface type of a frame grabber.	No	Enumerated value	S1_0 S2_0 S3_0

5.5.1.2 Equipment Enumeration



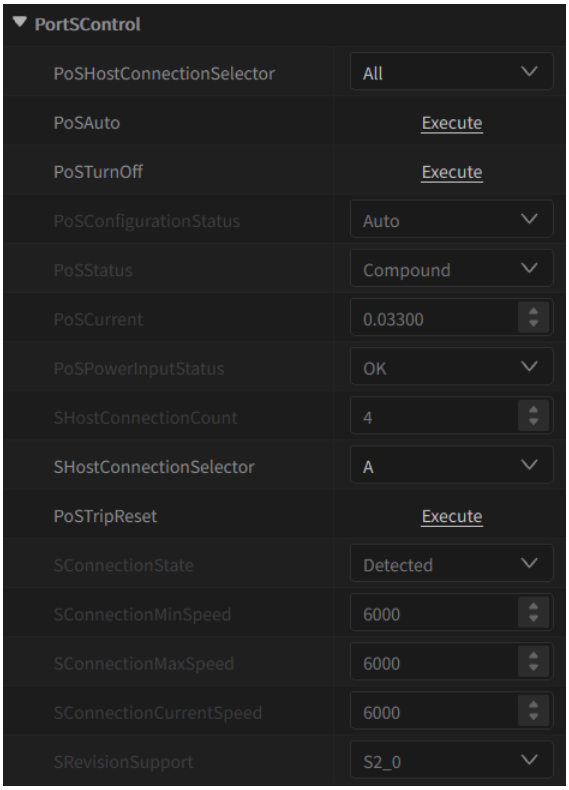
Parameter	Description	Modifiable	Type	Value Range
DeviceSelector	Device No.	Yes	Integer	0 to 3
DeviceID	Unique ID of a device within the interface range.	No	String	-
DeviceVendorName	Supplier name of a device.	No	String	-
DeviceModelName	Device model name.	No	String	-
DeviceAccessStatus	Device access status at last update.	No	Enumerated value	Unknown ReadWrite ReadOnly NoAccess Busy OpenReadWrite OpenReadOnly

5.5.1.3 Interface Control



Parameter	Description	Modifiable	Type	Value Range
FanStatus	Fan status.	No	Enumerated value	Stop and Turning
AuxiliaryPowerInput	Auxiliary power input.	No	Enumerated value	Unconnected Connected
AuxiliaryPower12VInput	12 V auxiliary power input.	No	Enumerated value	NotOK and OK
LampMode	Lamp control mode.	Yes	Enumerated value	Standard Dark Error Custom
Temperature	Main board temperature of a frame grabber.	No	Floating point	-

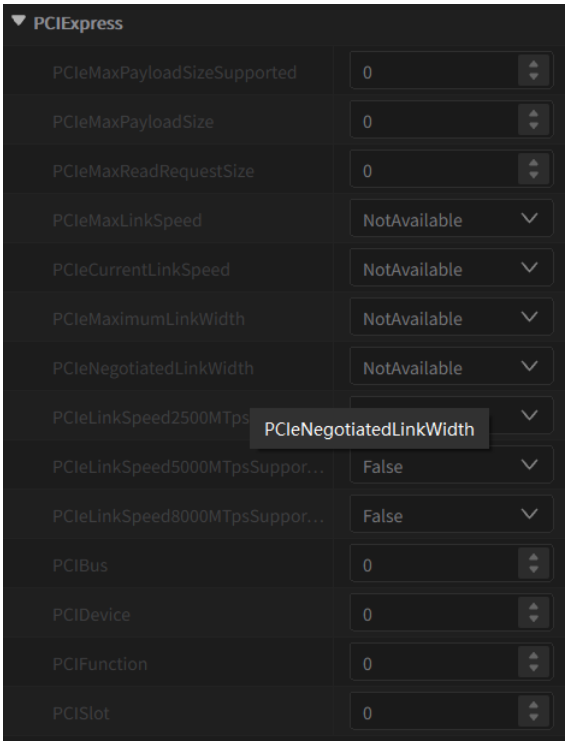
5.5.1.4 PortS Control



Parameter	Function Description	Commissioning Allowed	Type	Value Range
PoSHostConnectionSelector	Control channel selection for PortS power supply.	Yes	Enumerator	All A B C D
PoSAuto	PortS control for power-on of the corresponding channel.	Write-only	Button	-
PoSTurnOff	PortS control for power-off of the corresponding channel.	Write-only	Button	-
PoSConfigurationStatus	Power supply configuration for the corresponding PortS channel.	No	Enumerator	Off Auto Unknown Compound
PoSStatus	Power supply status for the corresponding PortS channel.	No	Enumerator	Off On Tripped Compound
PoSCurrent	Power supply current for the corresponding PortS channel.	No	Floating point	-

Parameter	Function Description	Commissioning Allowed	Type	Value Range
PoSPowerInputStatus	PortS power input status.	No	Enumerator	NotOK OK
PoSTripReset	Power supply reset for the corresponding PortS channel after tripping due to overcurrent.	Write-only	Button	-
SHostConnectionCount	Maximum number of connections supported by the PortS host.	No	Integer	-
SHostConnectionSelector	Selection of PortS physical connection.	Yes	Enumerator	A B C D
SConnectionState	PortS connection status.	No	Enumerator	Undetected Detected
SConnectionMinSpeed	Minimum speed of PortS connection, in Mbit/s. Unit: Mbps	No	Integer	-
SConnectionMaxSpeed	Maximum speed of PortS connection, in Mbit/s. Unit: Mbps	No	Integer	-
SConnectionCurrentSpeed	Current speed of PortS connection, in Mbit/s. Unit: Mbps	No	Integer	-
SRevisionSupport	PortS version supported by a frame grabber.	No	Enumerator	S1_0 S2_0 S3_0

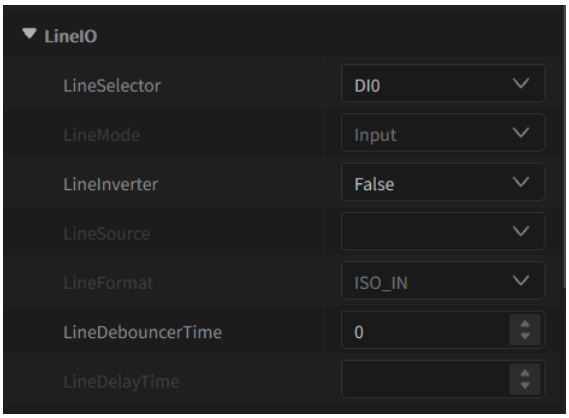
5.5.1.5 PCIe Information



Parameter	Description	Modifiable	Type	Value Range
PCIeMaxPayloadSizeSupported	Maximum PCIe TLP load size supported by this interface.	No	Integer	-
PCIeMaxPayloadSize	Maximum size of PCIe TLP load that can be generated by this interface.	No	Integer	-
PCIeMaxReadRequestSize	Maximum size of PCIe read requests that can be generated by this interface.	No	Integer	-
PCIeMaxLinkSpeed	Maximum PCIe transmission speed supported by the interface.	No	Enumerated value	NotAvailable PCIeLinkSpeed2500MTps PCIeLinkSpeed5000MTps PCIeLinkSpeed8000MTps
PCIeCurrentLinkSpeed	PCIe transmission speed after negotiation.	No	Enumerated value	NotAvailable PCIeLinkSpeed2500MTps PCIeLinkSpeed5000MTps PCIeLinkSpeed8000MTps
PCIeMaximumLinkWidth	Maximum PCIe link width supported by the interface.	No	Enumerated value	NotAvailable x1, x2, x4 x8, x12, x16, x32
PCIeNegotiatedLinkWidth	PCIe link width after negotiation.	No	Enumerated value	NotAvailable x1, x2, x4 x8, x12, x16, x32

Parameter	Description	Modifiable	Type	Value Range
PCIeLinkSpeed2500MTpsSupported	Whether the interface supports the PCIe Gen1 transmission speed (2.5 GT/s).	No	Boolean	True and False
PCIeLinkSpeed5000MTpsSupported	Whether the interface supports the PCIe Gen2 transmission speed (5.0 GT/s).	No	Boolean	True and False
PCIeLinkSpeed8000MTpsSupported	Whether the interface supports the PCIe Gen3 transmission speed (8.0 GT/s).	No	Boolean	True and False
PCIBus	PCI bus No.	No	Integer	-
PCIDevice	PCI device No.	No	Integer	-
PCIFunction	PCI function No.	No	Integer	-
PCISlot	PCI slot ID.	No	Integer	-

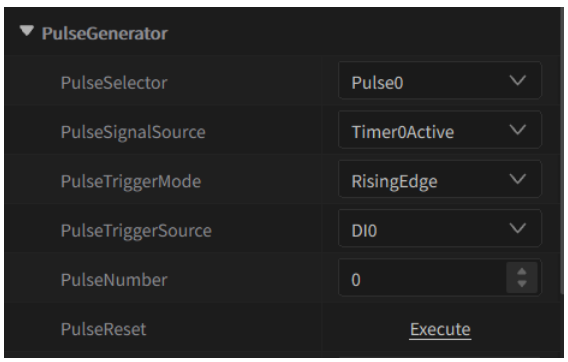
5.5.1.6 Physical I/O Line



Parameter	Description	Modifiable	Type	Value Range
LineSelector	Physical I/O line.	Yes	Enumerated value	DI0 to DI3 RS485_IN0 to RS485_IN1 TTL0 to TTL1 DO0 to DO3
LineFormat	Electrical type of the physical I/O line.	No	Enumerated value	ISO_IN ISO_OUT TTL RS485
LineMode	Direction of the physical I/O line.	No	Enumerated value	Input and Output

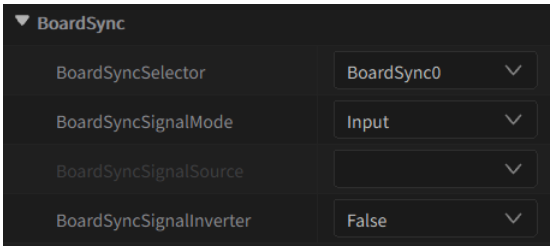
Parameter	Description	Modifiable	Type	Value Range
LineSource	Signal source of the output physical I/O line, which is valid when LineMode is set to Output. TTL_IN0 and TTL_IN1 are the signals when TTL0 and TTL1 are set to Input. TTL_OUT0 and TTL_OUT1 are the signals when TTL0 and TTL1 are set to Output.	Yes	Enumerated value	LevelLow AcquisitionEnable0 to AcquisitionEnable3 FVAL0 to FVAL3 LVAL0 to LVAL3 DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 BoardSync0 to BoardSync3 FG2CTrigger0 to FG2CTrigger3 Encoder0 RS485_IN0 to RS485_IN1 Timer0Active to Timer3Active FreqSythesiser0 Pulse0 to Pulse3
LineInverter	Whether to enable signal level inversion for the physical I/O line.	Yes	Boolean	True and False
LineDebouncerTime	Debouncing time of the input physical I/O line, with a precision of 10 ns. This parameter is valid when LineMode is set to Input.	Yes	Integer	0 to 100000000 (Max.: 1s)
LineDelayTime	Debouncing time of the output physical I/O line, with a precision of 100 ns. This parameter is valid when LineMode is set to Output.	Yes	Integer	0 to 10000000 (Max.: 1s)

5.5.1.7 Pulse Generator Settings



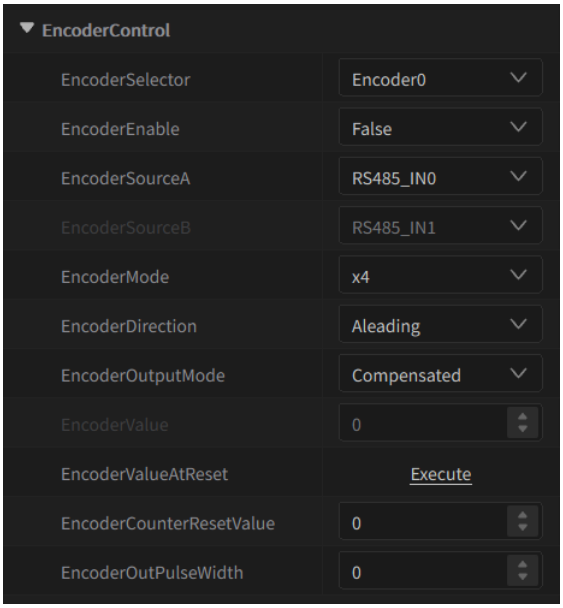
Parameter	Description	Modifiable	Type	Value Range
PulseSelector	Pulse signal generator to be set.	Yes	Enumerated value	Pulse0 to Pulse3
PulseSignalSource	Signal source of the pulse signal generator. The signal frequency is the same as the frequency of signals generated by the pulse signal generator.	Yes	Enumerated value	Timer0Active to Timer3Active DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 BoardSync0 to BoardSync3 FG2CTrigger0 to FG2CTrigger3 Encoder0 RS485_IN0 to RS485_IN1 FreqSythesiser0 FVAL0 to FVAL3 LVAL0 to LVAL3 Pulse0 to Pulse3 Timer0Start to Timer3Start Timer0End to Time3End
PulseTriggerMode	Pulse signal generator mode. Pulse signals are generated when the pulse signal generator detects the rising edge, falling edge, high level, or low level of the trigger source signal.	Yes	Enumerated value	RisingEdge, FalingEdge, LevelHigh, and LevelLow
PulseTriggerSource	Trigger source of the pulse signal generator.	Yes	Enumerated value	LevelLow and LevelHigh DI0 to DI3 TTL_IN0 to TTL_IN1 BoardSync0 to BoardSync3 Encoder0 RS485_IN0 to RS485_IN1
PulseNumber	Number of pulses generated by the pulse signal generator.	Yes	Integer	0 to 4294967295
PulseReset	Reset of the pulse signal generator.	Yes	Button	-

5.5.1.8 Board-to-board Sync Signal Settings



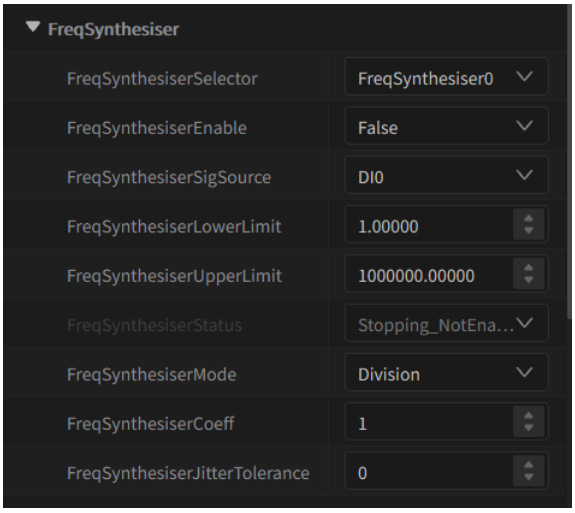
Parameter	Description	Modifiable	Type	Value Range
BoardSyncSelector	Board-to-board sync signal to be set.	Yes	Enumerated value	BoardSync0 to BoardSync3
BoardSyncSignalMode	Board-to-board sync signal direction.	Yes	Enumerated value	Input and Output
BoardSyncSignalSource	Board-to-board sync signal source, which is valid when BoardSyncSignalMode is set to Output.	Yes	Enumerated value	LevelLow FVAL0 to FVAL3 LVAL0 to LVAL3 DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 BoardSync0 to BoardSync3 FG2CTrigger0 to FG2CTrigger3 Encoder0 RS485_IN0 to RS485_IN1 Timer0Active to Timer3Active FreqSythesiser0 Pulse0 to Pulse3
BoardSyncSignalInverter	Board-to-board sync signal level inversion.	Yes	Boolean	True and False

5.5.1.9 Encoder Control



Parameter	Description	Modifiable	Type	Value Range
EncoderSelector	Encoder to be set.	Yes	Enumerated value	Encoder0
EncoderEnable	Encoder enable	Yes	Boolean	True and False
EncoderSourceA	Encoder phase A input signal.	Yes	Enumerated value	RS485_IN0 to RS485_IN1 TTL_IN0 to TTL_IN1
EncoderSourceB	Encoder phase B input signal, paired with A.	No	Enumerated value	RS485_IN0 to RS485_IN1 TTL_IN0 to TTL_IN1
EncoderMode	Encoder pulse input mode.	Yes	Enumerated value	x1, x2, x4
EncoderDirection	Encoder identification direction, with A leading or B leading.	Yes	Enumerated value	Aleading Bleading
EncoderOutputMode	Encoder output mode, including ALL, ForwardOnly, and Compensated.	Yes	Enumerated value	ALL ForwardOnly Compensated
EncoderOutPulseWidth	Encoder output pulse width, with a precision of 100 ns. This parameter is valid when EncoderMode is set to x4.	Yes	Integer	0 to 10000000 (Max.: 1s)
EncoderValue	Encoder offset pulse count.	Yes	Integer	0 to 4294967295
EncoderValueAtReset	Reset of the encoder offset pulse count.	Yes	Button	-
EncoderCounterResetValue	Count value upon encoder reset.	Yes	Integer	0 to 4294967295

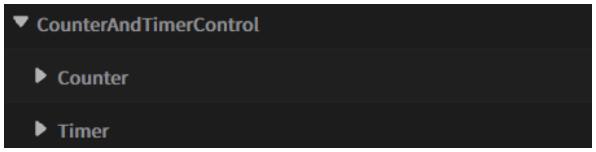
5.5.1.10 Frequency Synthesizer Settings



Parameter	Description	Modifiable	Type	Value Range
FreqSynthesiserSelector	Frequency synthesizer.	Yes	Enumerated value	FreqSynthesiser0
FreqSynthesiserEnable	Whether to enable the frequency synthesizer.	Yes	Boolean	True and False
FreqSynthesiserSigSource	Signal source of the frequency synthesizer.	Yes	Enumerated value	DI0 to DI3 DO0 to DO3 RS485_IN0 to RS485_IN1 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 BoardSync0 to BoardSync3 FG2CTrigger0 to FG2CTrigger3 Encoder0 RS485_IN0 to RS485_IN1
FreqSynthesiserLowerLimit	Lower limit of the input cycle of the frequency synthesizer (precision: Hz).	Yes	Floating point	1 to 1000000
FreqSynthesiserUpperLimit	Upper limit of the input cycle of the frequency synthesizer (precision: Hz).	Yes	Floating point	1 to 1000000
FreqSynthesiserJitterTolerance	Signal cycle jitter range of the frequency synthesizer (precision: 10 ns).	Yes	Integer	0 to 4294967295
FreqSynthesiserCoeff	Frequency synthesis ratio of the frequency synthesizer.	Yes	Integer	1 to 100

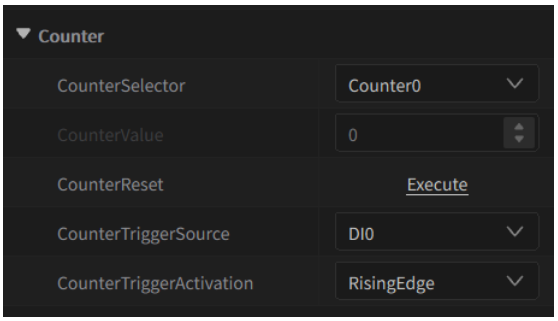
Parameter	Description	Modifiable	Type	Value Range
FreqSynthesiserStatus	Status of the frequency synthesizer. Valid values: Running, Stopping_ OverUpperLimit, Stopping_ OverLowerLimit, Stopping_ OverJitterTolerance, and Stopping_NotEnable.	No	Enumerated value	Running Stopping_OverUpperLimit Stopping_OverLowerLimit Stopping_OverJitterTolerance Stopping_NotEnable
FreqSynthesiserMode	Frequency synthesis mode of the frequency synthesizer. Valid values: Division and Multiplier.	Yes	Enumerated value	Division and Multiplier

5.5.1.11 Counter and Timer Control



Parameter	Description	Modifiable	Type	Value Range
Counter	Counter	-	Attribute group	-
Timer	Timer	-	Attribute group	-

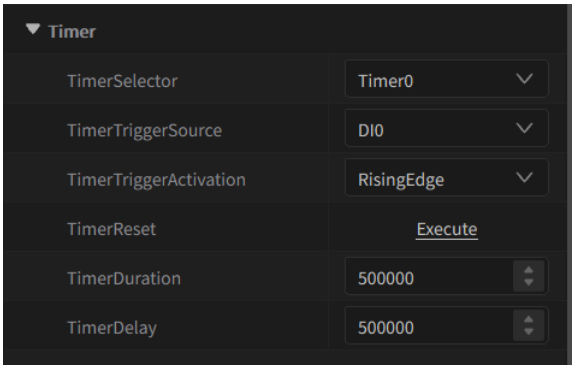
Counter setting



Parameter	Description	Modifiable	Type	Value Range
CounterSelector	Counter to be set.	Yes	Enumerated value	Counter0 to Counter3
CounterReset	Counter soft reset and startup.	Yes	Button	-

Parameter	Description	Modifiable	Type	Value Range
CounterTriggerSource	Counter trigger source.	Yes	Enumerated value	Off AcquisitionEnable0 to AcquisitionEnable3 FVAL0 to FVAL3 LVAL0 to LVAL3 DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 RS485_IN0 to RS485_IN1 BoardSync0 to BoardSync3 Timer0Start to Timer3Start Timer0Active to Timer3Active Timer0End to Timer3End FG2CTrigger0 to FG2CTrigger3 Encoder0 FreqSythesiser0 Pulse0 to Pulse3
CounterTriggerActivation	Counter trigger activation mode.	Yes	Enumerated value	RisingEdge FallingEdge AnyEdge
CounterValue	Current count value of the counter.	No	Integer	0 to 4294967295

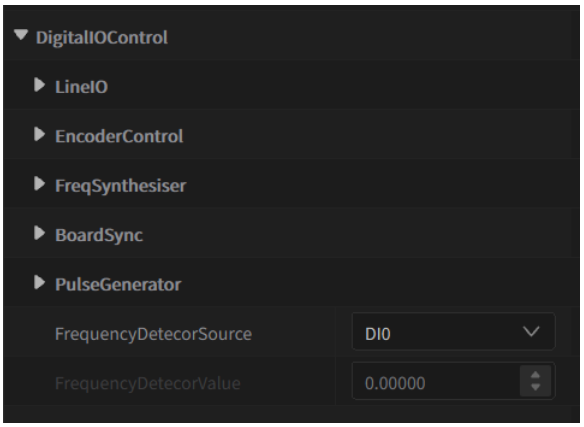
Timer setting



Parameter	Description	Modifiable	Type	Value Range
TimerSelector	Timer to be set.	Yes	Enumerated value	Timer0 to Timer3
TimerReset	Timer soft reset and startup.	Yes	Button	-

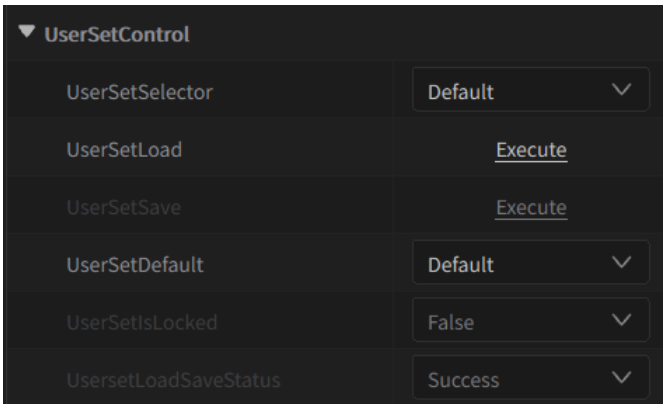
Parameter	Description	Modifiable	Type	Value Range
TimerTriggerSource	Timer trigger source.	Yes	Enumerated value	LevelLow AcquisitionEnable0 to AcquisitionEnable3 FVAL0 to FVAL3 LVAL0 to LVAL3 DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 RS485_IN0 to RS485_IN1 BoardSync0 to BoardSync3 Timer0Start to Timer3Start Timer0Active to Timer3Active Timer0End to Timer3End FG2CTrigger0 to FG2CTrigger3 Encoder0 FreqSythesiser0
TimerTriggerActivation	Timer trigger activation mode.	Yes	Enumerated value	RisingEdge FallingEdge AnyEdge LevelHigh LevelLow
TimerDuration	Timer pulse duration (precision: 1 μs).	Yes	Integer	0 to 1000000 (Max.: 1s)
TimerDelay	Delay time before timer trigger (precision: 1 μs).	Yes	Integer	0 to 1000000 (Max.: 1s)

5.5.1.12 Frequency Detector Settings



Parameter	Description	Modifiable	Type	Value Range
FrequencyDetecorSource	Frequency detection source.	Yes	Enumerated value	DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 BoardSync0 to BoardSync3 Timer0Active to Timer3Active FG2CTrigger0 to FG2CTrigger3 Encoder0 RS485_IN0 to RS485_IN1 AcquisitionEnable0 to AcquisitionEnable3 FVAL0 to FVAL3 LVAL0 to LVAL3 FreqSythesiser0 Pulse0 to Pulse3
FrequencyDetecorValue	Current frequency of detected signals.	No	Floating point	-3.4028235E38 to +3.4028235E38

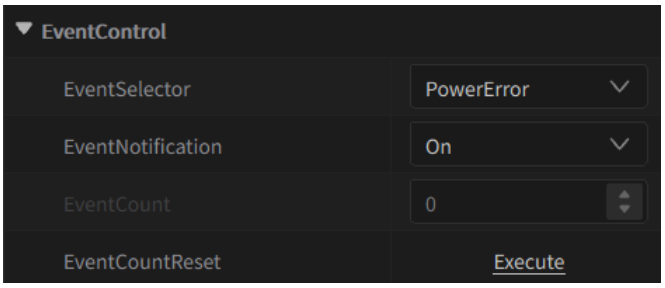
5.5.1.13 User Area Control



Parameter	Description	Modifiable	Type	Value Range
UserSetSelector	Load, storage, or setting in the user area.	Yes	Enumerated value	Default UserSet1 to UserSet4
UserSetIsLocked	Whether users in the current user area can be set.	Yes	Boolean	True and False
UserSetSave	Saving of parameter settings to the selected user area. This parameter is valid upon UserSetSelector!= Default.	Yes	Button	-
UserSetLoad	Load and activation of parameter settings in the selected user area.	Yes	Button	-

Parameter	Description	Modifiable	Type	Value Range
UserSetDefault	Default loaded user area upon restart.	Yes	Enumerated value	Default UserSet1 to UserSet4
UsersetLoadSaveStatus	Load or storage status of the user area.	Yes	Enumerated value	Success, Failure, and Busy

5.5.1.14 Event Control

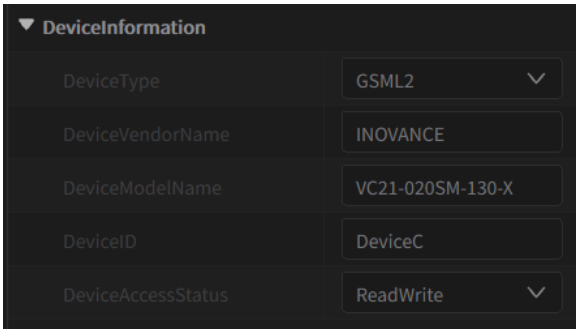


Parameter	Function Description	Commissioning Allowed	Type	Value Range
EventSelector	Event to send signals to the host.	Yes	Enumerator	PowerError E2PRomError OverTemperature BridgeDveiceIDError BridgeStreamIDError BridgeRegisterError BridgeDataError Unknown
EventNotification	Whether to enable or disable an event to send signals to the host controller.	Yes	Enumerator	On and Off
EventCount	Current count value for events (32-bit counter).	No	Integer	0 to 4294967295
EventCountReset	Reset of the event count value.	Yes	Button	-

5.5.2 Local Camera Property Settings

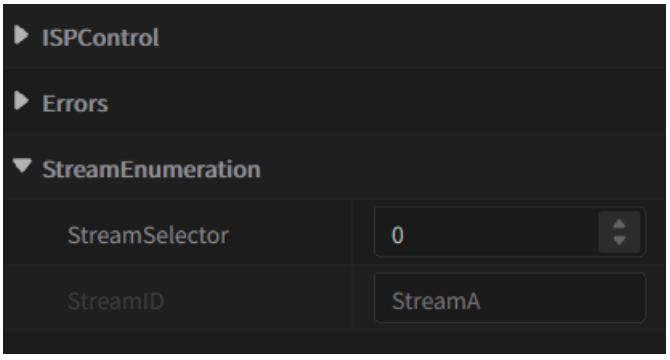
After the frame grabber is successfully connected, click a device under the frame grabber in the device list to set parameters of the local device in the local property settings.

5.5.2.1 Device Information



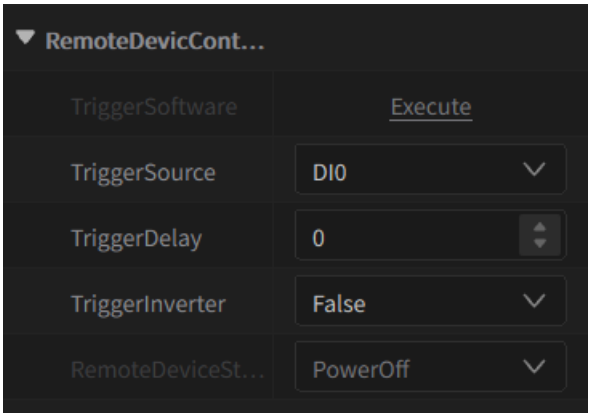
Parameter	Description	Modifiable	Type	Value Range
DeviceID	Unique ID of the current device in an interface.	No	String	-
DeviceVendorName	Supplier name of the connected camera.	No	String	-
DeviceModelName	Model name of the connected camera.	No	String	-
DeviceType	Transmission layer type of the current device.	No	Enumerated value	-
DeviceAccessStatus	Device access status at last update.	No	Enumerated value	Unknown ReadWrite ReadOnly NoAccess Busy OpenReadWrite OpenReadOnly

5.5.2.2 Stream Enumeration



Parameter	Description	Modifiable	Type	Value Range
StreamSelector	Stream selection.	Yes	Integer	-
StreamID	ID of the selected stream.	No	String	-

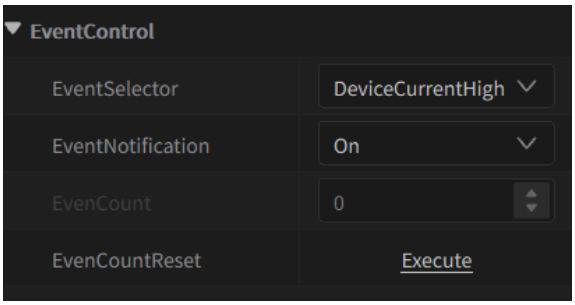
5.5.2.3 Remote Equipment Control



Parameter	Description	Modifiable	Type	Value Range
TriggerSoftware	Soft trigger signal of the frame grabber. When the button is clicked once, a trigger signal is sent to the camera. The signal can be received by the camera only when the camera is set to the trigger mode.	Yes	Button	-
TriggerSource	Trigger source signal sent by the frame grabber to the camera. The signal can be received by the camera only when the camera is set to the trigger mode.	Yes	Enumerated value	LevelLow SoftTrigger FVAL0 to FVAL3 LVAL0 to LVAL3 DI0 to DI3 DO0 to DO3 TTL_IN0 to TTL_IN1 TTL_OUT0 to TTL_OUT1 BoardSync0 to BoardSync3 RS485_IN0 to RS485_IN1 Timer0Active to Timer3Active Encoder0 FreqSythesiser0 Pulse0 to Pulse3
TriggerInverter	Inversion of the trigger source signal sent by the frame grabber to the camera.	Yes	Boolean	True and False

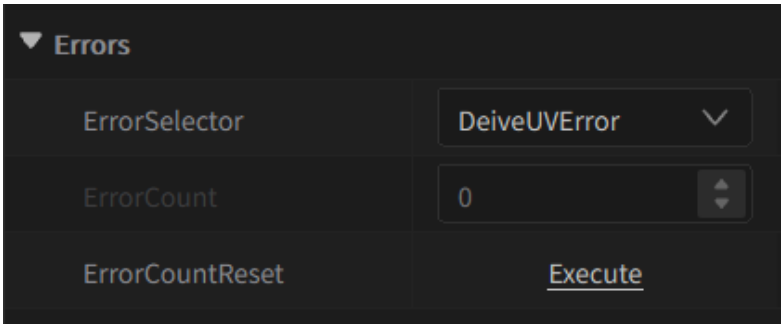
Parameter	Description	Modifiable	Type	Value Range
TriggerDelayTime	Delay of the trigger source signal sent by the frame grabber to the camera (precision: 100 ns).	Yes	Integer	0 to 10000000 (Max.: 1s)
RemoteDeviceStatus	Camera status.	Yes	Enumerated value	PowerOff PowerOn Connection Malfunction

5.5.2.4 Event Control



Parameter	Function Description	Commissioning Allowed	Type	Value Range
EventSelector	Event to send signals to the host.	Yes	Enumerator	DeviceCurrentHigh DeviceTransfer
EventNotification	Whether to enable or disable an event to send signals to the host controller.	Yes	Enumerator	Off, On, and Once
EventCount	Current count value for events (32-bit counter).	No	Integer	0 to 4294967295
EventCountReset	Reset of the event count value.	Yes	Button	-

5.5.2.5 Error Statistics

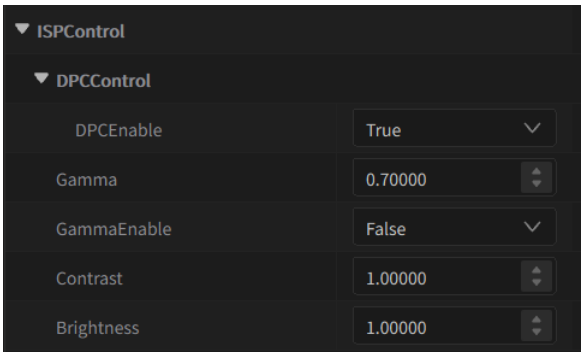


Parameter	Description	Modifiable	Type	Value Range
ErrorSelector	Error selection.	Yes	Enumerated value	DeiveUVError DeiveOVError DeiveOCError DeiveTSError DeserializerTransferError
ErrorCount	Error count.	No	Integer	0 to 4294967295
ErrorCountReset	Error count clear.	Yes	Button	-

The following table describes the error types.

Error Type	Description	Solution
DeiveUVError	The device is in a condition of undervoltage.	Check whether the voltage of the power supplied to the camera is below the nominal voltage. If the indicator is not on when the camera is installed for the first time, check for this error. The reason may be that the ATX 6-pin power cable of the grabber is not connected.
DeiveOVError	Overvoltage occurs on the device.	Check whether the voltage of the power supplied to the camera exceeds the rated voltage. If the camera is connected to an external power supply by using the ATX 6-pin cable, overvoltage may occur.
DeiveOCError	Overcurrent occurs on the device.	Check whether the current of the power supplied to the camera exceeds the rated current. If the device is short-circuited, this error may be triggered.
DeiveTSError	The device is overheated.	Check whether the chip of the switch supplying power to the camera is overheated. Overheat protection may be triggered in extreme harsh environments.
DeserializerTransferError	The deserializer encounters a transmission error.	Check whether the deserializer of the grabber encounters a transmission error.

5.5.2.6 Image Signal Processor Control

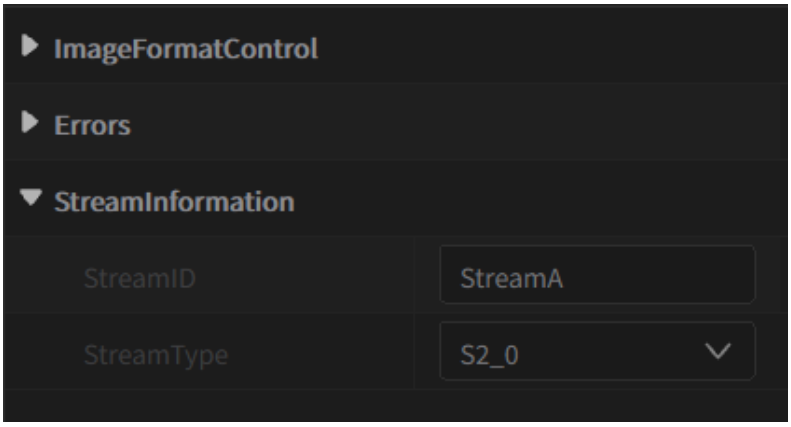


Parameter	Description	Modifiable	Type	Value Range
DPCControl	Defective pixel correction (DPC) control.	No	Attribute group	-
DPCEnable	Enable of static DPC.	Yes	Boolean	True and False

Parameter	Description	Modifiable	Type	Value Range
Gamma	Coefficient for calculating the Gamma mapping table.	Yes	Floating point	0.2 to 5
GammaEnable	Gamma enable.	Yes	Boolean	True and False
Contrast	Image contrast ratio.	Yes	Floating point	0 to 3
Brightness	Image brightness.	Yes	Floating point	0 to 3

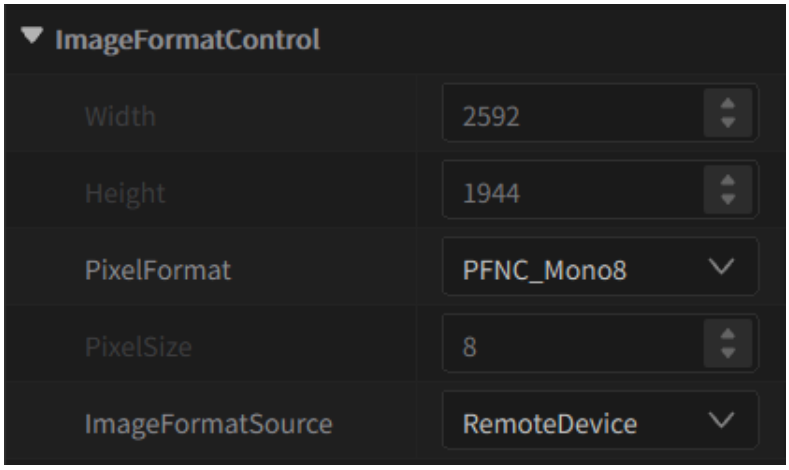
5.5.3 Stream Property Settings

5.5.3.1 Stream Information



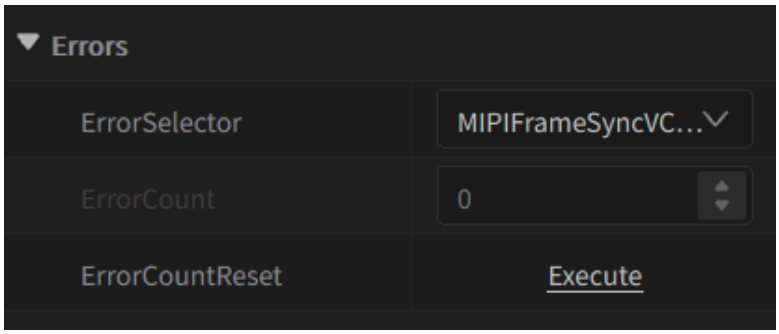
Parameter	Description	Modifiable	Type	Value Range
StreamID	Unique ID of the stream in the device.	No	String	-
StreamType	Transmission layer type of the current stream.	No	Enumerated value	S1_0 S2_0 S3_0

5.5.3.2 Image Format Control



Parameter	Description	Modifiable	Type	Value Range
Width	Image stream width.	No	Integer	-
Height	Image stream height.	No	Integer	-
PixelFormat	Image stream pixel format.	Yes	Enumerated value	PFNC_Mono8 PFNC_Mono10
PixelSize	Image stream pixel depth.	No	Integer	-
ImageFormatSource	Image stream data source, including RemoteDevice and TestPattern.	Yes	Enumerated value	RemoteDevice TestPattern

5.5.3.3 Error Statistics



Parameter	Function Description	Commissioning Allowed	Type	Value Range
ErrorSelector	Error selection.	Yes	Enumerator	MIPISOTSyncHSError MIPISOTHSError MIPICrcStatusError MIPIEccStatusError MIPILineBufferFullError
ErrorCount	Error count.	No	Integer	0 to 4294967295
ErrorCountReset	Error count clear.	Yes	Button	-

The following table describes the error types.

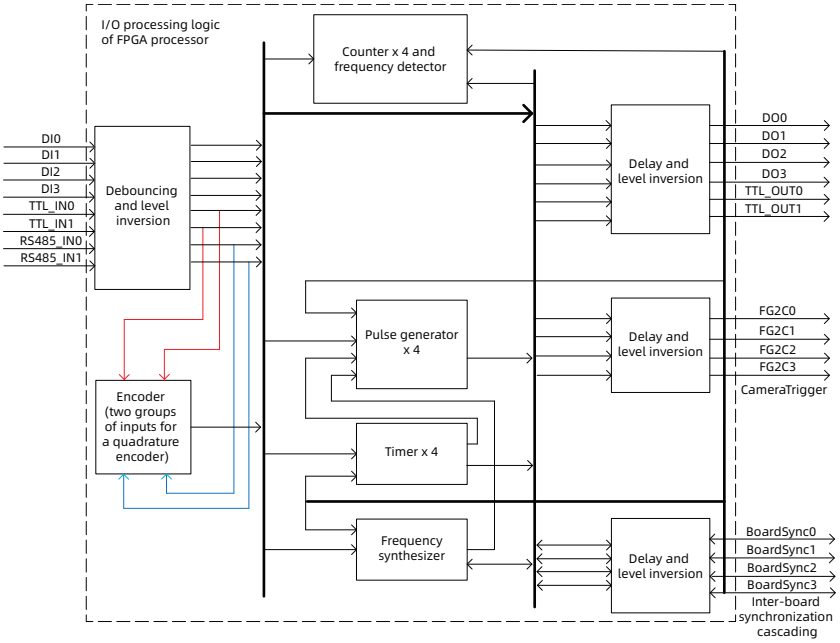
Error Type	Description	Solution
MIPICrcStatusError	A CRC error occurs.	Check whether the Mobile Industry Processor Interface (MIPI) fails to receive camera data properly due to incomplete signals (most common) or noise interference.
MIPIEccStatusError	An ECC error occurs.	Check whether the MIPI fails to receive camera data properly due to signal quality problems.
MIPISOTSyncHSError	A synchronization code error occurs when transmission starts at the physical layer.	Check whether the MIPI fails to receive camera data properly. This indicates a D-PHY timing issue: The preparation for HS mode is not completed correctly (For example, the timing requirements between HS Request and HS Ready are not met).

Error Type	Description	Solution
MIPISOTHSError	A time sequence error occurs when transmission starts at the physical layer.	Check whether the MIPI fails to receive camera data properly. This indicates a D-PHY timing issue: The preparation for HS mode is not completed correctly (For example, the timing requirements between HS Request and HS Ready are not met).
MIPILineBufferFullError	A First In, First Out (FIFO) overflow error occurs.	Check whether the MIPI fails to receive camera data properly. This error may occur if the upstream (AXI4-Stream interface) fails to read the data in a timely manner when the row buffer (FIFO) inside the IP core of the MIPI is full.

6 Trigger Principles and Cases

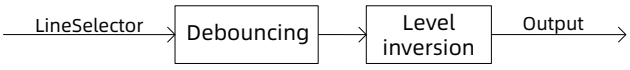
6.1 Trigger Principles

The grabber receives a trigger input signal (from a photoelectric sensor or encoder) to enable the camera to shoot. It can also trigger the flashlight simultaneously through DO or TTL_OUT. If a single industrial personal computer is connected to two grabbers, the trigger signals destined for the grabbers can be cascaded to simplify wiring. The following figure shows the working mechanism.

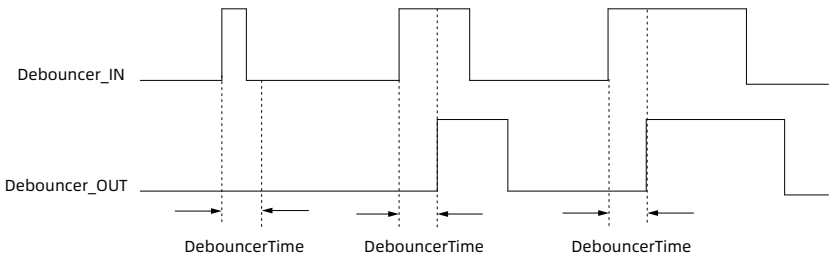


6.1.1 Input Signal Processing

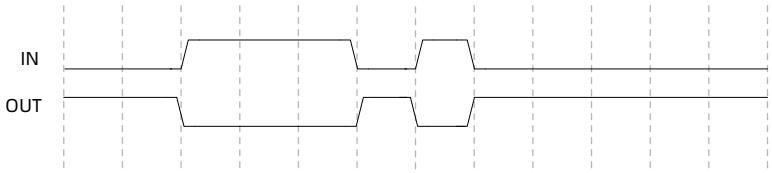
Each channel of input signals DI0 to DI3, TTL_IN0 to TTL_IN1, and RS485_IN0 to RS485_IN1 is debounced before being sent to the level inversion switch, and then transferred for subsequent processing. See the following figure.



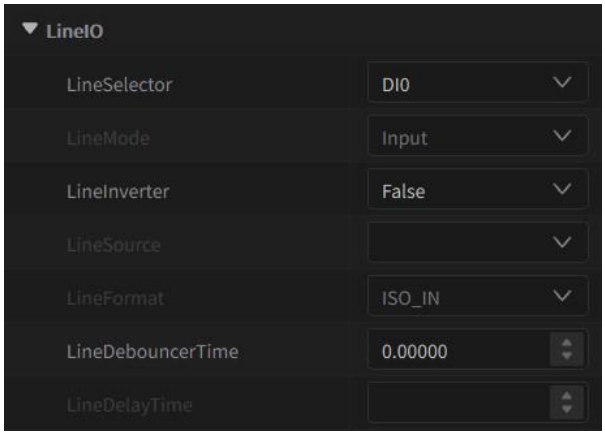
The following figure shows the debouncing sequence.



Level inversion means to invert the high and low levels of signals, as shown in the following figure.



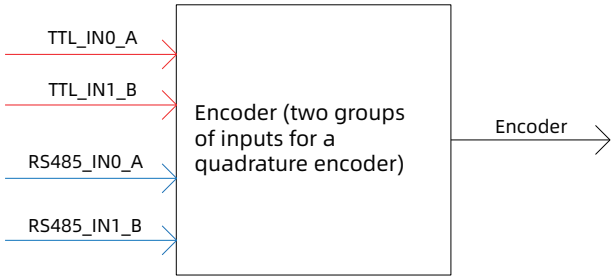
The following table describes the software parameters for debouncing and level inversion. Debouncing takes effect only when LineSelector is set to an input signal source. The debouncing precision is 10 ns. The value range is 0 to 100000000. The maximum value is 1s.



Parameter	Description
LineSelector	I/O signal source. For details about the signal source list, see . “Physical I/O Line” on page 40
LineMode	Signal I/O mode, if supported. This parameter cannot be modified if not supported.
LineInverter	Phase inversion switch, which controls whether to enable level inversion.
LineSource	Output signal source, which must be the same as the value of LineSelector. For details about the signal source list, see . “Physical I/O Line” on page 40
LineFormat	I/O signal attribute, which is read-only.
LineDebouncerTime	Debouncing time, which is valid only for input signals.
LineDelayTime	Delay time, which is valid only for output signals.

6.1.2 Quadrature Encoder Signal Processing

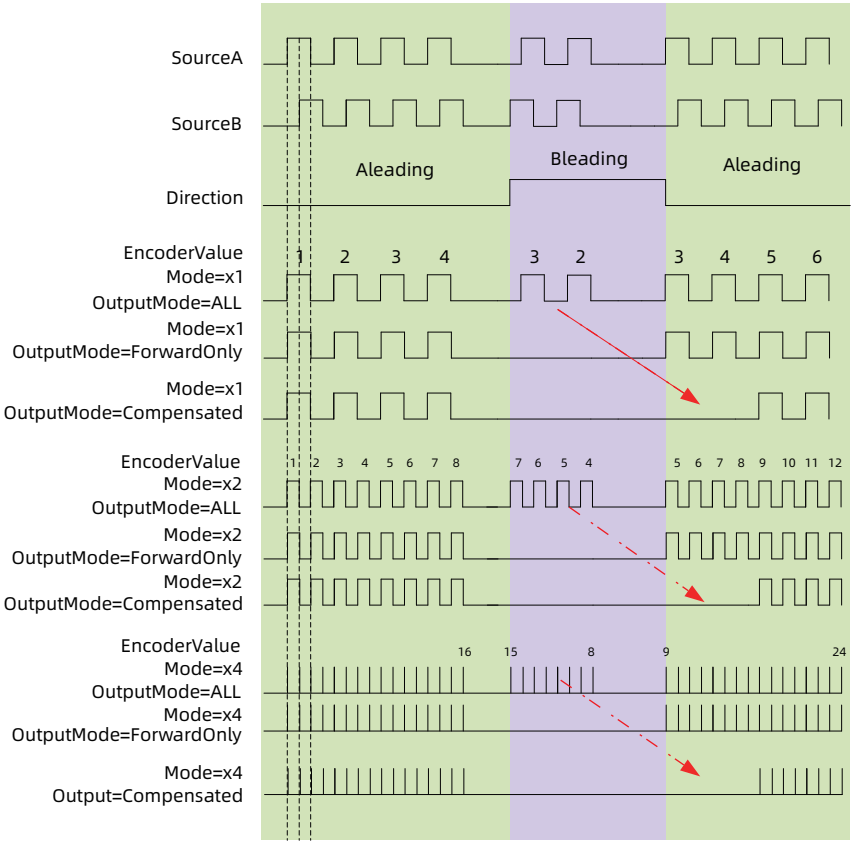
Before TTL inputs TTL_IN0 to TTL_IN1 and RS485 inputs RS485_IN0 to RS485_IN1 are sent to the encoder module, debouncing and level inversion are performed for them. The encoder module forwards the TTL or RS485 inputs to the quadrature encoder for signal processing. See the following figure.



The following figure shows the software page.



The following figure shows the time sequence for each parameter.



The following table describes the parameters.

Parameter	Description
EncoderEnable	Whether to enable the signal processing module of the encoder.
EncoderSourceA, EncoderSourceB	A-phase or B-phase input. You can select TTL_IN0 to TTL_IN1 or RS485_IN0 to RS485_IN1.

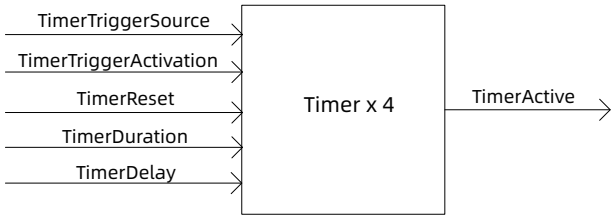
Parameter	Description
EncoderMode (x1, x2, and x4)	• Valid values are x1, x2, and x4. In x1 mode, the output signals of the encoder are the same as those of A-phase (EncoderSourceA). • In x2 mode, the output signals of the encoder are subject to the following formula: Q = (A != B). In other words, when the levels of the A-phase and B-phase signals are different, a high level is output. When they are the same, a low level is output. • In x4 mode, the rising and falling edges of A-phase and B-phase signals are detected. The output pulse width is subject to EncoderOutPulseWidth, whose precision is 100 ns.
EncoderDirection (Aleading and Bleading)	Direction polarity of the signal source of the grabber. Valid values are Aleading and Bleading.
EncoderOutputMode (All, ForwardOnly, and Compensated)	• ALL: The encoder outputs pulse signals for both Aleading and Bleading. • ForwardOnly: The encoder outputs pulse signals only for Aleading. • Compensated: The pulse signals output for Aleading will reduce those output for Bleading.
EncoderValue	Current offset count.
EncoderValueReset	To reset the current offset count.
EncoderCounterResetValue	New offset count.

Note

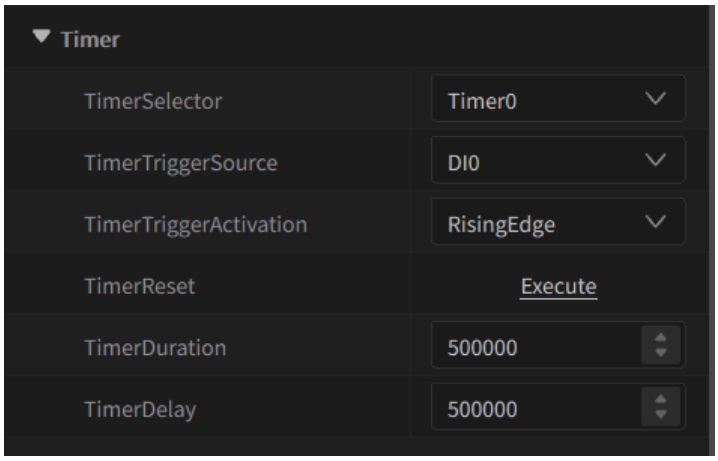
- When you select the A and B signal sources, debouncing is required. The signal sources must share the same debouncing width (LineDebouncerTime).
- If a reverse motion occurs when the offset count is 0, the offset count will not change to a negative value but remains at 0. Therefore, it is recommended that a larger value be set for EncoderCounterResetValue.

6.1.3 Timer

The timer generates pulse signals with a specific width based on internal or external signals. See the following figure.



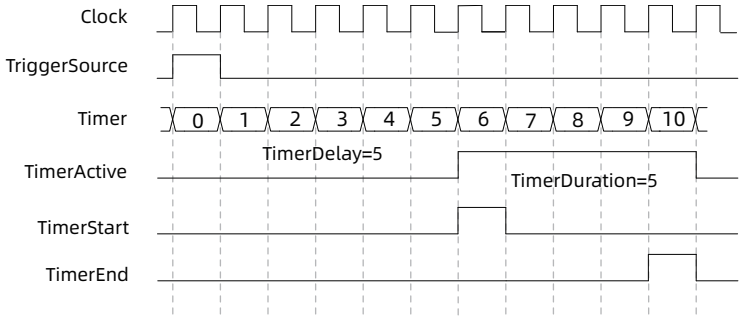
The following figure shows the software page.



The following table describes the parameters.

Parameter	Description
TimerReset	To reset the timer.
TimerTriggerSource	Trigger source of the timer. For details about the trigger source list, see the "Timer setting" section in "5.5.1.11 Counter and Timer Control" on page 46.
TimerDuration	High-level duration of the output of the timer, with a precision of 1 μs.
TimerDelay	Low-level duration of output pulses, with a precision of 1 μs.
TimerTriggerActivation	Response mode of trigger signals. • RisingEdge: Timer output starts on the rising edge of the trigger source. • FalingEdge: Timer output starts on the falling edge of the trigger source. • AnyEdge: Timer output starts on any edge of the trigger source. • LevelHigh: Timer output continues when the trigger source is at a high level. • LevelLow: Timer output continues when the trigger source is at a low level.

The following figure shows the working mechanism of the timer.

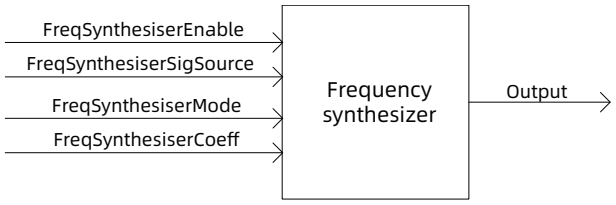


Note

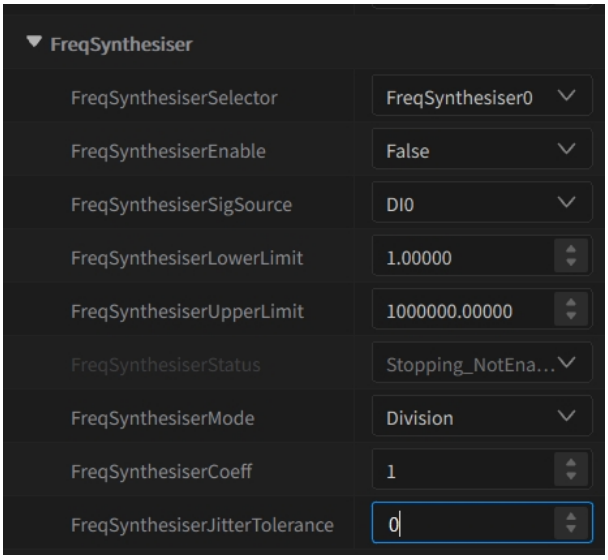
If the edge triggering frequency is greater than the timer frequency, the actual number of output pulses will not be as expected.

6.1.4 Frequency Synthesizer

The frequency synthesizer divides or multiplies pulse and trigger signals with a ratio range of 1 to 100. See the following figure.



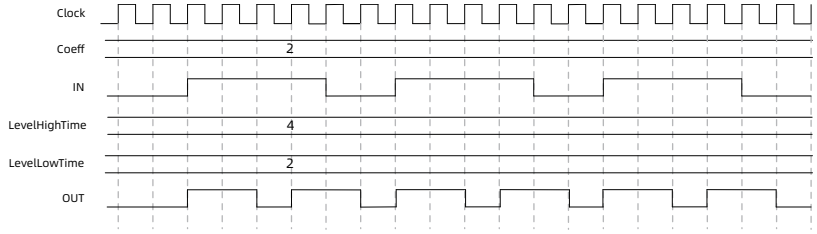
The following figure shows the software page.



The following table describes the parameters.

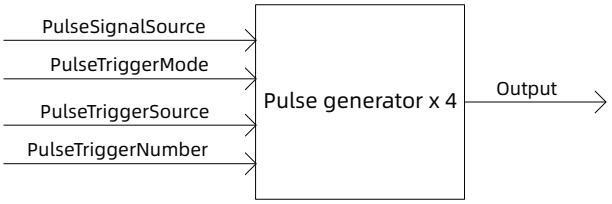
Parameter	Description
FreqSynthesiserEnable	Whether to enable the frequency synthesizer.
FreqSynthesiserSigSource	Signal source of the frequency synthesizer. For details about the signal source list, see . *"5.5.1.10 Frequency Synthesizer Settings" on page 45*
FreqSynthesiserLower/UpperLimit (Hz)	Valid frequency range of signals for frequency multiplication. Signals beyond the range will be ignored during frequency multiplication. If the frequencies of input signals exceed the range for a long time, the frequency synthesizer stops.
FreqSynthesiserJitterTolerance (0.01 μs)	Acceptable jitter range of input signal cycles. Input signal cycle jitters within the specified range will be ignored.
FreqSynthesiserMode	Synthesis mode of the frequency synthesizer. Valid values: • Division • Multiplier
FreqSynthesiserCoeff	Synthesis coefficient. Value range: 1 to 100.
FreqSynthesiserStatus	Operating status of the frequency synthesizer. • Running: The frequency synthesizer runs properly. • Stopping_OverLowerLimit: The frequency synthesizer stops because the frequencies of input signals are lower than the lower limit. • Stopping_OverUpperLimit: The frequency synthesizer stops because the frequencies of input signals exceed the upper limit. • Stopping_OverJitterTolerance: The frequency synthesizer stops because input signal cycle jitters are beyond the range. • Stopping_NotEnable: The frequency synthesizer is not enabled.

Double frequency means that the output frequency is twice the input frequency, and the output cycle is half the input cycle, as shown in the following figure.

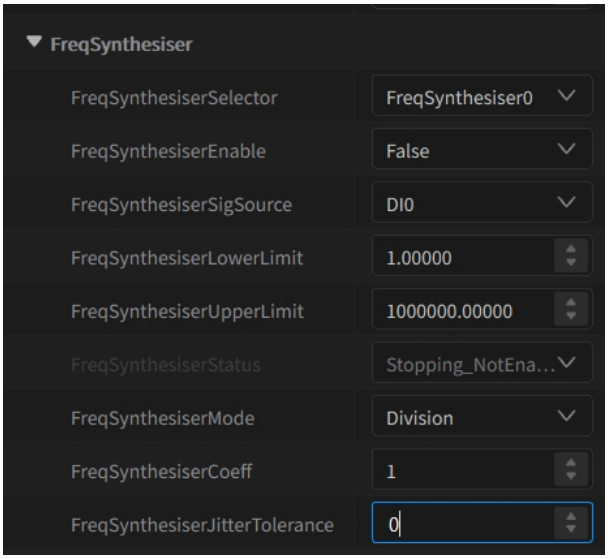


6.1.5 Pulse Generator

The pulse generator generates a defined number of pulse signals. The grabber can collect multiple images with one external input pulse, as shown in the following figure.



The following figure shows the software page.

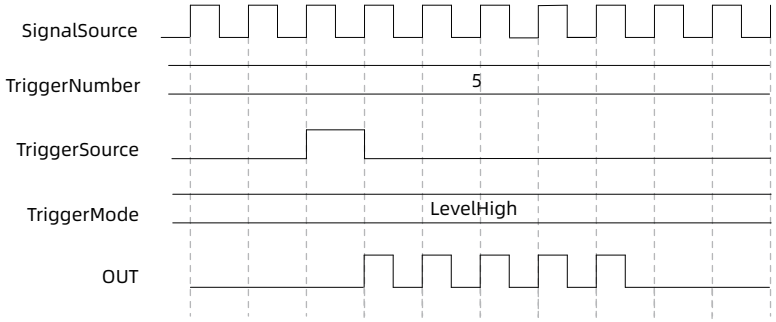


The following table describes the parameters.

Parameter	Description
PulseSelector	Pulse generator. Valid values: 0 to 3.
PulseSignalSource	Output signal source of the pulse generator. For details about the signal source list, see . *"5.5.1.7 Pulse Generator Settings" on page 41*
PulseTriggerMode	Output trigger mode of the pulse generator. • RisingEdge: Output starts on the rising edge of the trigger source. • FalingEdge: Output starts on the falling edge of the trigger source. • LevelHigh: Output continues when the trigger source is at a high level. • LevelLow: Output continues when the trigger source is at a low level.

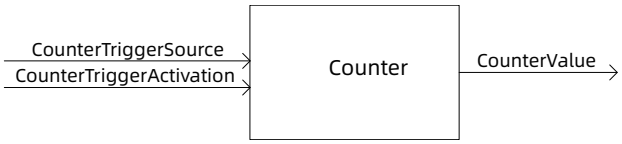
Parameter	Description
PulseTriggerSource	Output trigger source of the pulse generator. For details about the trigger source list, see . "5.5.1.7 Pulse Generator Settings" on page 41
PulseTriggerNumber	Number of pulses (PulseSignalSource) to be output when the triggering conditions are met.
PulseReset	To reset the pulse generator.

The following figure shows the working mechanism of outputting five pulses with one input pulse.

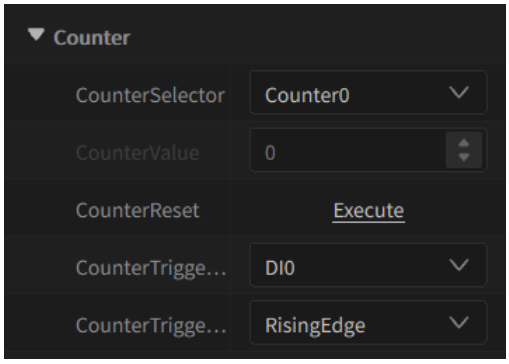


6.1.6 Counter

The counter counts the number of pulse signals, as shown in the following figure.



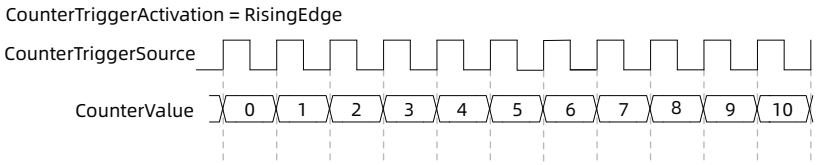
The following figure shows the software page.



The following table describes the parameters.

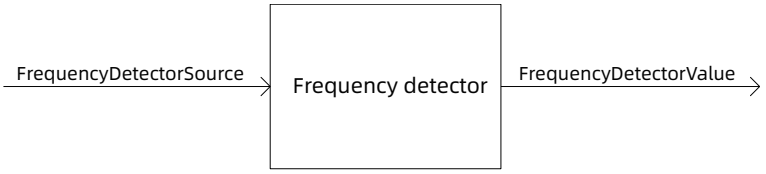
Parameter	Description
CounterSelector	Counter. Valid values: 0 to 3.
CounterValue	Current count.
CounterReset	To reset the counter.
CounterTriggerSource	Signal source of the counter, that is, the signals to be detected. For details about the signal source list, see the "Counter setting" section in "5.5.1.11 Counter and Timer Control" on page 46.
CounterTriggerActivation	Signal counting method. • RisingEdge: Only rising edges of the signal source are counted. • FallingEdge: Only falling edges of the signal source are counted. • AnyEdge: Both the rising and falling edges of the signal source are counted.

The following figure shows the method of counting rising edges.

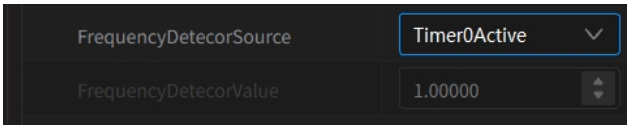


6.1.7 Frequency Detector

The frequency detector detects the frequency of pulse signals, as shown in the following figure.



The following figure shows the software page.

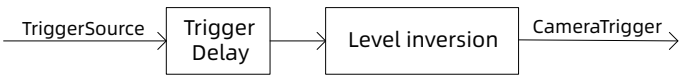


The following table describes the parameters.

Parameter	Description
FrequencyDetectorSource	Signals to be detected. For details about the signal source list, see . *"5.5.1.12 Frequency Detector Settings" on page 48*
FrequencyDetectorValue	Current frequency of detected signals, in Hz.

6.1.8 Camera Trigger Signal FG2C

The camera trigger signal FG2C is sent to the camera through the Gigabit Multimedia Serial Link (GMSL), as shown in the following figure.



The following figure shows the software page.

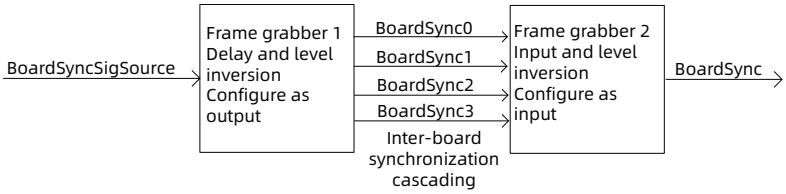


The following table describes the parameters.

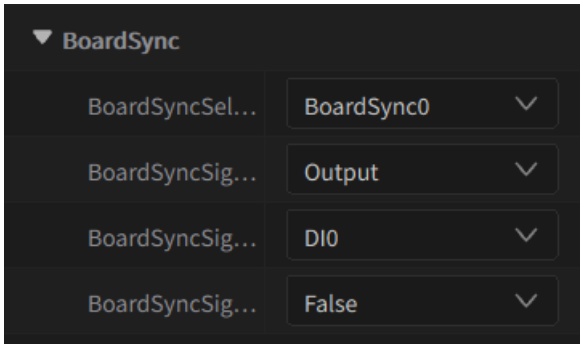
Parameter	Description
TriggerSource	Output signal source. For details about the signal source list, see . "5.5.2.3 Remote Equipment Control" on page 52
TriggerSoftware	Click to send a trigger signal. This parameter is valid only when TriggerSource is set to SoftTrigger.
TriggerInverter	Whether to enable level inversion.
TriggerDelay	Delay time of output signals, with a precision of 100 ns. Value range: 0 to 10000000 (maximum value: 1s). The delay time must not exceed the pulse output cycle.

6.1.9 Board-to-board Sync Signal BoardSync

The board-to-board synchronization signal BoardSync is a bidirectional signal. The following figure shows the networking between grabbers.



The following figure shows the software page.



The following table describes the parameters.

Parameter	Description
BoardSyncSelector	Processing signal.
BoardSyncMode	Input or output direction of the signal.
BoardSyncSigSource	Output signal source. For details about the signal source list, see . "5.5.1.8 Board-to-board Sync Signal Settings" on page 43
BoardSyncInverter	Whether to enable level inversion.

6.1.10 Trigger Link Delay

The following figure shows trigger delay of a grabber.

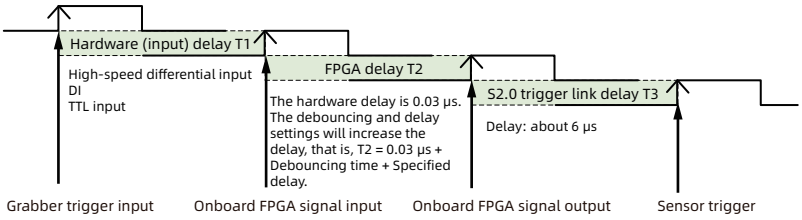


Table 6–1 High-speed differential input delay

High-speed Differential Input	Typical Value	Maximum Value	Description
T1	0.021 μs	0.03 μs	Hardware delay
T2	0.03 μs	-	Excluding the delay configured in software settings.
T3	6 μs	-	Transmission delay

Table 6–2 DI input delay

DI Input	Typical Value	Maximum Value	Description
T1	0.036 μs	0.12 μs	Hardware delay
T2	0.03 μs	-	Excluding the delay configured in software settings.
T3	6 μs	-	Transmission delay

Table 6–3 TTL input delay

TTL Input	Typical Value	Maximum Value	Description
T1	0.0017 μs	0.015 μs	Hardware delay
T2	0.03 μs	-	Excluding the delay configured in software settings.
T3	6 μs	-	Transmission delay

6.2 Trigger Cases

This section describes common trigger scenarios.

The following table describes some trigger modes supported for the grabber.

No.	Trigger Mode	Description
1	Capture mode triggered by external trigger signal	An input signal of DI0 to DI3, TTL_IN0 to TTL_IN1, or RS485_IN0 to RS485_IN1 triggers the capture mode of the camera.
2	Capture mode triggered by external trigger signal with debouncing and level inversion	Debouncing can efficiently prevent false camera triggering. Debouncing is commonly used in complex electromagnetic environments or in mechanical contact triggering scenarios with glitches.
3	Capture mode triggered by fixed-frequency pulses generated by timer	The timer generates a trigger signal with a defined frequency and duty cycle to trigger the capture mode of the camera, without depending on external trigger signals.

No.	Trigger Mode	Description
4	Multi-image capture mode triggered by single pulse	A single external trigger signal triggers the multi-image capture mode of the camera.
5	Trigger cascading for grabbers	When multiple grabbers work in the same industrial personal computer, you need to connect only one trigger cable to the primary grabber and the secondary grabbers can be triggered through the board-to-board synchronization signal. This greatly simplifies cable connections.
6	I/O trigger signals measured by counter	The counter can count the rising and falling edges on different signal nodes of the trigger link. It is usually used to commission the signal link during system commissioning and locate I/O trigger signal problems or frame loss.

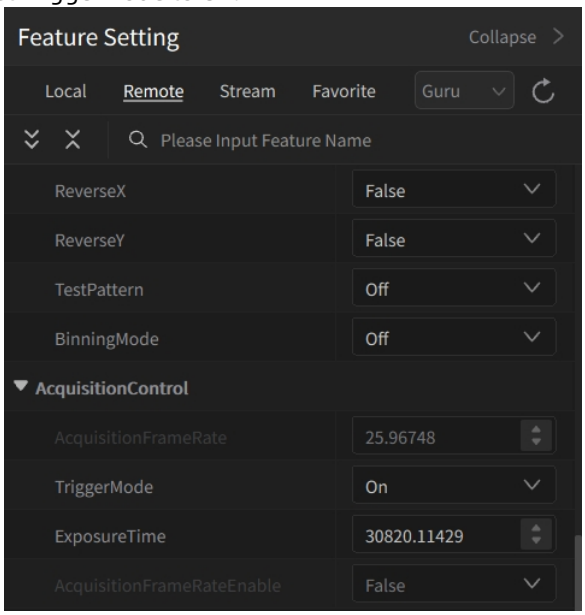
Note

The preceding table describes only the trigger modes in common scenarios. For trigger modes in other scenarios, contact Inovance technical support.

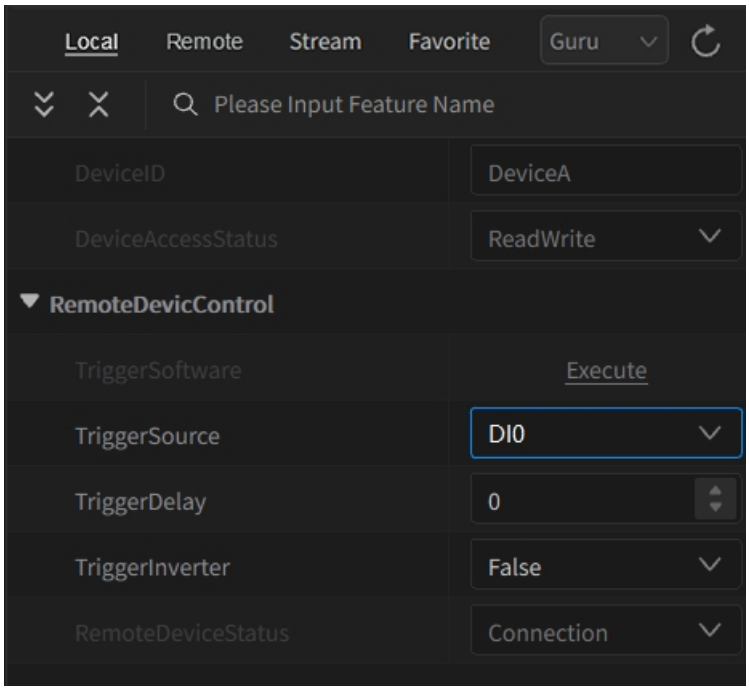
6.2.1 Capture Mode Triggered by External Trigger Signal

To select DI0 as the external trigger signal source of a camera, perform the following steps:

1. On the "Remote" tab, set TriggerMode to On.

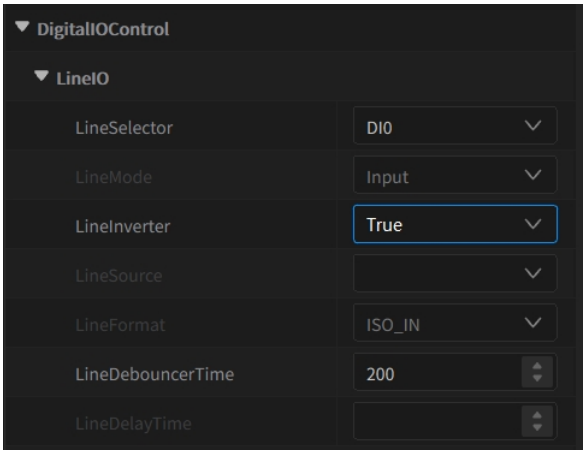


2. On the "Local" tab, set TriggerSource to DI0.



6.2.2 Capture Mode Triggered by External Trigger Signal with Debouncing and Level Inversion

Enable level inversion for DI0 and set the debouncing time, which must not be greater than the high-level duration of signals.

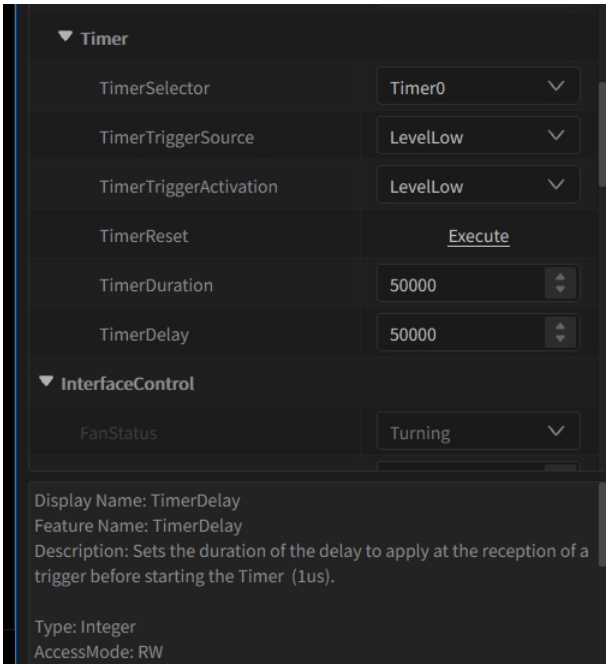


For the detailed procedure, see *"6.2.1 Capture Mode Triggered by External Trigger Signal" on page 69*.

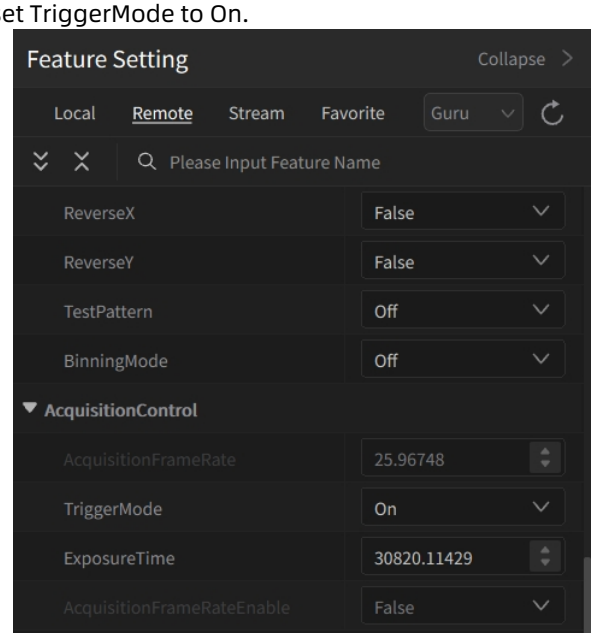
6.2.3 Capture Mode Triggered by Fixed-frequency Pulses Generated by Timer

1. Configure timer parameters based on the following figure. Set the output frequency to 10 Hz. The frequency and duty cycle of periodic pulse signals output by the timer can be calculated based on the following formula: Period = TimerDuration + TimerDelay, where TimerDuration/

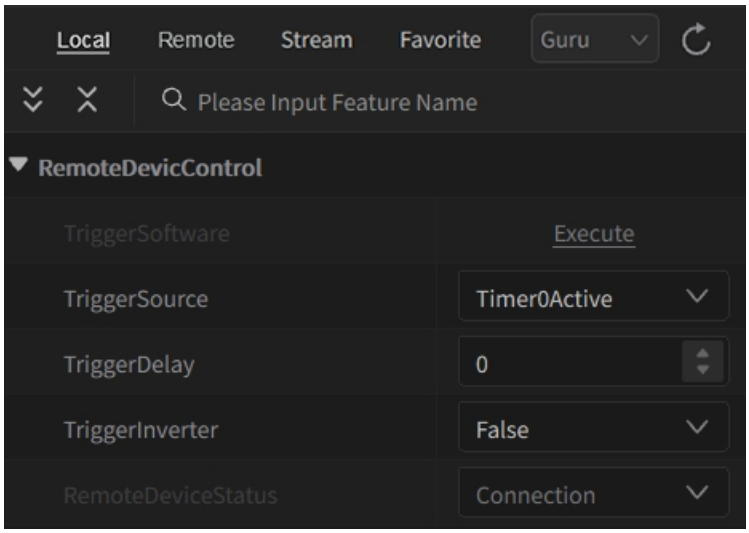
Period is the duty cycle. That is, Period = 50000 × 1 μs + 50000 × 1 μs = 100 ms. Therefore, the frequency is 10 Hz and the duty cycle is 50%.



2. On the "Remote" tab, set TriggerMode to On.

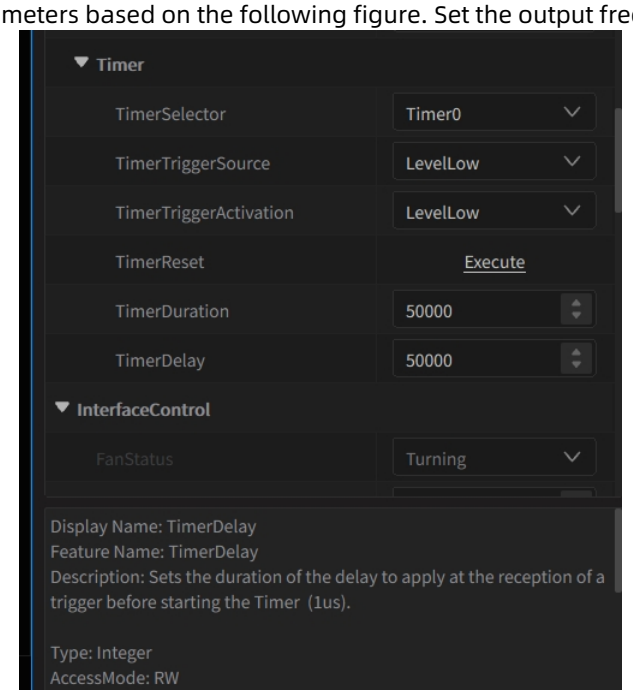


3. On the "Local" tab, set TriggerSource to Timer0Active.

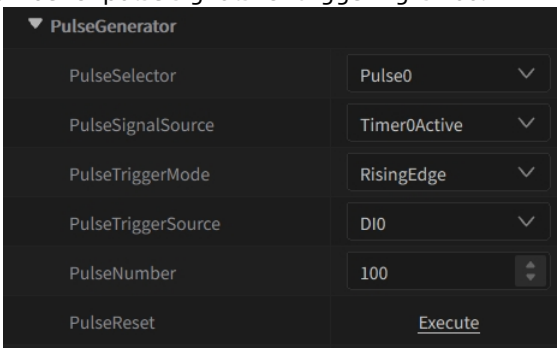


6.2.4 Multi-image Capture Mode Triggered by Single Pulse

1. Configure timer parameters based on the following figure. Set the output frequency to 10 Hz.



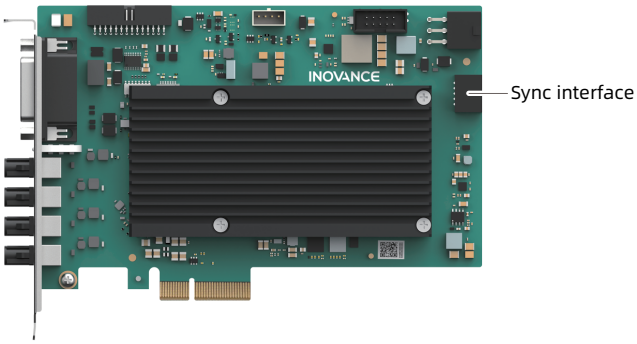
2. Configure pulse generator parameters based on the following figure. Assume that DI0 is the only trigger source and the number of pulse signals for triggering is 100.



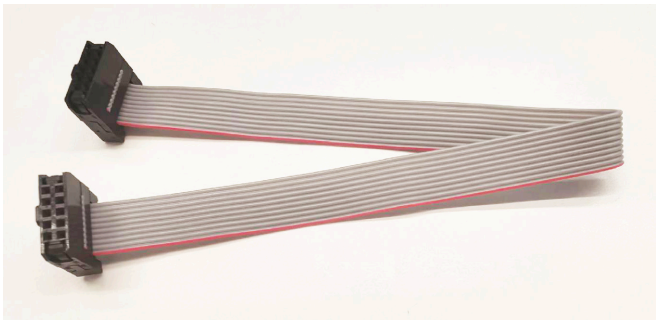
3. For the detailed procedure, see *"6.2.1 Capture Mode Triggered by External Trigger Signal" on page 69*. You only need to set TriggerSource to Pulse0.

6.2.5 Trigger Cascading for Grabbers

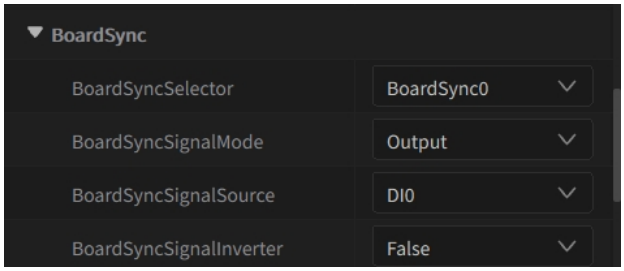
Take two grabbers as an example. Connect the BoardSync0 interfaces of the two grabbers with a dedicated cable. The following figure shows the position of the Sync interface for BoardSync signals.



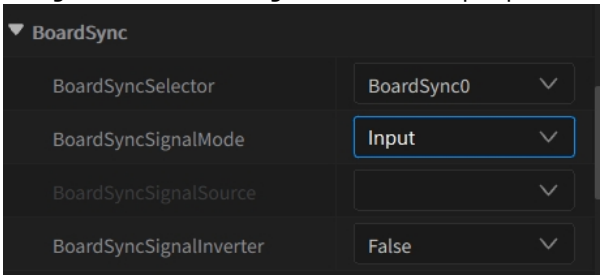
The following figure shows a cable for synchronization between boards.



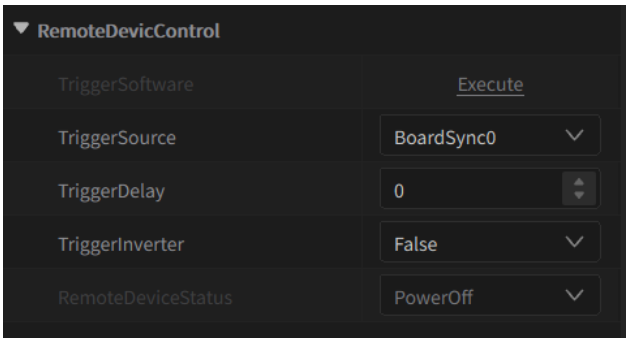
1. Configure the BoardSync signal of the first grabber as the output pulse, with the signal source being DI0.



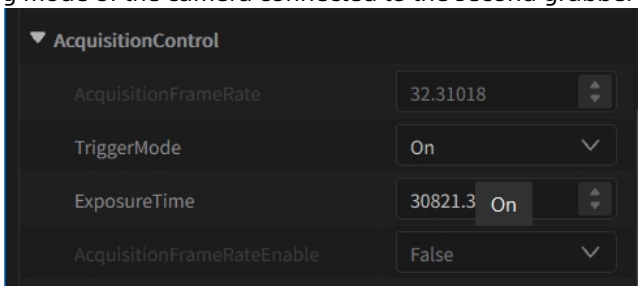
2. Configure the BoardSync signal of the second grabber as the input pulse.



3. Configure BoardSync0 as the trigger source of the camera connected to the second grabber.



4. Configure the working mode of the camera connected to the second grabber to trigger mode.

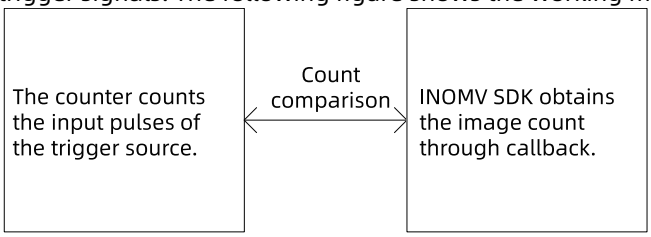


6.2.6 Using the Counter

The counter is used to count pulse edges from signal sources, such as pulse counts from trigger inputs, sensor trigger counts, and image frame counts received by the data acquisition card (FVAL). Refer to the signal source selection list for the counter. *" Physical I/O Line" on page 40*

Based on its extensive counting capabilities, the counter can be used to help locate signal problems and frame loss. Here are two typical scenarios:

1. Suspected frame loss in images obtained through callback of the host computer: Use the counter to check for missing trigger signals. The following figure shows the working mechanism.

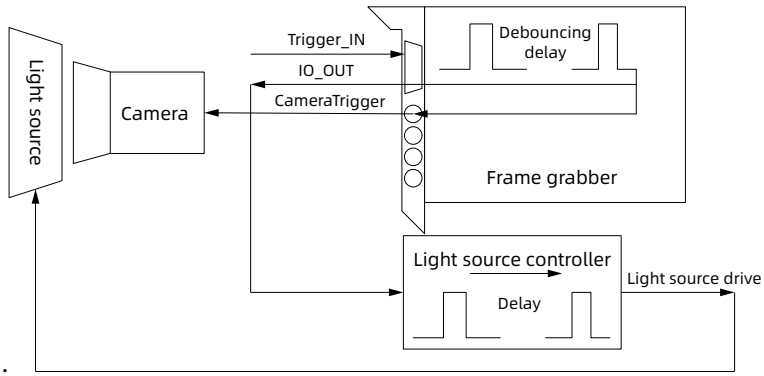


2. Wiring and signal problems during commissioning: Count the pulses of input or output signals to check whether cables are correctly connected.

6.3 Synchronous Triggering of Camera and Flashlight

6.3.1 Working Mechanism

The camera and flashlight can be simultaneously triggered based on the debouncing delay on the grabber and delay control on the light source controller. The following figure shows the working mechanism.



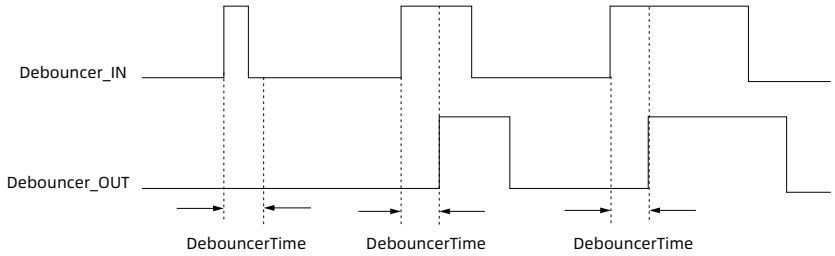
6.3.2 Wiring of IO_OUT

The light source controller supports two IO_OUT signal sources: DO and TTL_OUT. For details about the wiring of the DO interface, see *"4.2.5 DO Interface" on page 28*. For details about the wiring of the IO_TTL interface, see *"4.2.6 IO_TTL Interface" on page 29*.

6.3.3 Debouncing and Delay Control in Camera Triggering

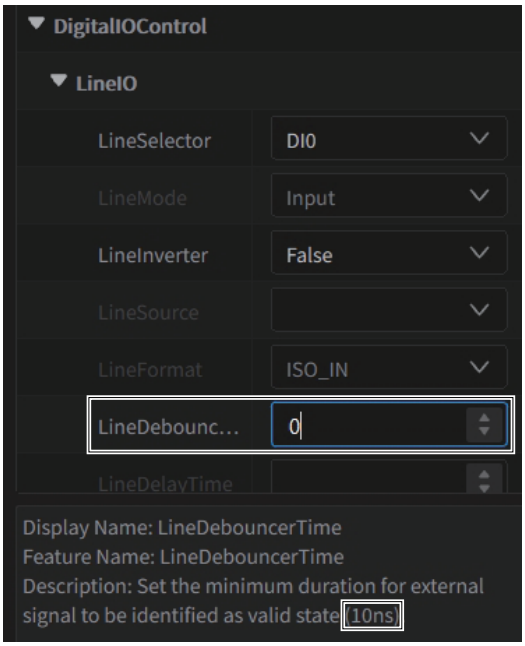
6.3.3.1 Debouncing

An external trigger signal input to the grabber may contain glitches or noise signals. Therefore, debouncing is required. The following figure shows the working mechanism of debouncing.



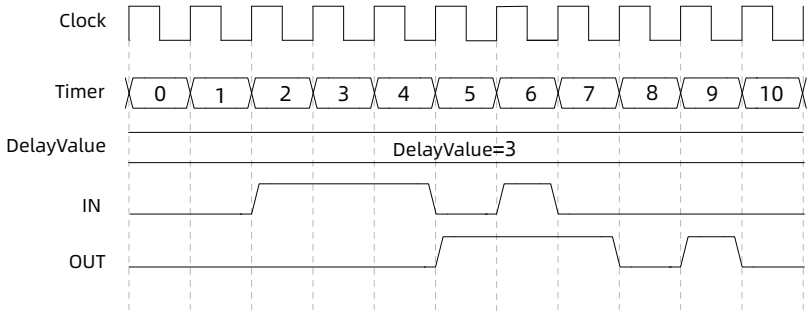
Debouncing time:

- LineDebouncerTime: Precision: 10 ns. Value range: 0 to 100000000. Maximum value: 1s.
- The debouncing time cannot exceed the normal high-level duration of the input pulse signal.

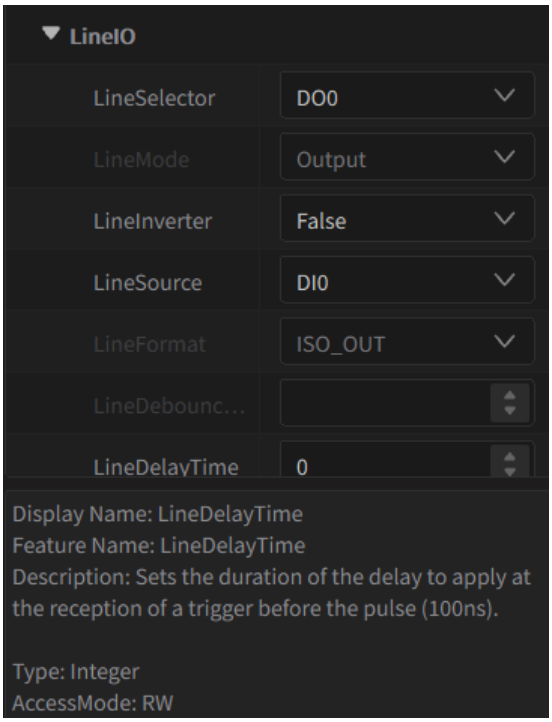


6.3.3.2 Delay Control

Signals output from within the grabber can be delayed by at most one cycle. The following figure shows the working mechanism.



LineDelayTime: Precision: 100 ns. Value range: 0 to 10000000. Maximum value: 1s.



6.3.4 IO_OUT Delay Control

For details, see *"6.3.3.2 Delay Control" on page 76*.

7 Maintenance

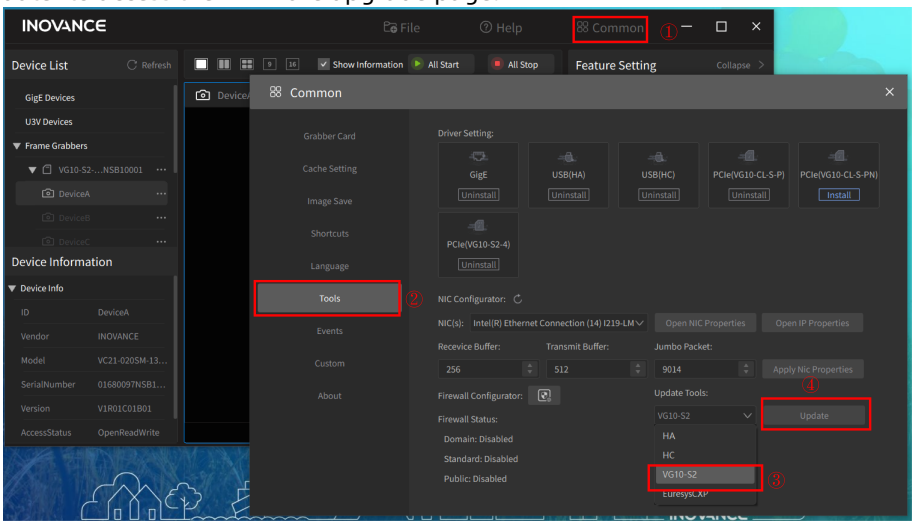
7.1 Firmware Upgrade

Caution

- If the upgrade fails, contact Inovance for technical support.
- After the upgrade is complete, shut down and restart the computer.

Firmware Upgrade Page

1. Click "Common" on the top toolbar.
2. Click "Tools" on the "Common" page.
3. Select "VG10-S2" from the "Update Tools" drop-down list.
4. Click "Update" to access the firmware upgrade page.

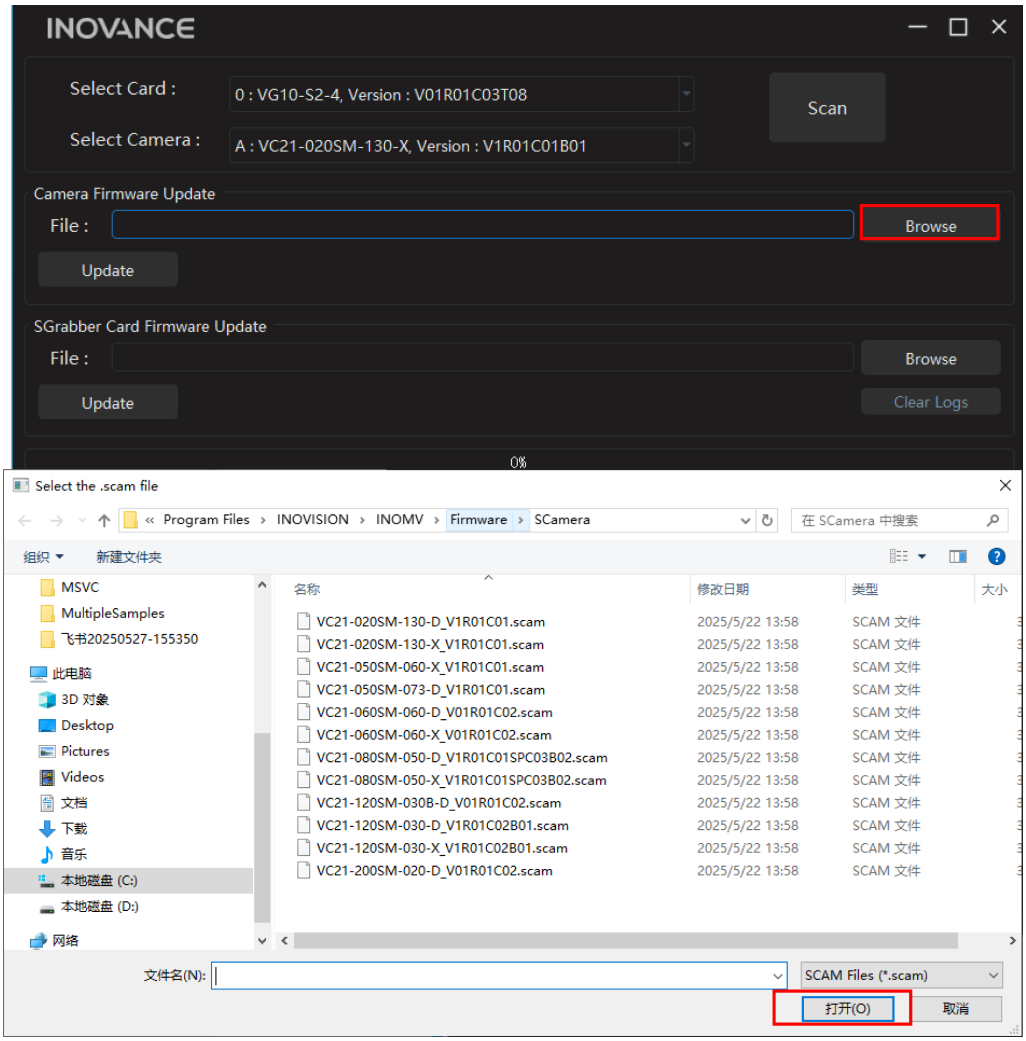


Procedure

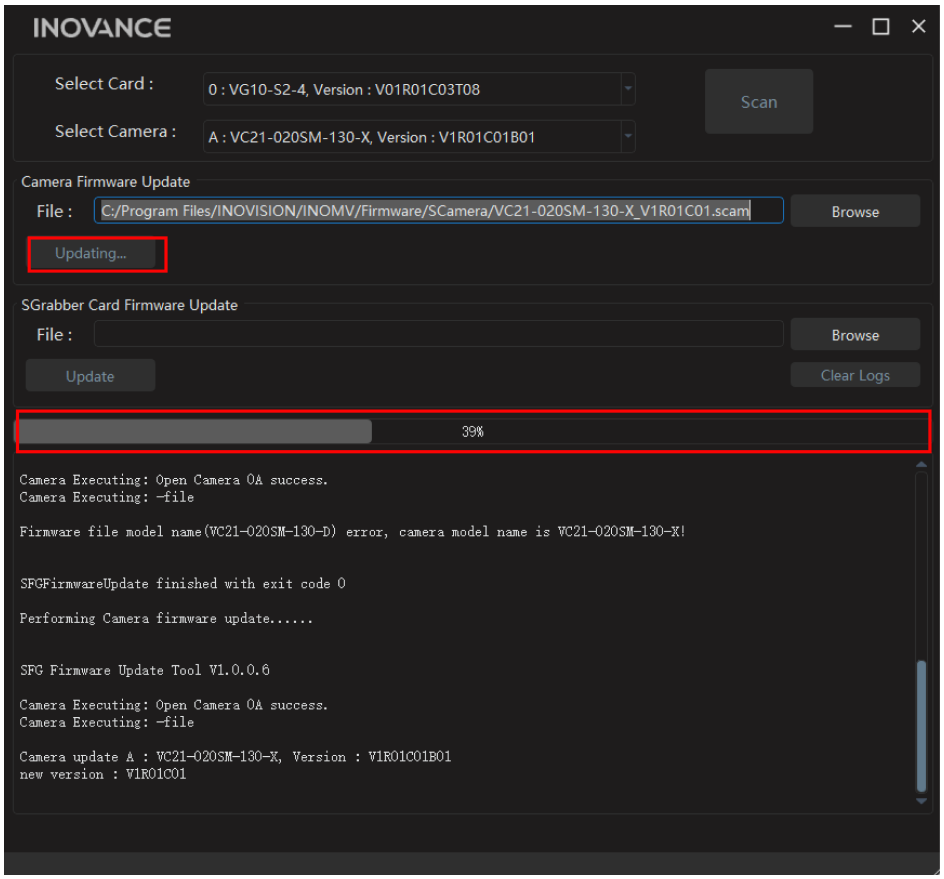
1. Click "Scan", and select the image frame grabber and camera to be upgraded from the scanned devices.



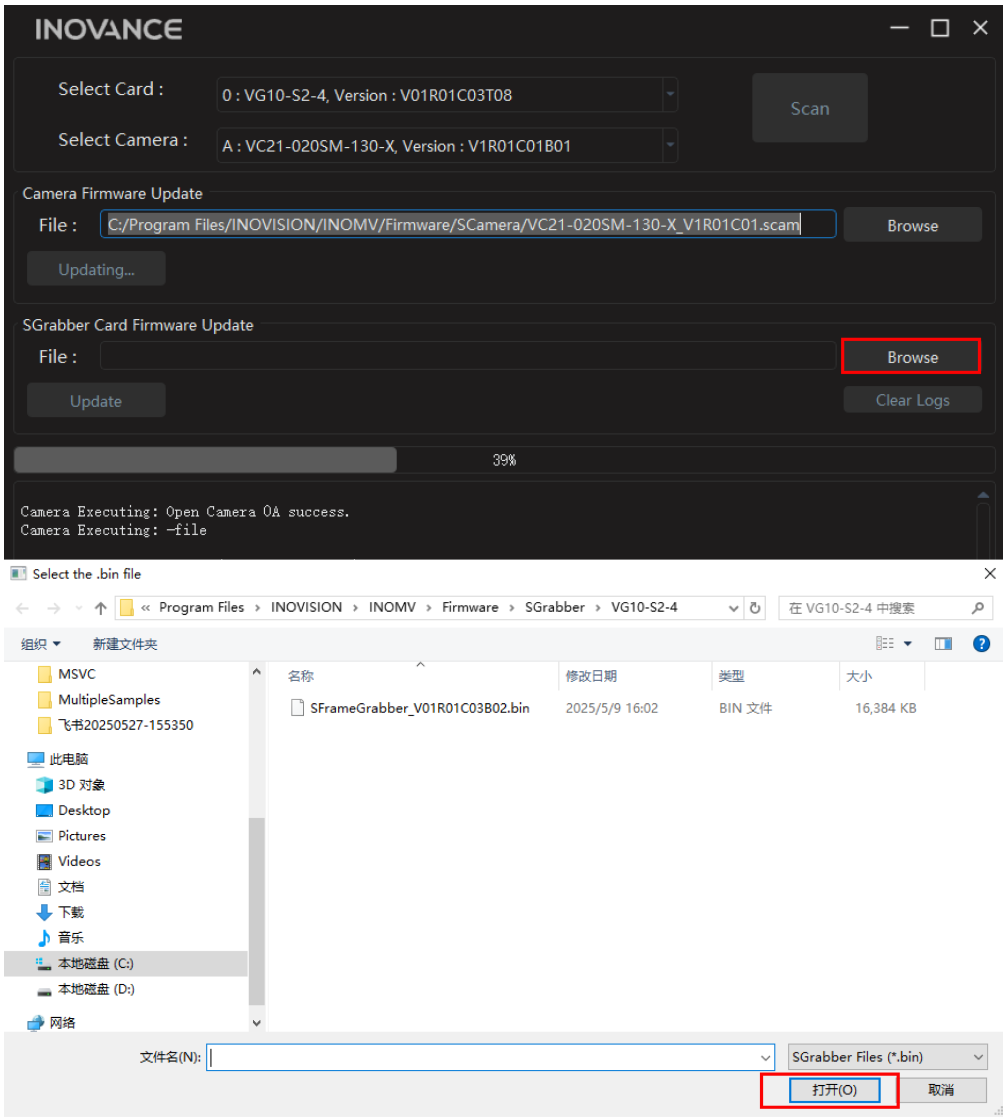
2. To upgrade the camera, click "Browse" and select the camera firmware to be loaded.



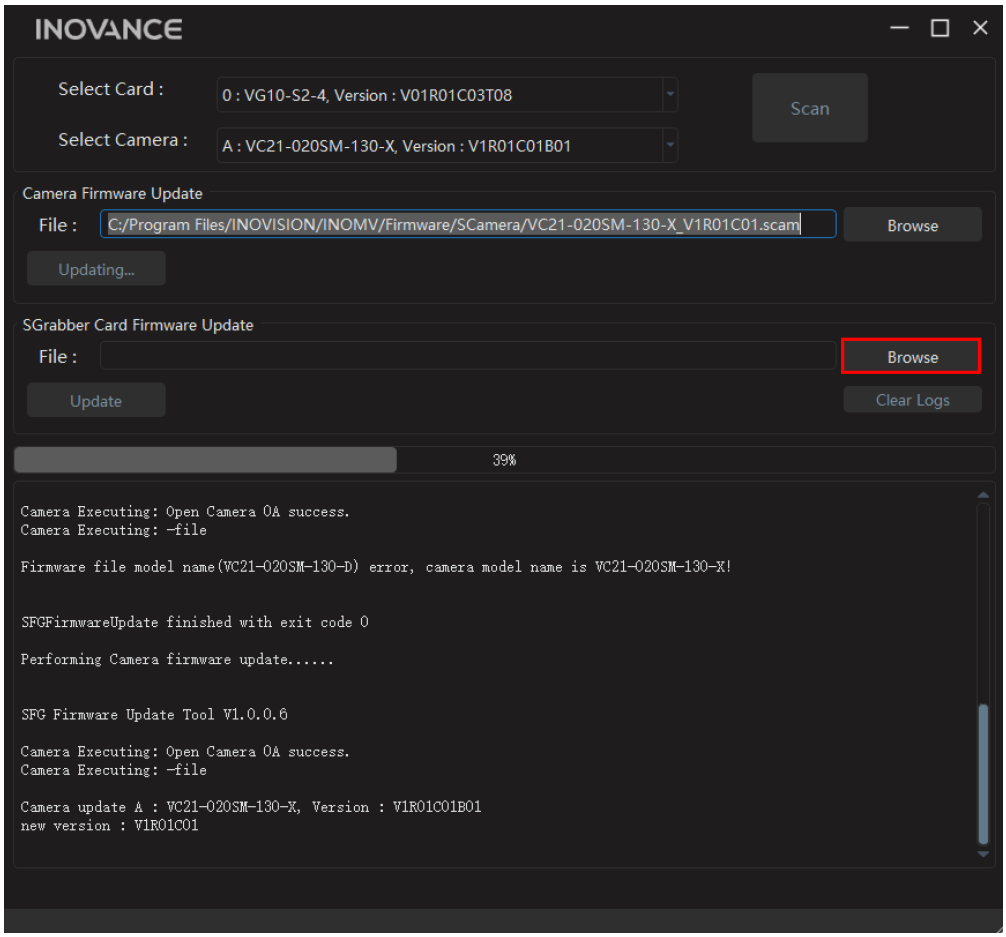
3. Click "Update". After the button text changes to "Updating", you can view the upgrade progress in the progress bar below. When the progress reaches 100%, the upgrade is complete.



4. To upgrade the image frame grabber, click "Browse", select the image frame grabber to be loaded, and click "Update". When the progress reaches 100%, the upgrade is complete.



5. Click "Clear Logs" to clear the log information generated in the log area during the upgrade process.


INOVANCE
Select Card :
0 : VG10-S2-4, Version : V01R01C03T08
Scan
Select Camera :
A : VC21-020SM-130-X, Version : V1R01C01B01
Camera Firmware Update
File :
C:/Program Files/INOVISION/INOMV/Firmware/SCamera/VC21-020SM-130-X_V1R01C01.scam
Browse
Updating...
SGrabber Card Firmware Update
File :
Browse
Update
Clear Logs
39%
Camera Executing: Open Camera 0A success.
Camera Executing: -file
Firmware file model name(VC21-020SM-130-D) error, camera model name is VC21-020SM-130-X!
SFGFirmwareUpdate finished with exit code 0
Performing Camera firmware update.....
SFG Firmware Update Tool V1.0.0.6
Camera Executing: Open Camera 0A success.
Camera Executing: -file
Camera update A : VC21-020SM-130-X, Version : V1R01C01B01
new version : V1R01C01

8 Common Faults

If you encounter problems while using the product, refer to this document.

1. **Frame grabber indicator off**
   Possible cause:

   The board power supply is abnormal.

   Solution:

   Check that the frame grabber slots are connected properly.

2. **Camera connection failure**
   Possible cause:

   - The 6-pin connector is not connected.
   - The GMSL2.0 interface cable is not correctly connected.

   Solution:

   - Check that the 6-pin connector is properly connected.
   - Check that the frame grabber and the GMSL2.0 interface connector of the camera are connected properly.

3. **No output from DO**
   Possible cause:

   The DO module is not powered.

   Solution:

   Check that the 24 V DO power supply is connected to the D-Sub 26-pin connector.

4. **Failure to identify the frame grabber by host controller software**
   Possible cause:

   - The frame grabber is not properly connected.
   - The frame grabber driver is not correctly installed.

   Solution:

   - Check that the frame grabber is properly connected.
   - Re-install the software driver.

5. **No image output in camera-triggered mode**
   Possible cause:

   The software configuration is incorrect.

   Solution:

   Check that the frame grabber software configuration is consistent with the wiring method, and that the correct I/O signal routing mode is matched.

9 Certification and Standard Compliance

9.1 CE, RoHS, and KC Certification

The product complies with the following CE, RoHS, and KC certification requirements. The attainment of certifications is subject to the marks on the nameplate of the product.

Certification	Directive		Standard
CE and RoHS certification	EMC directive	2014/30/EU	EN 61000-6-4 EN 61000-6-2
	RoHS	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
KC certification	-	-	KN 61131-2



Figure 9-1 KC certification

9.2 Reference Standards

- EN 55032: Electromagnetic compatibility of multimedia equipment - Emission requirements
- EN 55035: Electromagnetic compatibility of multimedia equipment - Immunity requirements

Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit https://www.inovance.com/global to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (https://zshc-eu.inovance.com/download-pc/) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.

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