Hangzhou Hikrobot Technology Co., Ltd.

3D Laser Profile Sensor

User Manual

HIKROBOT

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This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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

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

Available Model

This manual is applicable to the 3D Laser Profile Sensor (DP2000 series device and DP3000 series device).

Contact Information

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Contents

Chapter 1 Safety Instruction

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

1.1 Safety Claim

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

1.2 Safety Instruction

⚠Caution

- Do not install the device if it is found that the device and accessories are damaged, rusted, water ingress, model mismatch, missing parts, etc., when unpacking.
- Avoid storage and transportation in places such as water splashing and rain, direct sunlight, strong electric fields, strong magnetic fields, and strong vibrations.
- Avoid dropping, smashing or vigorously vibrating the device and its components.
- It is forbidden to install the indoor device in an environment where it may be exposed to water or other liquids. If the device is damp, it may cause fire and electric shock hazard.
- Place the device in a place out of direct sunlight and ventilation, away from heat sources such as heaters and radiators.
- The supplied bracket in the package is only applicable for this device, and using with other equipment may cause instability and injury.
- This is a Class A device. In the living environment, this device may cause radio interference. In this case, the user may be required to take practical measures against the interference.
- In the use of the device, you must be in strict compliance with the electrical safety regulations of the nation and region.
- Do not connect multiple devices to the same power adapter. Exceeding the adapter load may cause a fire due to excessive heat generation.

- Use the power adapter provided by the official manufacturer. The power adapter must meet the Limited Power Source (LPS) requirements. For specific requirements, please refer to the device's technical specifications.
- Do not cover the device's plug or outlet for disconnecting power supply.
- It is strictly forbidden to wire, maintain, and disassemble the device that is powered on. Otherwise there is a danger of electric shock and a damage to device.
- Make sure that the device is installed in good condition, the wiring is firm, and the power supply meets the requirements before powering on the device.
- For a device with a power switch, please use the switch to power on and off. It is strictly forbidden to plug and unplug the power cord.
- If the device emits smoke, odor or noise, please turn off the power and unplug the power cord immediately, and contact the dealer or service center in time.
- It is strictly forbidden to touch any terminal of the device when operating it. Otherwise there is a danger of electric shock.
- It is strictly forbidden for non-professional technicians to detect signals during device operation, otherwise it may cause personal injury or device damage.
- Avoid aiming the image sensor at strong light in direct mode or reflection mode, such as laser beams, otherwise the image sensor will be damaged.
- Please keep the image acquisition window clean. It is recommended to wipe it with a clean cloth that is moistened with alcohol (75% or less). When the product is not in use, dust protection is required. Damage caused by improper maintenance will not be liable for warranty.
- If the device does not work properly, please contact your dealer or the nearest service center. Never attempt to disassemble the device yourself. We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.
- Caution: If the device has battery, there is a risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.
- In order to ensure the stability of the depth data, avoid enabling the depth data measurement function of the device immediately after the installation. It is recommended to start the measurement at least one hour after the electric current is taken on the device to ensure the uniform heat diffusion of the internal device.
- Please dispose of the device in strict accordance with the relevant national or regional regulations and standards to avoid environmental pollution and property damage.

Note

- Check whether the device's package is in good condition, whether there is damage, intrusion, moisture, deformation, etc. before unpacking.
- Check the surface of the device and accessories for damage, rust, bumps, etc. when unpacking.
- Check whether the quantity and information of the device and accessories are complete after unpacking.
- Store and transport the device according to the storage and transport conditions of the device, and the storage temperature and humidity should meet the requirements.
- It is strictly prohibited to transport the device in combination with items that may affect or damage the device.

- Quality requirements for installation and maintenance personnel:
  - Qualification certificate or working experience in weak current system installation and maintenance, and relevant working experience and qualifications. Besides, the personnel must possess the following knowledge and operation skills.
  - The basic knowledge and operation skills of low voltage wiring and low voltage electronic circuit connection.
  - The ability to comprehend the contents of this manual.
- Please read the manual and safety instructions carefully before installing the device.
- Please install the device strictly according to the installation method in this manual.
- Do not contact the device with strong acids, alkalis, oils, greases or organic solutions such as thinners.
- To prevent injury, the device must be securely fastened to the profile.
- Do not expose the device directly to flashlights, high-frequency switch lighting devices, or to sunlight, which may affect the performance.

1.3 Electromagnetic Interference Prevention

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

maintain good conductivity.

- Use a shielded network cable to connect to the device. If you use a self-made network cable, make sure that the shielding shell at the aviation head is well connected to the aluminum foil or metal braid of the shielding cable.

1.4 Laser Precaution

The device complies with IEC 60825-1:2014 and GB 7247.1-2012.

⚠Caution

- Do not look directly at the laser beam, and if necessary, adjust the direction of direct eye gaze or close your eyes for protection.
- Do not use optical instruments (such as telescopes, magnifier) to observe the laser beam.
- Do not place optical instruments (such as mirrors) within the irradiation range of the laser beam.
- The laser radiation emitted from the device can cause eye injuries, burning of skin or inflammable substances.
- Wear the laser safety goggles within the operation range of the device. Do not look directly at the laser beam, even if wearing the laser safety goggles.
- The wavelength of the laser safety goggles must include the peak wavelength of the laser, and the optical density must be greater than OD5+.
- Avoid shining the laser on highly reflective materials. If it is unavoidable, the angle of the reflective material should be adjusted to prevent damage caused by laser reflection.
- Turn off the laser when the device is not in use.
- Please use this device correctly and safely in accordance with the contents of this manual and the local standards and laws and regulations. Otherwise the operator may be exposed to the risk of injury, electric shock, or radiation from the laser.

The laser-related parameters are shown below.

Table 1-1 Laser Parameters

Device Model	Laser Safety Class	Wavelength	Beam Divergence Angle	Pulse Width	Repetitive Frequency	Max. Power	Nominal Ocular Hazard Distance (NOHD)	Max. Permissible Exposure (MPE)
MV-DP2060-01H	Class2M	405±10 nm	0.611	14 μs to 10000 μs	0-18800	50 mW	1500 mm	NA
MV-DP2060-01D	Class3R	405±10 nm	0.611	946 ns (0 ns to 950 ns)	1 MHz	80 mW	1000 mm	NA
MV-DP206	Class3R	405±10 nm	0.611	946 ns (0 ns to 950	1 MHz	80 mW	1000 mm	NA

0-01P				ns)				
MV-DP2120-01H	Class2M	405±10 nm	0.785	14 µs to 10000 µs	0-18800	50 mW	1500 mm	NA
MV-DP2120-01P	Class3R	405±10 nm	0.611	946 ns (0 ns to 950 ns)	1 MHz	80 mW	1000 mm	NA
MV-DP2150-01H	Class2M	405±10 nm	0.785	14 µs to 10000 µs	0-18800	80 mW	1000 mm	NA
MV-DP2240-01H	Class2M	405±10 nm	0.698	14 µs to 10000 µs	0-18800	65 mW	1500 mm	NA
MV-DP2240-01P	Class3R	405±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	100 mW	2500 mm	NA
MV-DP2240-03H	Class2M	650±10 nm	0.698	14 µs to 10000 µs	0-18800	65 mW	1500 mm	NA
MV-DP2240-03P	Class3R	650±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	100 mW	2500 mm	NA
MV-DP2470-01H	Class3R	405±10 nm	0.698	14 µs to 10000 µs	0-18800	110 mW	2500 mm	NA
MV-DP2470-01P	Class3B	405±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	150 mW	2500 mm	0.848 mW
MV-DP2470-03H	Class3R	650±10 nm	0.698	14 µs to 10000 µs	0-18800	110 mW	2500 mm	NA
MV-DP2470-03P	Class3R	650±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	150 mW	2500 mm	NA
MV-DP2900-03H	Class3R	650±10 nm	0.611	14 µs to 10000 µs	0-18800	150 mW	2500 mm	NA
MV-DP290	Class3	650±10 nm	0.611	946 ns (0 ns to 950	1 MHz	150	2500 mm	NA

0-03P	R			ns)		mW		
MV-DP3020-01H	Class3R	405±10 nm	0.262	14 µs to 10000 µs	0-26000	80 mW	2500 mm	NA
MV-DP3020-01P	Class3R	405±10 nm	0.262	946 ns (0 ns to 950 ns)	1 MHz	80 mW	2500 mm	NA
MV-DP3060-01H	Class2M	405±10 nm	0.611	14 µs to 10000 µs	0-26000	50 mW	1500 mm	NA
MV-DP3060-01P	Class3R	405±10 nm	0.611	946 ns (0 ns to 950 ns)	1 MHz	80 mW	1000 mm	NA
MV-DP3060-01D	Class3R	405±10 nm	0.611	946 ns (0 ns to 950 ns)	1 MHz	80 mW	1000 mm	NA
MV-DP3062-01P	Class3B	405±10 nm	0.262	946 ns (0 ns to 950 ns)	1 MHz	80 mW	2500 mm	0.848 mW
MV-DP3120-01H	Class2M	405±10 nm	0.785	14 µs to 10000 µs	0-26000	50 mW	1500 mm	NA
MV-DP3120-01P	Class3R	405±10 nm	0.611	946 ns (0 ns to 950 ns)	1 MHz	80 mW	1000 mm	NA
MV-DP3300-01H	Class2M	405±10 nm	0.698	14 µs to 10000 µs	0-26000	65 mW	1500 mm	NA
MV-DP3300-01P	Class3R	405±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	65 mW	2500 mm	NA
MV-DP3300-03H	Class2M	650±10 nm	0.698	14 µs to 10000 µs	0-26000	65 mW	1500 mm	NA
MV-DP3300-03P	Class3R	650±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	65 mW	2500 mm	NA
MV-DP358	Class3	405±10 nm	0.698	14 µs to	0-26000	110	2500 mm	NA

0-01H	R			10000 μs		mW		
MV-DP3580-01P	Class3B	405±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	110 mW	2500 mm	0.848 mW
MV-DP3580-03H	Class3R	650±10 nm	0.698	14 μs to 10000 μs	0-26000	110 mW	2500 mm	NA
MV-DP3580-03P	Class3R	650±10 nm	0.698	946 ns (0 ns to 950 ns)	1 MHz	110 mW	2500 mm	NA
MV-DP3900-03H	Class3R	650±10 nm	0.611	14 μs to 10000 μs	0-26000	150 mW	2500 mm	NA
MV-DP3900-03P	Class3R	650±10 nm	0.611	946 ns (0 ns to 950 ns)	1 MHz	150 mW	2500 mm	NA

The laser labels are shown below.

Figure 1-1 Laser Label

Chapter 2 Overview

2.1 Introduction

With built-in high-accuracy algorithm, image process algorithm of wide dynamic range and data integration algorithm, the 3D laser profile sensor can output high accurate 3D point cloud data in real-time by combining high frame rate chip and accurate laser control. With compact structure, high integration and easy operation, it is widely applied into 3C industry, electronic manufacturing, automobile industry, etc.

2.2 Key Features

- Built-in high-accuracy algorithm and accuracy is up to submicron level.
- Supports multiple exposure modes with good robustness.
- Adopts multiple-frame integration technology to provide complete contours.
- Provides multiple filter modes with stable data.
- Supports ROI selection and auto setting for easier operation.

Note

- The device functions may differ by models.
- For specific device functions, refer to the device's user manual.

2.3 Parameter Description

The key performance parameters of the device are shown below.

Note

Refer to the device's specification for detailed parameter information. Parameters mentioned in the specification are tested in the laboratory environment with temperature of 25 °C (77 °F).

Table 2-1 Parameter Description

Parameters	Description
Scan Frequency	The image quantity collected by the device per unit time.
Measurement Range (MR)	The depth range that the device can measure. If the measured object is not in the measurement range, and effective data cannot be obtained.

Reference Distance	The distance between the bottom of the device and the center of the measurement range.
Near Field of View	The size of the field of view corresponds to the measurement range closest to the device.
Far Field of View	The size of the field of view corresponds to the measurement range farthest to the device.
Resolution (X)	The distance of adjacent contour points in single profile data, and it is determined by the field of view and single contour point quantity.
Resolution (Z)	It is the fixed height position within the measurement range, and the min. height difference that the device can detect. This parameter is determined by the device installation position and algorithm accuracy.
Repeatability Z (μm)	In the measurement range, the same target area is repeatedly measured, and the max. deviation value of measurement result is repeated accuracy. This parameter reflects the measurement stability performance of the device.
Linearity Z (±% of MR)	It indicates the deviation between the measured value and the true value of the measured object within the measurement range. This parameter reflects the absolute measurement capability of the device.

The measurement range diagram is shown below.

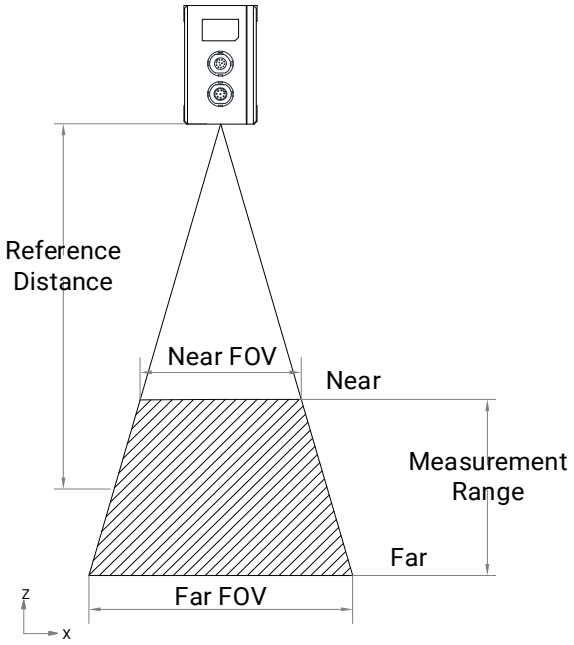


Figure 2-1 Measurement Range Diagram

2.4 Naming Rule

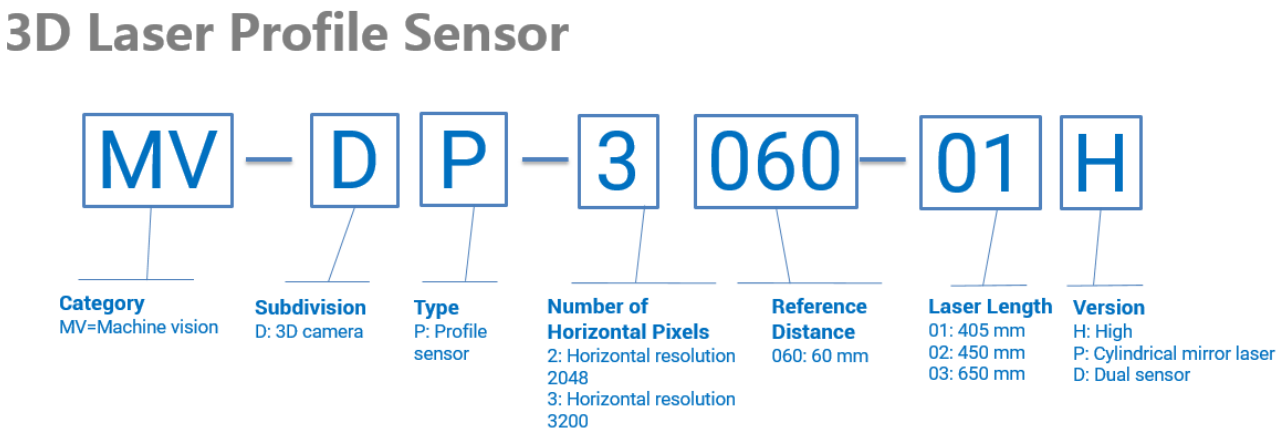


Figure 2-2 Naming Rule

Chapter 3 Appearance

Note

Appearance here is for reference only. Refer to the device's specification for detailed dimension information.

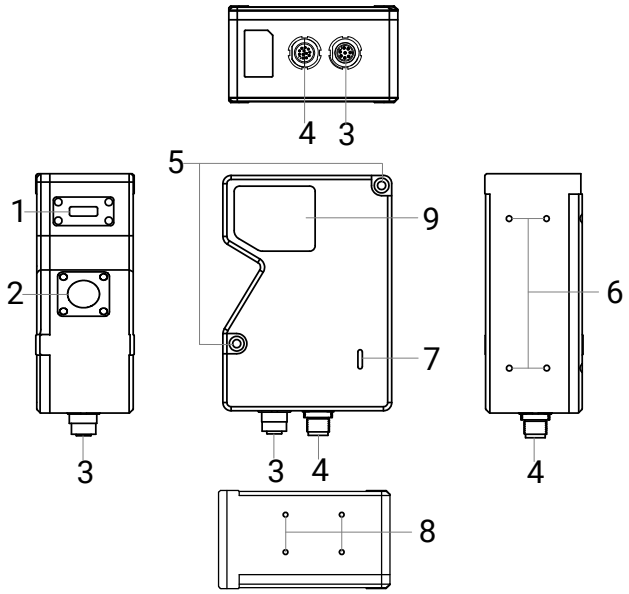


Figure 3-1 Appearance of Monocular Device

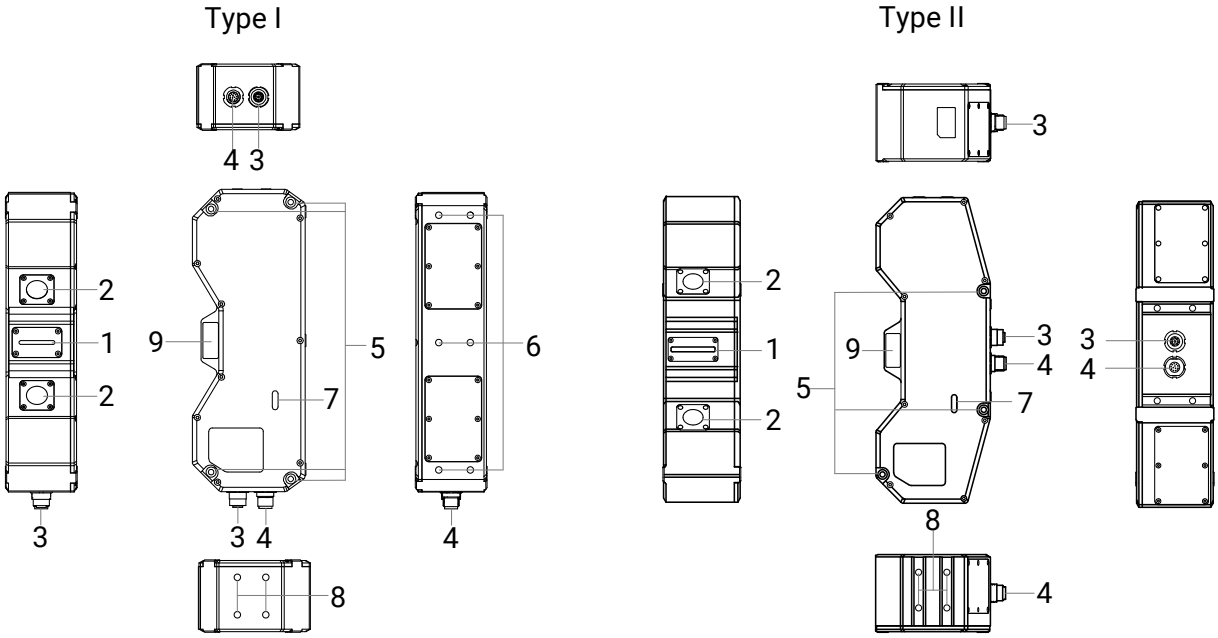


Figure 3-2 Appearance of Binocular Device

Table 3-1 Component Description

No.	Name	Description
1	Laser	It sends out laser to object surface.
2	Image Sensor	It acquires the laser contour of the object.
3	Gigabit Ethernet Interface	It is a gigabit Ethernet interface to transmit data. The interface is designed with threads to tighten connection between the device and cable.
4	12-Pin Interface	It provides power, I/O and serial port function. The interface is designed with threads to tighten connection between the device and cable.
5	Mounting Hole	It refers to 2 mounting holes each on the side of the device, and these holes are used to fix the device. Refer to device's specification for screw information.
6	Screw Hole (Top)	It refers to the screw holes on the top of the device, and these screw holes are used to fix the device. Refer to device's specification for screw information.
7	Indicator	It displays the operating status of the device.
8	Screw Hole (Side)	It refers to 4 screw holes on the side of the device, and these screw holes are used to install the baffle. Refer to device's specification for screw information.
9	Laser Label	It shows laser information.

Note

The mounting holes and screw holes (top) are both used to fix the device. You can select one of them to fix the device according to actual demands.

Chapter 4 Interface and Indicator

4.1 12-Pin Interface

The device has a 12-pin M12 interface that provides power, input and output signals, and the serial port signal.

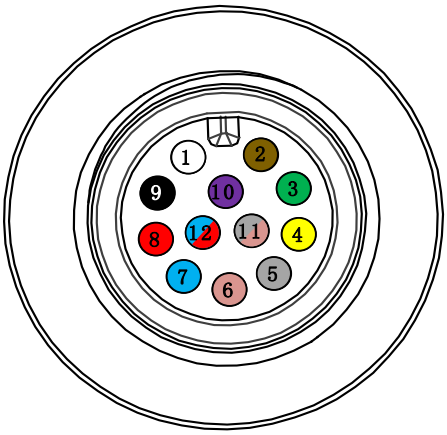


Figure 4-1 12-Pin Interface

Table 4-1 Pin Definitions

No.	Cable Color	Signal	I/O Signal Source	Description
1	White	POWER_IN	--	DC power supply positive
2	Brown	GND	--	Power supply ground
3	Green	IO_OUT1_P	Line 1+	Differential output IO 1 positive
4	Yellow	IO_OUT1_N	Line 1-	Differential output IO 1 negative
5	Gray	IO_IN0_N	Line 0-	Differential input IO 0 negative
6	Pink	IO_IN0_P	Line 0+	Differential input IO 0 positive
7	Blue	IO_IN3_N	Line 3-	Differential input IO 3 negative
8	Red	IO_IN3_P	Line 3+	Differential input IO 3 positive
9	Black	IO_IN6_N	Line 6-	Differential input IO 6 negative
10	Purple	IO_IN6_P	Line 6+	Differential input IO 6 positive
11	Gray/Pink	232_RXD	--	RS-232 input
12	Red/Blue	232_TXD	--	RS-232 output

Note

You should refer to the table above and the label attached to the power and I/O cable to wire the device.

4.2 Indicator

The device's indicator is used to indicate the operating status of the device.

Note

When the indicator is flashing rapidly, flashing slowly, or flashing very slowly, its unlit interval is 0.2 sec, 1 sec, and 2 sec respectively.

Table 4-2 Indicator

Indicator Color	Indicator Status	Device Status
Blue	Solid	● The device is operating normally. ● The device's firmware is updated.
Green	Flashing rapidly	The device acquires images normally, but the laser line is not within the field of view.
	Solid	The device acquires images normally, and the laser line is within the field of view.
Red	Flashing very slowly	The device's IP address conflicts or the network is disconnected.
	Solid	● Loading uboot failed. ● Updating firmware failed. ● A fatal exception occurs. ● Other exceptions occur.
Red and blue	Flashing alternatively	The device is updating its firmware.

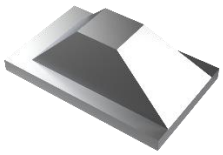
Chapter 5 Installation

5.1 Installation Preparation

You need to prepare following accessories before device installation.

Table 5-1 Accessories

No.	Name	Picture	Quantity	Description
1	Power and I/O cable		1	It refers to the 12-pin power and I/O cable with M12 interface. You need to purchase separately. **Note** When the length of the power and I/O cable is no less than 7 m, a power adapter of 24 V 1 A or higher is required for power supply.
2	Network Cable		1	It refers to the gigabit Ethernet network cable, and its interface is M12 to RJ45 connector. You need to purchase separately.
3	Power Adapter		1	It refers to the power adapter or switch power supply above 12 V, 2 A or 24 V, 1 A. You need to purchase separately.
4	Screws		Several	It refers to the supplied M4x35, M3x8, M4x55, M4x10, M5x10, or M3x7 screws, which may differ by device model.

No.	Name	Picture	Quantity	Description
				
5	System Calibration Block		1	It is used to convert the sensor's coordinate data into system coordinate data. You need to purchase separately.

Note

- Before any installation or maintenance work, please disconnect the power supply from the utility, and ensure that it will not be reconnected inadvertently.
- Do not install the power supply in places with high moisture or near the water.
- Do not install the power supply in places with high ambient temperature or near fire source.
- Please install the exposed high-voltage terminals on the power supply in a closed chassis or cabinet to prevent accidental contact.
- Keep enough insulation distance between mounting screws and internal components of power supply.
- Fans and ventilation holes must be kept free from any obstructions. Also a 10 cm to 15 cm clearance should be kept when the adjacent device is a heat source.
- The power supply must be grounded as required.
- Output current and output power must not exceed the rated values on specifications.
- Non-standard mounting or operating under high ambient temperature may increase the internal component temperature and will decrease the output power.
- All failure should be examined by a qualified technician. Do not remove the case of the power supply by yourself.
- Do not touch the power terminal for 5 minutes after the power is turned off, that may cause electric shock.

5.2 Install Device

Before You Start

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

Note

- When installing the device, make sure that the device's X/Y direction is parallel with the

datum plane, and the device's Y direction is same with its movement direction.

- The installation height depends on the field of view of the device and object size. Refer to the device's specification for specific reference distance and measurement range.

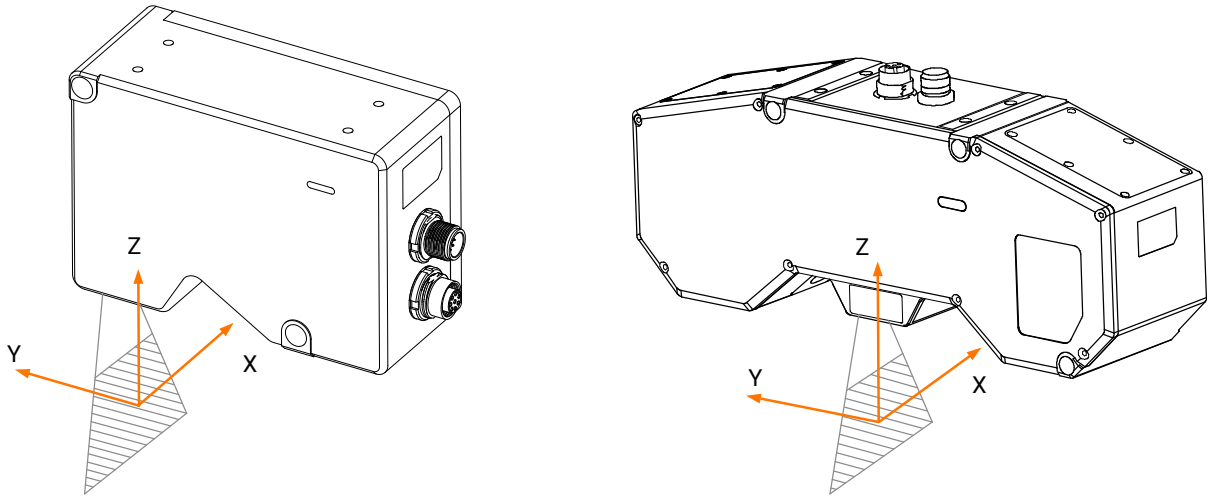


Figure 5-1 Installation Direction Diagram

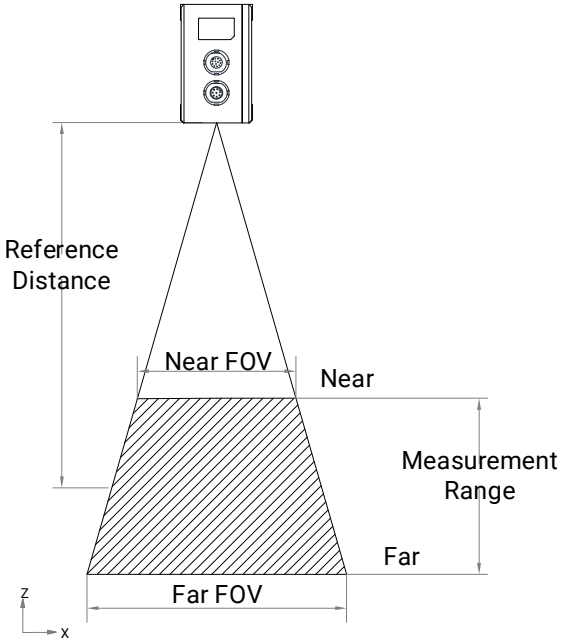


Figure 5-2 Distance Requirement

Steps

1. Use the screws to fix the device to the mounting plate from the front side or from the top side.

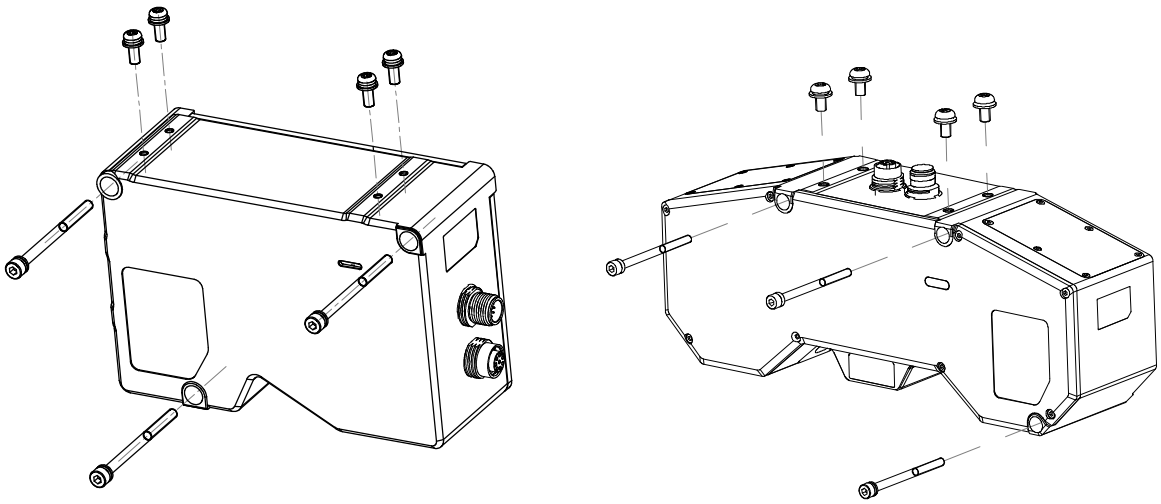


Figure 5-3 Fix Device

Note

The front side of the device refers to the side where the indicator is located. During installation, make sure the indicator is not covered.

2. Use the network cable to connect the device to a switch or NIC.
3. Use the power and I/O cable to connect the device to a suitable switch power supply.

The device is easily affected by the environment, measured objects, angle, etc. When installing the device, pay attention to following items.

- Do not use the device in the environment with direct sun light. Otherwise, the measurement accuracy may be inaccurate.
- Do not keep the device too close to wall or baffle plate. Otherwise, the secondary reflection may occur that will affect the measurement accuracy.

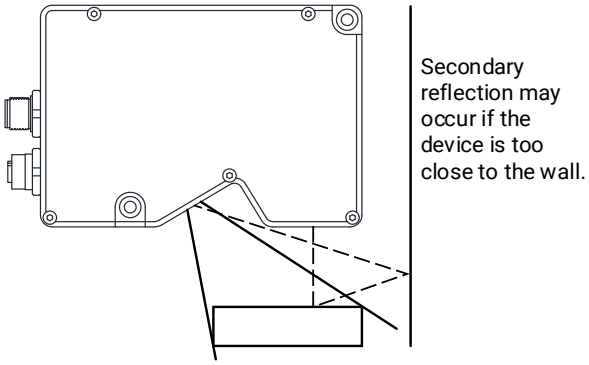
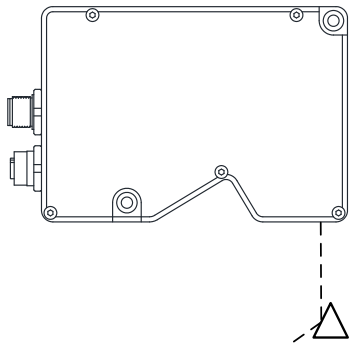


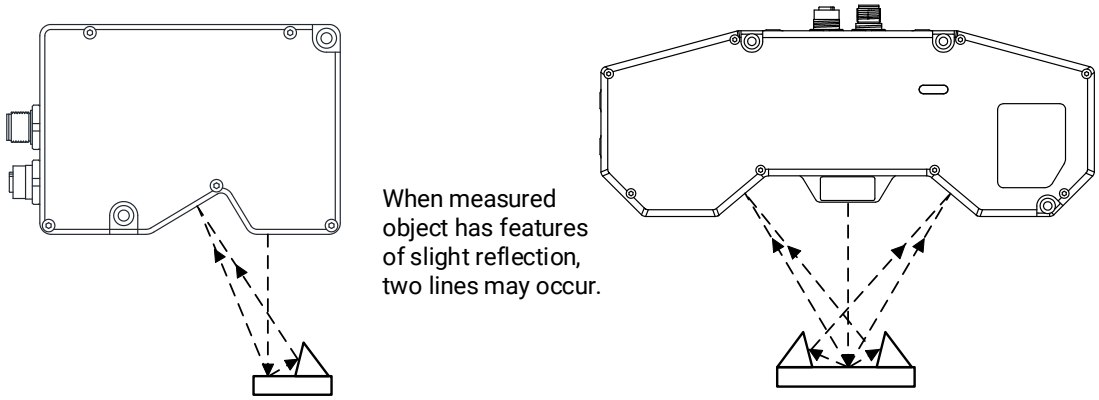
Figure 5-4 Secondary Reflection

- If measured objects have the features of absorbance, reflection or transmittance, the device's image data may lose, images may have noise, and central line cannot be extracted.



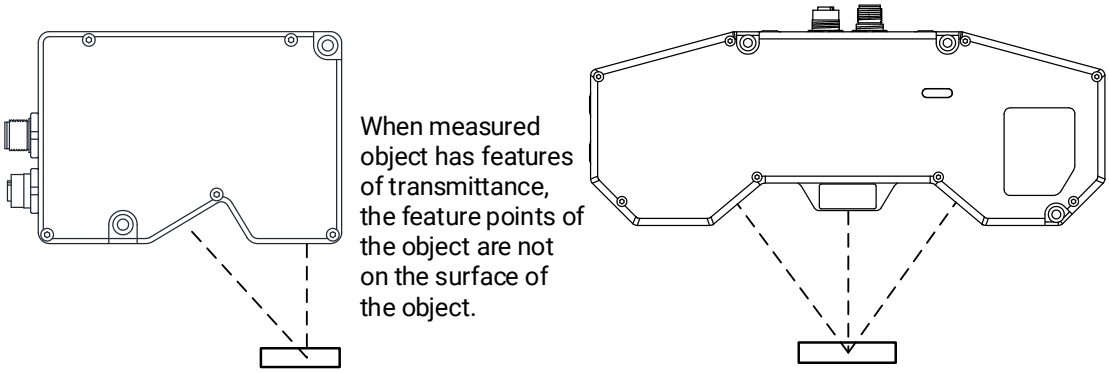
When measured object has features of reflection, the device cannot acquire feature points of the object.

Figure 5-5 Reflection



When measured object has features of slight reflection, two lines may occur.

Figure 5-6 Slight Reflection



When measured object has features of transmittance, the feature points of the object are not on the surface of the object.

Figure 5-7 Transmittance

Due to imaging angle, certain measured objects may have a blind zone in the device field of view, as shown below.

- When there is the blind zone in X direction, you need to put the measured object near the center of field of view to reduce the size of the blind zone.
- When there is the blind zone in Y direction, it is recommended to install the device (except binocular device) in an inclined position, or adjust the position of the measured object.

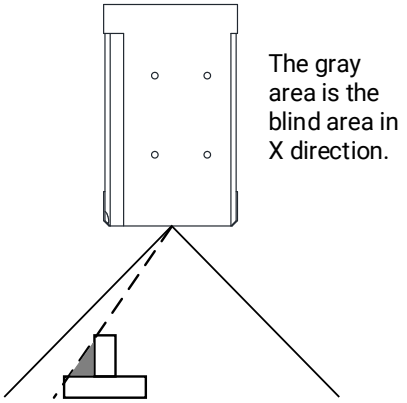


Figure 5-8 Blind Area in X Direction

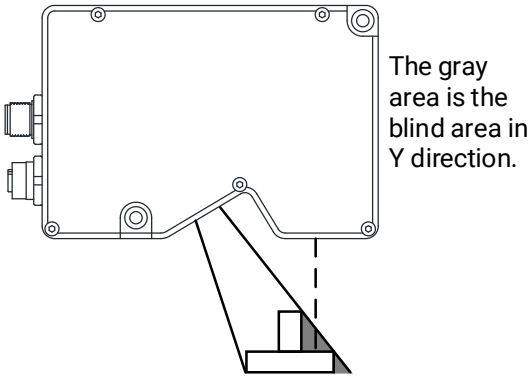


Figure 5-9 Blind Area in Y Direction

Note

For the binocular device, there is no blind area in Y direction.

Chapter 6 Device Connection

Device connection to the client software is required for device's configuration and remote operations. This section introduces how to install the client software, set PC and device network, connect the device to the client software, etc.

6.1 Install Client Software

3DMVS is a client software for device configuration and remote operations.

Steps

Note

- Check the Windows version. The client software is compatible with 32/64-bit Windows 7/10 and 64-bit Windows 11.
- You can get the client software installation package from *https://en.hikrobotics.com/*.
- The graphic user interface may differ by different versions of client software you use.

1. Double click the installation package to start installing the client software.
2. Select the language.
3. Read and check **Terms of the License Agreement**.
4. Click **Start Setup**.
5. Select installation directory and click **Next**.

Figure 6-1 Installation Interface

6. Finish the installation according to the interface prompts.

6.2 Turn off Firewall

To ensure stable client running and image transmission, you are recommended turning off Windows firewall before using the client software.

Steps

Note

For different Windows versions, the path name or interface may differ. Please refer to the actual condition.

1. Go to Windows Firewall.
Windows 7 system: Click **Start** → **Control Panel** → **Windows Firewall**.
Windows 10 system: Click **Start** → **Control Panel** → **System and Security** → **Windows Defender Firewall** → **Firewall & network protection**.
Windows 11 system: Click **Start** → **Settings** → **Privacy & security** → **Windows Security** → **Firewall & network protection**.
2. For Windows 7 and 10 system, click **Turn Windows Defender Firewall on or off** on the left. For Windows 11, select the network and turn off in **Microsoft Defender Firewall**.
3. Select **Turn off Windows Defender Firewall (not recommended)**.

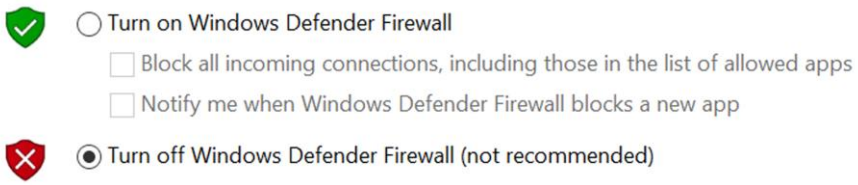


Figure 6-2 Windows Defender Firewall

4. Click **OK**.

6.3 Set PC Network

To ensure stable image transmission and normal communication between the PC and the device via client software, you need to set the PC network before using the client software.

Steps

Note

For different Windows versions, the path name or interface may differ. Please refer to the actual condition.

1. Go to PC network settings page: **Start** → **Control Panel** → **Network and Internet** → **Network and Sharing Center** → **Change adapter settings**.
2. Select NIC and set the IP obtainment mode.

- Select **Obtain an IP address automatically** to get an IP address of the PC automatically.
- Select **Use the following IP address** to set an IP address for the PC manually.

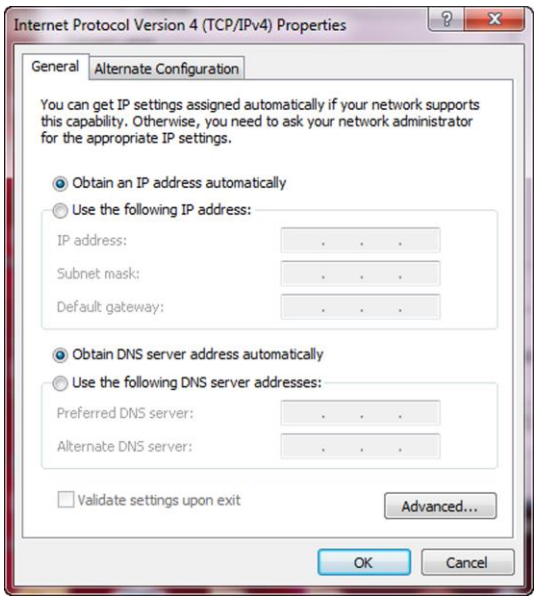


Figure 6-3 Set PC Network

3. Set NIC property.
   1) Go to NIC settings page: **Control Panel** → **Hardware and Sound** → **Device Manager** → **Network Adapter**.
   2) Select corresponding network interface card, and click **Advanced**.
   3) Set **Receive Buffers** to its max. value.

6.4 Set Device Network

You can set and operate the device in the client software only when the device is in the same network segment with the PC where the client software is installed.

Steps

1. Double click the client software to run it, and the **Device List** window will pop up.
2. Click **Edit** to open the **Edit IP Address** window.

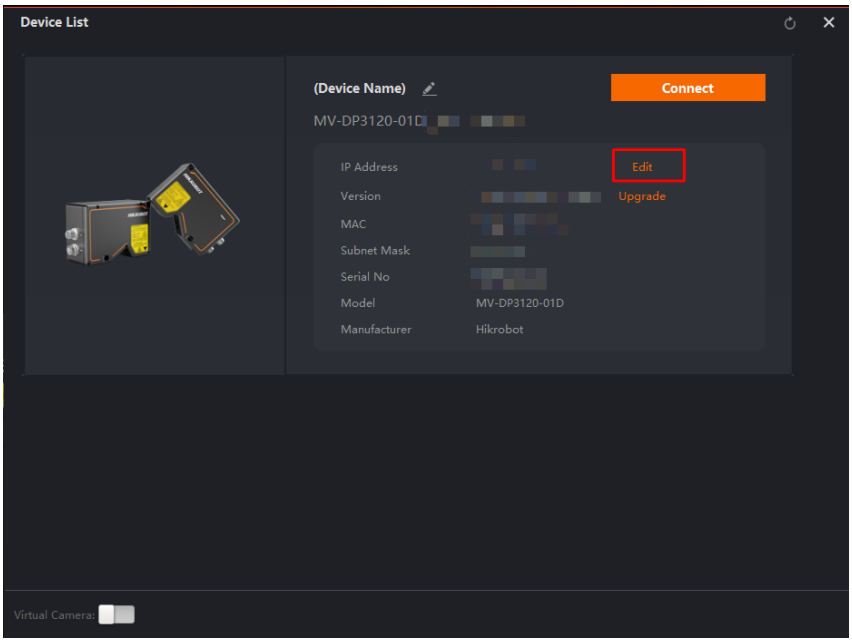


Figure 6-4 Device List

5. Set the IP address of the device in the same network segment with the PC.

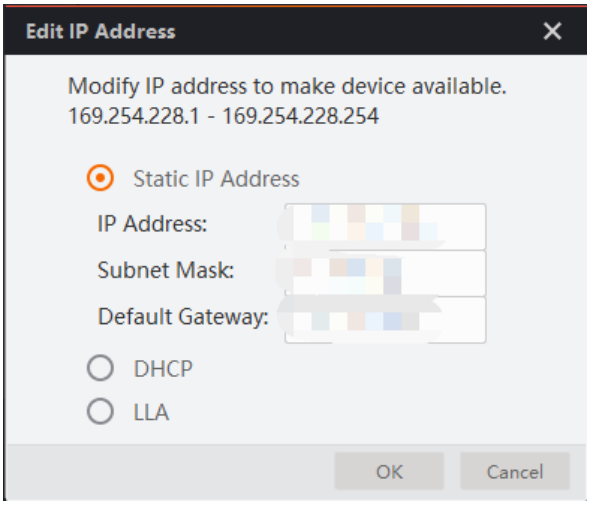


Figure 6-5 Edit IP Address

Note

It is recommended to set the IP address as the static IP for device's stable operating.

6.5 Connect Device to Client Software

Make sure your device IP address is in the same network segment with the PC where you

installed the client software before connecting the device to it.
Open the **Device List** window, and click **Connect** to connect the device to the client.

Chapter 7 Quick Started with 3DMVS

This section introduces the layout of the client software, and basic operations about device in the client software.

7.1 Client Software Layout

After connecting to the device, the client software can read the device attributes and display them.

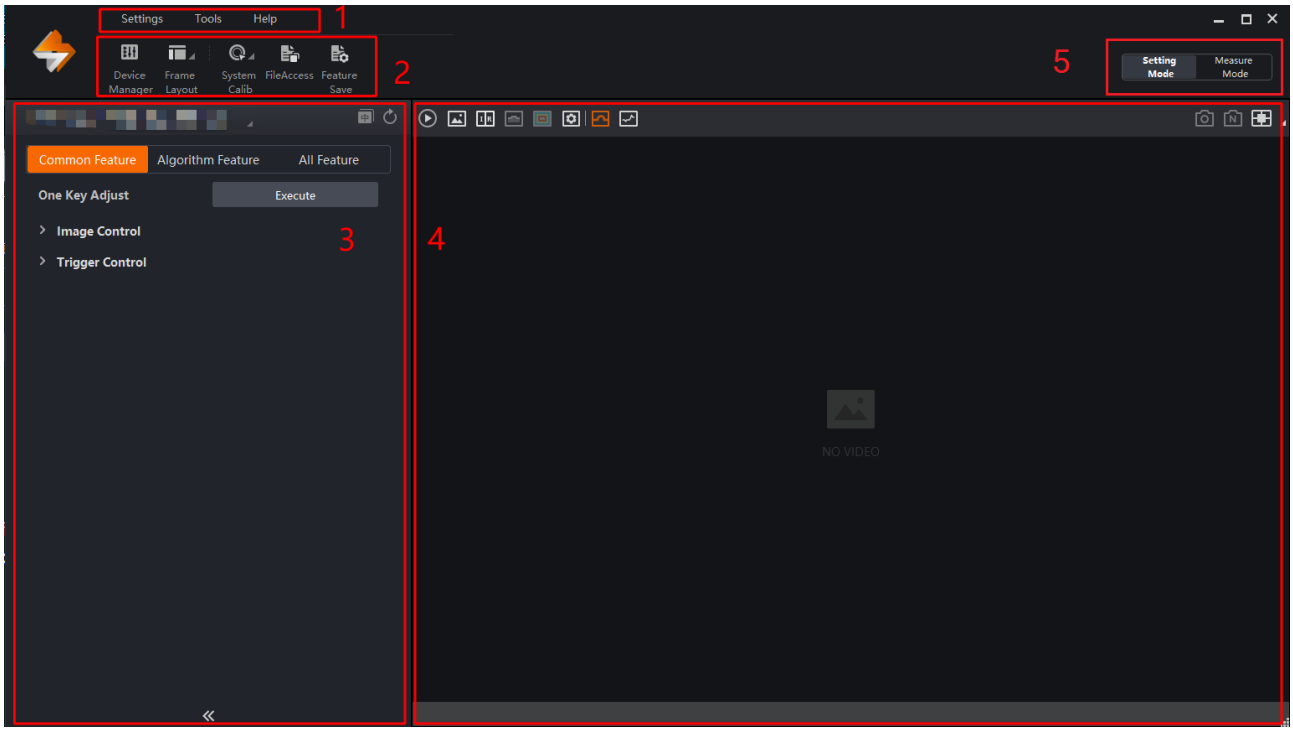


Figure 7-1 Main Window

Note

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

Table 7-1 Description of the Main Window

No.	Name	Description
1	Menu Bar	The menu bar displays function modules, including **Settings**, **Tools**, and **Help**.
2	Control Toolbar	The control toolbar provides quick operations for the device.
3	Settings Area	You can view and set device's parameters.

No.	Name	Description
4	Live View Area	This area displays device's images, and you can switch image mode, capture images, etc.
5	Mode Switching	You can switch to **Setting Mode** or **Measure Mode**.

Note

For specific attributes, please refer to the actual device you got.

Table 7-2 Device Attribute Description

Attribute	Description
Device Control	You can view device information, edit its name and reset the device.
Scan Control	You can enable the laser, and set sensor, trigger, output and chunk data related parameters.
Algorithm Control	It includes profile algorithm control and range image control, and you can set related parameters here.
Transport Layer Control	You can set the parameters of transport layer.
User Set Control	You can save or load the device's parameters, and set the default parameter of the device.

7.2 Basic Operation with Client Software

After installing the client software, you need to debug the device, and the overall process is shown below.

Note

It is recommended to measure objects after powering on the device for about one hour.

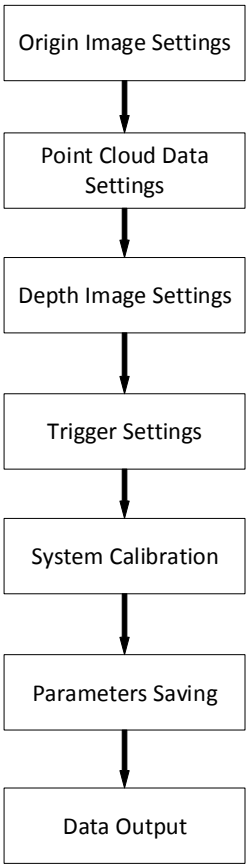


Figure 7-2 Device Debug Process Flow

You can switch image mode on the toolbar.

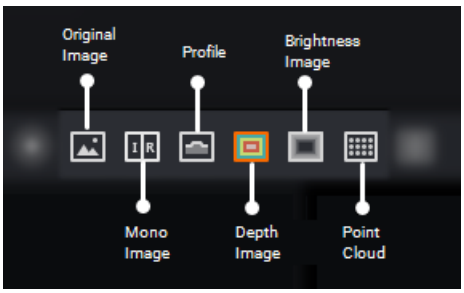


Figure 7-3 Image Mode

7.2.1 Set Original Image

Click  to switch to the original mode, draw ROI (Region of Interest), and set image parameters in the origin image mode.

- Drawing ROI is to block the invalid region, reduce outputted bandwidth, and increase outputted frame rate. Refer to section **Set ROI** in *3D Laser Profile Sensor User Manual* for details.
- Setting image parameters is to select high precision or wide dynamic in photosensitivity, or select custom to adjust the device's exposure and gain to make sure the brightness of

the device is enough and the central line can be extracted. Refer to section **Set Exposure Mode** and section **Set Photosensitivity** in *3D Laser Profile Sensor User Manual* for details.

Note

- For binocular device, you can click to check the clarity of binocular image.
- Methods for adjusting exposure and gain vary in different situations.
  - If the image is too dark, you can increase the exposure and gain appropriately. If the exposure is too large to influence the device frame rate, the gain should be increased.
  - If the image is too bright, you can reduce the exposure and gain appropriately.
  - If the image is partially too bright and too dark, you can enable the multiple exposure function.

7.2.2 Set Point Cloud Data

In order to get an ideal image effect, you need to process profile data and stitch them into point cloud data. The flow is shown below.

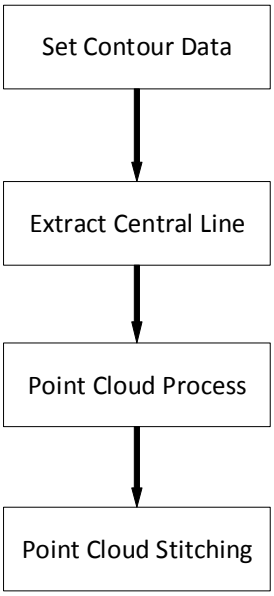


Figure 7-4 Process Flow

Steps

1. Click to switch to the profile mode.
2. Go to **Algorithm Feature** → **Profile Algorithm Features** to set related parameters for extracting the central line. Refer to section **Set Profile Algorithm Parameters** in 3*D Laser Profile Sensor User Manual* for details.
3. Go to **All Feature** → **Algorithm Control** → **Profile Algorithm Control** to set **Hole Filling** and **Profile Filter** to preprocess point cloud data. Refer to section **Set Profile Algorithm Parameters** in *3D Laser Profile Sensor User Manual* for details.
4. Go to **Algorithm Feature** to set **Step Distance** in **Profile Algorithm Features** and **Range Image Height** in **Range Image Control** to stitch the point cloud data.

- Step distance can be calculated by relative displacement speed of measured object and the device/the device's real time frame rate.
- Range image height refers to the quantity of contours to be stitched.

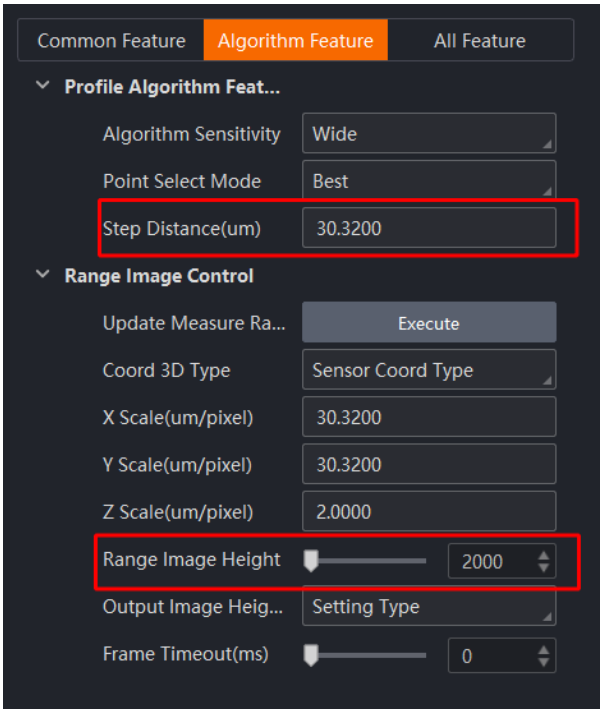


Figure 7-5 Step Distance and Line Number

7.2.3 Set Depth Image

Before You Start

Make sure the device has stopped acquiring images.

Note

- After you click **Execute** in **One Key Adjust** and set the related parameters, a set of parameters of the device will be generated automatically.
- Save the parameters before clicking the quick settings button, otherwise all parameters except original image ROI will be reset.

Steps

1. Go to **Common Feature**, and click **Execute** in **One Key Adjust**.

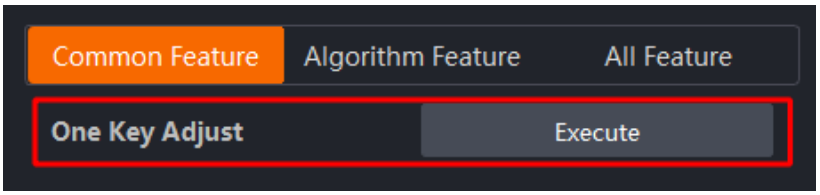


Figure 7-6 Quick Parameter Setting for Depth Image

2. Set the **Trigger Mode**. The options are introduced below.

- **Free Collection Mode** cannot control the device to start or stop acquiring images, but can control the acquisition frame rate via internal signal.
- **Frame Trigger (Pulse Signal)** can control the device to start or stop acquiring images via external trigger or software trigger, and control the acquisition frame rate via internal signal.
- **Line Trigger** cannot control the device to start or stop acquiring image, but can control the acquisition frame rate via external trigger.
- **Frame (Pulse Signal) & Line Trigger** can control the device to start or stop acquiring images via external trigger or software trigger, and control the acquisition frame rate via external trigger.

3. Set the **Moving Speed** or **Encoder Resolution** according to the trigger mode you select.

- If you set **Free Collection Mode** or **Frame Trigger (Pulse Signal)** as the trigger mode, the **Moving Speed** should be set. It refers to the relative moving speed of the device and the object.
- If you set **Line Trigger** or **Frame (Pulse Signal) & Line Trigger** as the trigger mode, the **Encoder Resolution** should be set. It refers to the physical distance represented by one pulse period from the encoding device

4. Set **X/Y Single Pixel Precision** and **Object Moving Distance.**

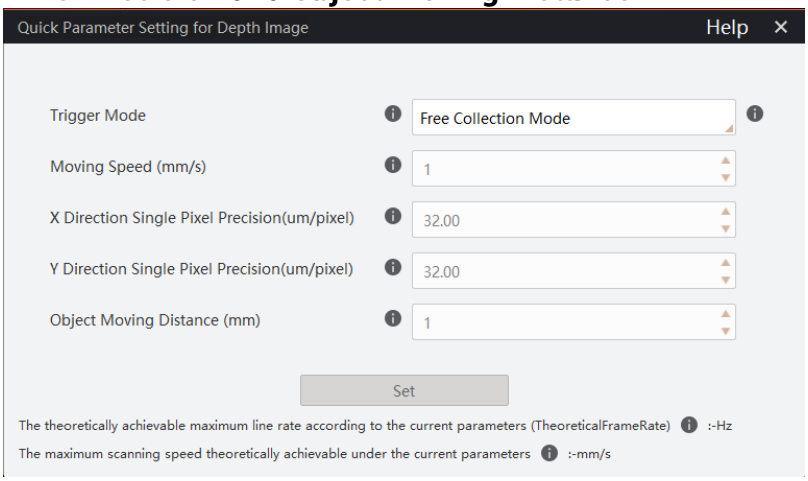


Figure 7-7 Set Related Parameters

5. Click **Set**. The success message will pop up.

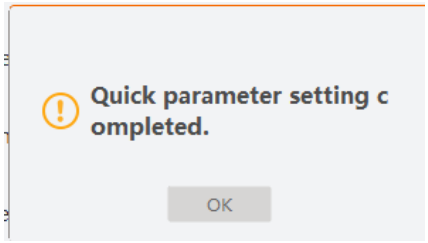


Figure 7-8 Quick Parameter Settings Succeeded

7. Click  on the control toolbar of the client software to start acquisition.

Note

If the **Frame Trigger (Pulse Signal)** or **Frame (Pulse Signal) & Line Trigger** is set as the trigger mode, you should select the trigger source in the pop-up window after you click **Set**.

7.2.4 Set Trigger

After wiring the device according to section ***Wire Device*** in *3D Laser Profile Sensor User Manual*, you need to set related parameters of line trigger and frame trigger, and refer to section ***Trigger Input*** in *3D Laser Profile Sensor User Manual* for details.

- Line trigger is used to trigger device to output the point cloud of single lines via the pulse signal.
- Frame trigger is used to control the device to start acquiring images or stop acquiring images.

7.2.5 Set System Calibration

System calibration is required before using the device.
The system calibration can correct the installation deviation and datum plane of the device, and get the three-dimensional data in the system coordinate system.
The device supports customized coordinate system zero position and coordinate direction to correct the relative deflection caused by device installation and motion mechanism movement.
System calibration is divided into line calibration, static calibration, dynamic calibration, and rotation calibration. For multi-camera scene, dynamic stitching calibration and static stitching calibration are also available. Different calibration methods are suitable for different scenarios. Refer to section ***Device Calibration*** in *3D Laser Profile Sensor User Manual* for details.

7.2.6 Save Parameters

After setting parameters and debugging images, you need to save them in case of restoring to default settings after restarting the device. Refer to section ***User Set Customization*** in *3D Laser Profile Sensor User Manual* for details.

7.2.7 Output Data

The image data of the device can be stored via the client software, or obtained and outputted via the SDK.

- The 3DMVS client software can store the device's original images, point cloud data, and depth images. Refer to the ***3DMVS Client Software User Manual*** for details.
- The device can obtain, transform and store the device's original images, point cloud data and depth images via the SDK. Refer to the ***3D Laser Profile Sensor SDK Developer Guide*** for details.

Chapter 8 Image Debugging

8.1 Enable Laser

Caution

The safety class of the device's laser is Class 2M or Class 3R. Do not observe the device's laser module to avoid eye damage.

The device's laser is used to send laser lines to the measured object. For normal use of the device, you need to enable the laser.
Go to **Scan Control**, and enable **Laser Enable**.

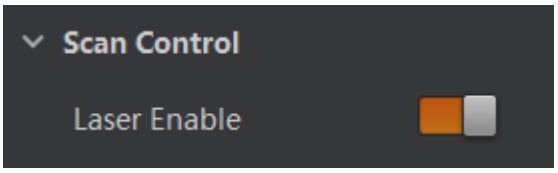


Figure 8-1 Enable Laser

8.2 Set Laser Ratio

You can set laser ratio to adjust the brightness of the laser line. For example, when the laser ratio is set as 50, it means that the laser turn-on time is 50% of the total laser cycle time.
When the exposure mode is **Multiple**, you should set laser ratio separately for the two sets of exposure times. **Laser Ratio** and **Laser Ratio Sub** correspond to the first set and the second set.

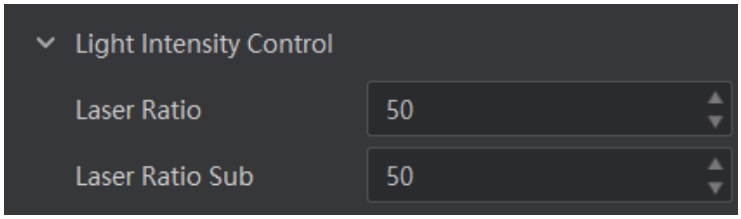


Figure 8-2 Set Laser Ratio

Note

Whether the function is supported or not depends on the firmware version. Refer to the actual device you got.

8.3 Set ROI

The device supports setting ROI (Region of Interest) that allows the device to acquire and measure images in specific area for improving the device's frame rate.

Note

Currently, the device's ROI mode has 3 types, including **Full**, **Middle**, and **Small**. In different modes, the vertical resolution and image's vertical coordinates may differ.

You can select **Custom** to set ROI based on actual demands if the existing 3 types of ROI mode do not meet your requirements.

Steps

1. Go to **Scan Control** → **Sensor Control** → **Image Mode**, and set **Origin Image** as **Image Mode**.

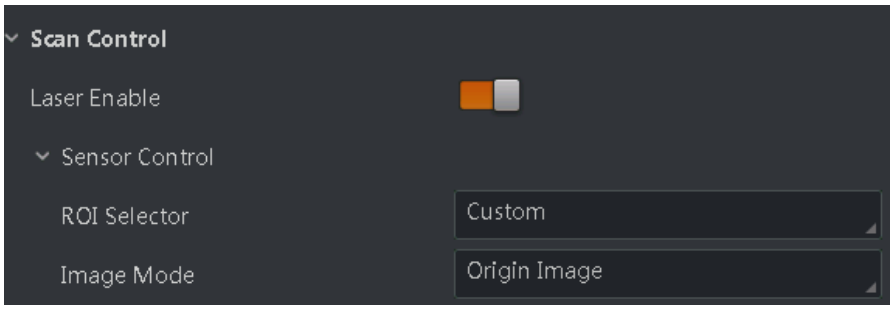


Figure 8-3 Origin Image

2. Click on the control toolbar of the client software to start acquisition.
3. Go to **Common Feature** → **Image Control** → **Draw ROI**, click to draw the ROI in the live view area, and click to finish drawing.

Note

- You can click to cancel drawing, click to make the ROI in the center of the live view area, or resize the ROI window.
- When the shield region is not in the ROI, it will not be displayed.

4. (Optional) Click to adjust existing ROI.
5. (Optional) Click to delete the ROI and restore to the full screen.

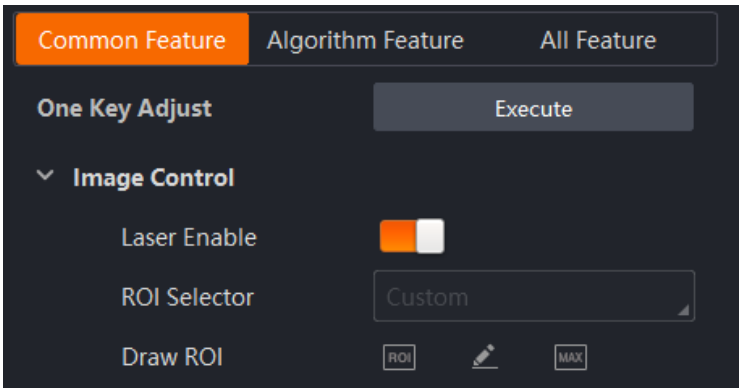


Figure 8-4 Draw ROI

8.4 Set Shield Region

When there is a light in the ROI, it may affect the measurement accuracy. You can avoid interference by setting the shield region to eliminate the measurement error caused by the light.

Note

- The shield region function may differ by device models.
- If the light appears in the range of the measured object, the use of shield region function may also cause effective data to be filtered. It is recommended to use this function with caution.
- Up to 10 shield regions can be drawn, and you can draw 10 sides in a shield region at most.
- If the shield region and effective region are available at the same time, only the shield region in the effective region is valid.

Steps

1. Go to **Scan Control** → **Sensor Control** → **Image Mode**, and set **Origin Image** as **Image Mode**.
2. Click on the control toolbar of the client software to start acquisition.
3. Go to **Common Feature** → **Image Control** → **Draw Shield**, and click .

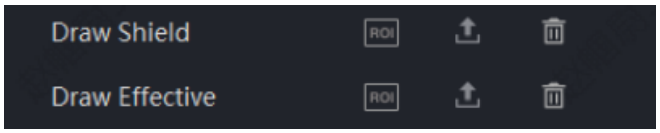


Figure 8-5 Draw Shield

4. Click in the image to decide the starting point, drag the cursor to draw line, and double click to create a closed polygon area.

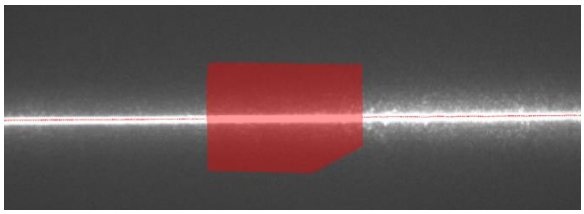


Figure 8-6 Draw Shield Region

5. (Optional) Click to clear drawing.
6. Click to upload to the device after drawing.

8.5 Set Effective Region

You can draw an effective region if there is interference of light in measurement area to ensure effective data is not filtered.

Note

- The effective region function may differ by device models.
- Up to 3 effective regions can be drawn, and you can draw 10 sides in a effective region at most.

Steps

1. Go to **Scan Control** → **Sensor Control** → **Image Mode**, and set **Origin Image** as **Image Mode**.
2. Click on the control toolbar of the client software to start acquisition.
3. Go to **Common Feature** → **Image Control** → **Draw Effective**, and click .

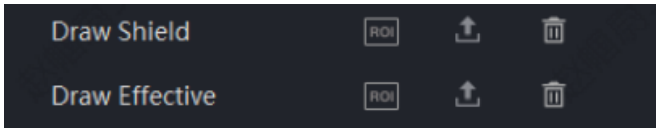


Figure 8-7 Draw Effective

4. Click in the image to decide the starting point, drag the cursor to draw line, and double click to create a closed polygon area.

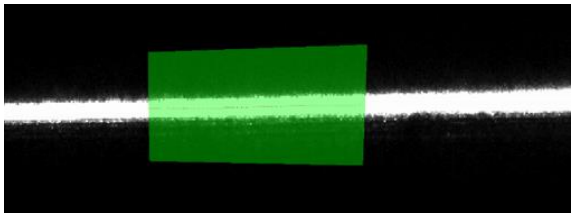


Figure 8-8 Draw Effective Region

5. (Optional) Click to clear drawing.
6. Click to upload to the device after drawing.

8.6 Set Binning

The purpose of binning is to enhance sensibility. With binning, multiple sensor pixels are combined as a single pixel to reduce resolution and improve image brightness. Go to **Scan Control** → **Sensor Control** → **Binning Selector** and set it.

Note

This function is available for DP3000 series device. Refer to the actual device you got.

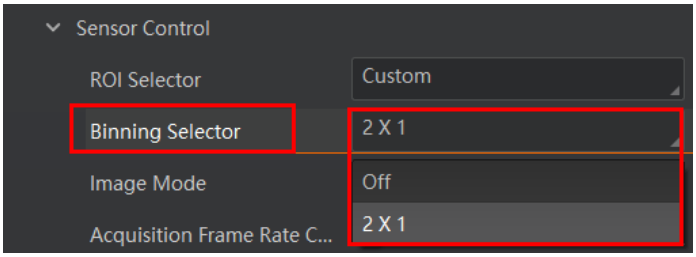


Figure 8-9 Set Binning

8.7 Set Brightness Fusion

You can set brightness fusion to adjust the brightness of the image. Go to **Scan Control** → **Sensor Control** → **Brightness Fusion** and set it.

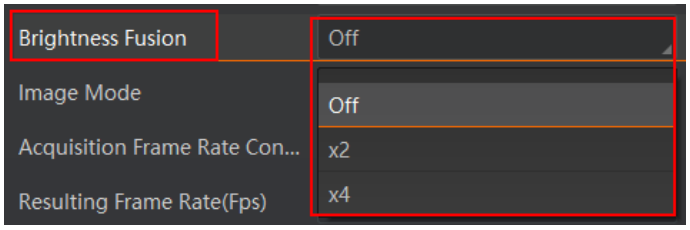


Figure 8-10 Set Brightness Fusion

This function can adjust the brightness of the laser line by adjusting the gray value of the pixels. The higher the fusion factor, the brighter the laser line is.

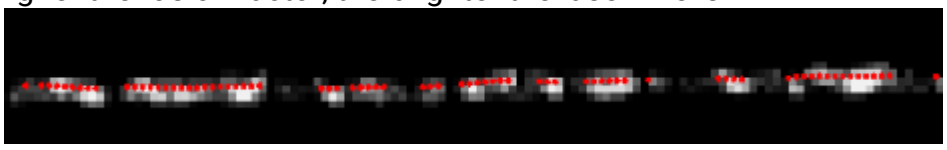


Figure 8-11 Brightness Fusion Off

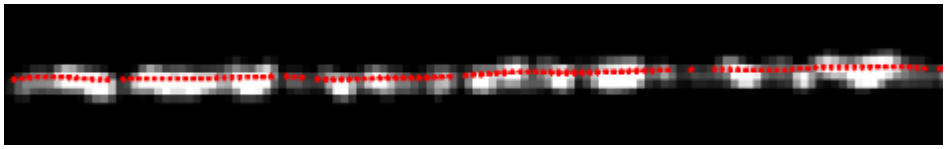


Figure 8-12 Brightness Fusion × 2

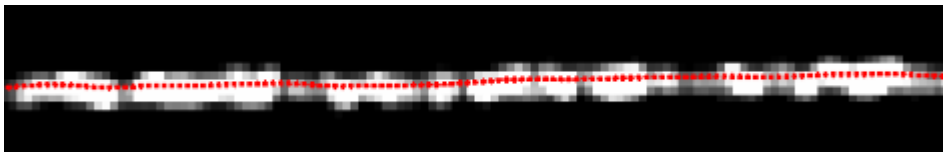


Figure 8-13 Brightness Fusion × 4

Note

- Whether the function is supported or not depends on the firmware version. Refer to the actual device you got.
- It is recommended to adjust brightness fusion first, and then adjust the exposure.

8.8 Set Image Mode

The device can output different data types, including origin images, depth images, profile data, and brightness image.

- Origin image: Go to **Scan Control** → **Sensor Control** → **Image Mode**, and set **Origin Image** as **Image Mode**. Click to view the image and click or to see the center coordinate or line width.
- Depth image: Go to **Scan Control** → **Sensor Control** → **Image Mode**, and set **3D Range Image** as **Image Mode**. Click to view the image and click or to see the brightness image and point cloud.
- Profile data: Go to **Scan Control** → **Sensor Control** → **Image Mode**, and set **3D Point Cloud** as **Image Mode**. Click to view the image.

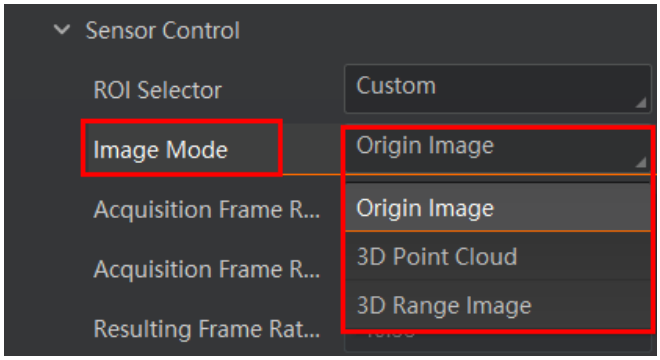


Figure 8-14 Set Image Mode

Note

Line width is available when the chunk function is enabled. Refer to section ***Chunk Function*** for details.

8.9 Set Bino Fusion Weight

For binocular device, you can set the bino fusion weight for different original images. If the value is 3:1, it means that the bino fusion weight of the main sensor and the sub sensor is 3:1.

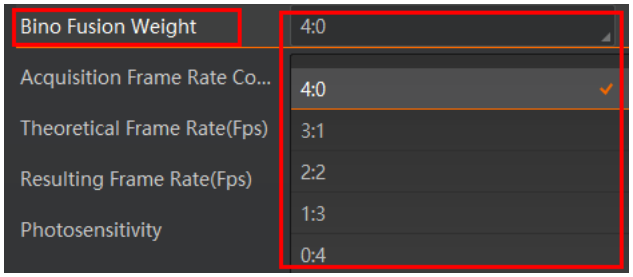


Figure 8-15 Set Bino Fusion Weight

Note

The bino fusion weight function is only available for the binocular device.

8.10 Set Frame Rate

Frame rate refers to the image quantity that is acquired by the device per second. The higher frame rate, and shorter time used for image acquisition will be. The following 4 factors determine the device's frame rate in real-time.

- ROI: The larger resolution of the ROI, and the lower frame rate of the device.
- Image mode: The frame rate of the device differ by the image mode you selected. In general, the frame rate in the origin image mode is lower than that in the 3D point cloud.
- Exposure time: If the reciprocal of max. frame rate that the device supports is t, and when the configured exposure time is larger than t, the less the exposure time, the higher the frame rate will be. When the configured exposure time is less than or equal to t, and exposure time will not influence the frame rate.
- Binning: By using binning function, the device's resolution is reduced and the frame rate increases.

Note

- The Binning function is available for some models. Refer to the actual device you got.
- Network bandwidth also affects the device frame rate. It is recommended to use the device in a Gigabit network environment.

Go to **Scan Control** → **Sensor Control**, enable **Acquisition Frame Rate Control Enable**, and enter **Acquisition Frame Rate** according to actual demands. You can refer to **Resulting Frame Rate** to view the device's resulting frame rate.

Figure 8-16 Set Frame Rate

Note

- If the real-time frame rate is smaller than configured frame rate, the device acquires images according to the real-time frame rate.
- If the real-time frame rate is larger than configured frame rate, the device acquires images according to the configured frame rate.
- If the set frame rate is larger than the theoretical frame rate, the device still acquires images according to the theoretical frame rate.

8.11 Set Photosensitivity

You can set photosensitivity according to the actual demands. Go to **Scan Control** → **Sensor Control**, and set **Photosensitivity**.

DP2000 Series Device

The options for DP2000 series device are shown below.

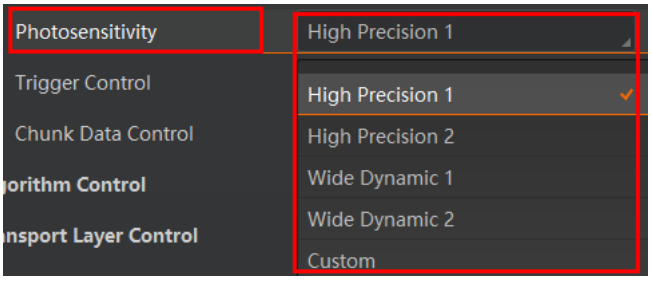


Figure 8-17 Photosensitivity of DP2000 Series Device

Table 8-1 Photosensitivity Parameters of DP2000 Series Device

Parameters	Description
High Precision 1	It is applicable for diffuse reflection or highly reflective materials with high contour precision. ● Exposure mode: Single ● Exposure time: 100 μs ● Gain: 0 dB ● Contour filter: Disabled

High Precision 2	It is applicable for materials with low reflectivity, such as metal, and high contour precision. ● Exposure mode: Single ● Exposure time: 200 μs ● Gain: 3 dB ● Contour filter: Enabled, and its value is fixed.
Wide Dynamic 1	It is applicable for scenes with some differences in materials, and has high contour integrity. ● Exposure mode: Multiple ● Exposure time: 50 μs / 100 μs ● Gain: 0 dB / 3 dB ● Fusion weight: 0.5 by default ● Contour filter: Enabled, and its value is fixed.
Wide Dynamic 2	It is applicable for scenes with large differences in materials, and has high contour integrity. ● Exposure mode: Multiple ● Exposure time: 50 μs / 150 μs ● Gain: 0 dB / 3 dB ● Fusion weight: 0.5 by default ● Contour filter: Enabled, and its value is fixed.
Custom	Set exposure mode, gain, and contour filter manually.

DP3000 Series Device

The options for DP3000 series device are shown below.

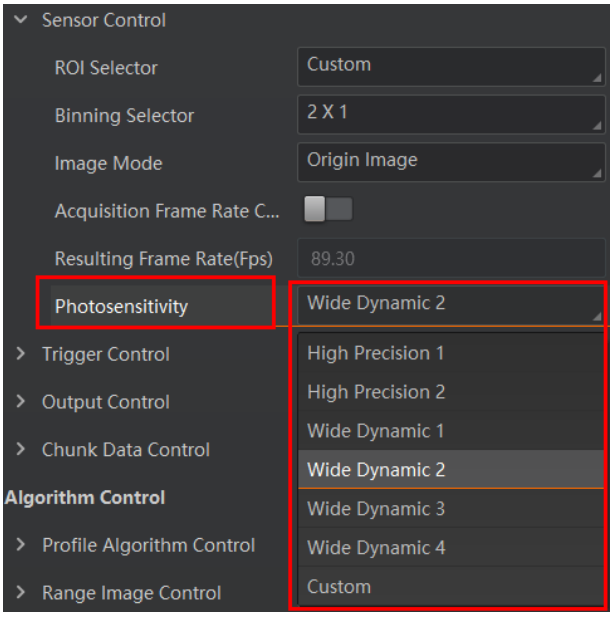


Figure 8-18 Photosensitivity of DP3000 Series Device

Table 8-2 Photosensitivity Parameters of DP3000 Series Device

Parameters	Description
High Precision 1	● Exposure mode: Single ● Exposure time: 300 μs ● Gain: 2 × ● Contour filter: Disabled
High Precision 2	● Exposure mode: Single ● Exposure time: 600 μs ● Gain: 2 × ● Contour filter: Disabled
Wide Dynamic 1	● Exposure time: 300 μs ● Gain: 1 × ● Single frame HDR: Enabled; K position: Mid; K Value: 5 ● Contour filter: Enabled, and its value is fixed.
Wide Dynamic 2	● Exposure time: 400 μs ● Gain: 1 × ● Single frame HDR: Enabled; K position: Mid; K Value: 25 ● Contour filter: Enabled, and its value is fixed.
Wide Dynamic 3	● Exposure time: 500 μs ● Gain: 1 × ● Single frame HDR: Enabled; K position: Mid; K Value: 75 ● Contour filter: Enabled, and its value is fixed.
Wide Dynamic 4	● Exposure time: 500 μs ● Gain: 1 × ● Single frame HDR: Enabled; K position: Mid; K Value: 200 ● Contour filter: Enabled, and its value is fixed.
Custom	Set exposure mode, gain, single frame HDR, and contour filter manually.

8.12 Set Single Frame HDR

After you enable the single frame HDR, multi-exposure fusion, overexposure control, and dynamic range improvement will be executed within a frame.

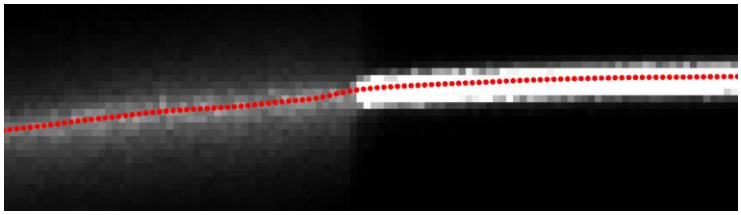


Figure 8-19 Single Frame HDR Disabled

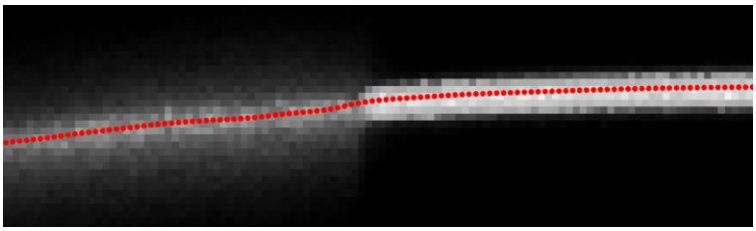


Figure 8-20 Single Frame HDR Enabled

If **Custom** is selected for photosensitivity, you can go to **Scan Control** → **Sensor Control** to enable **Single Frame HDR**, and set K position and K value.

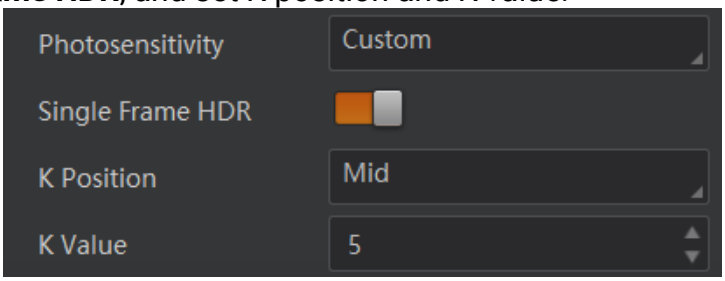


Figure 8-21 Set Single Frame HDR

Note

This function is available for DP3000 series device. Refer to the actual device you got.

8.13 Set Exposure Mode

You can set exposure mode according to the actual demands. Go to **Scan Control** → **Sensor Control**, and set **Exposure Mode**.

The device supports 2 types of exposure mode, including single and multiple, and you are also allowed to set exposure time and analog gain.

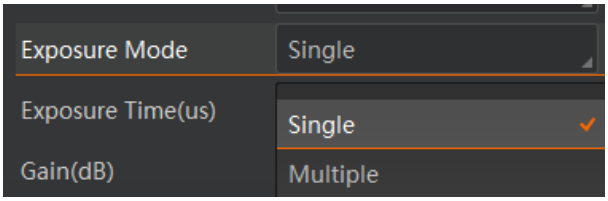


Figure 8-22 Set Exposure Mode

- If **Single** is selected as **Exposure Mode**, you can enter **Exposure Time** and **Gain** according to actual demands. When the device is acquiring images, you can also click **Execute** in **Auto Set** to let the device automatically adjust its exposure time.

Figure 8-23 Single Exposure Mode

Note

- **Auto Set** cannot be set in trigger mode.
- Under the single exposure mode, for DP2000 series device, you can enter the gain value, and for DP3000 series device, you can select the gain value in the drop-down list.

- If **Multiple** is selected as **Exposure Mode**, there are two types according to the device memory.
  Multiple exposure: You can enter 2 sets of exposure time and gain. The device will automatically acquire images based on the parameters you configured.
  Long/short frame fusion exposure: You can enter 2 sets of exposure time and gain, and set fusion weight.

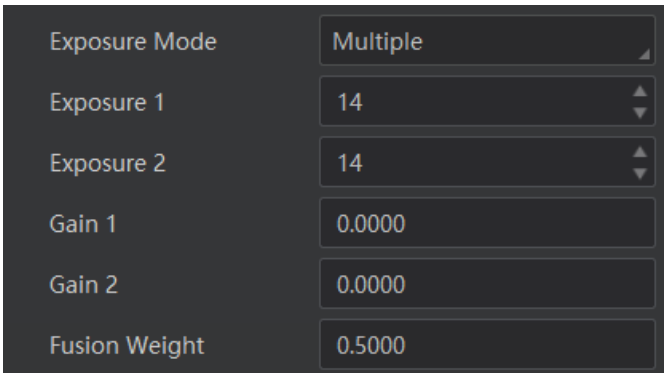


Figure 8-24 Multiple Exposure Mode of DP2000 Series Device

Note

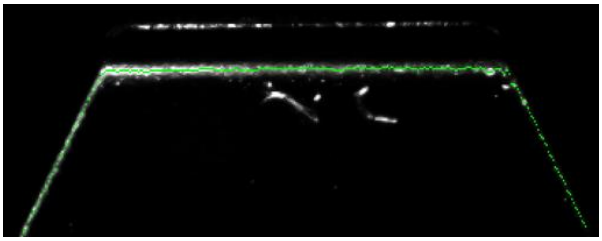
- The long/short frame fusion exposure mode can reduce image interference from overexposed pixels.
- Under the multiple exposure mode, for DP2000 series device, you can configure 2 sets of gain, and for DP3000 series device, you can configure 1 set of gain.

Chapter 9 Algorithm Parameters

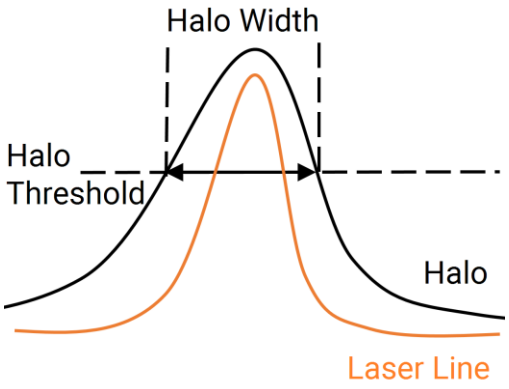
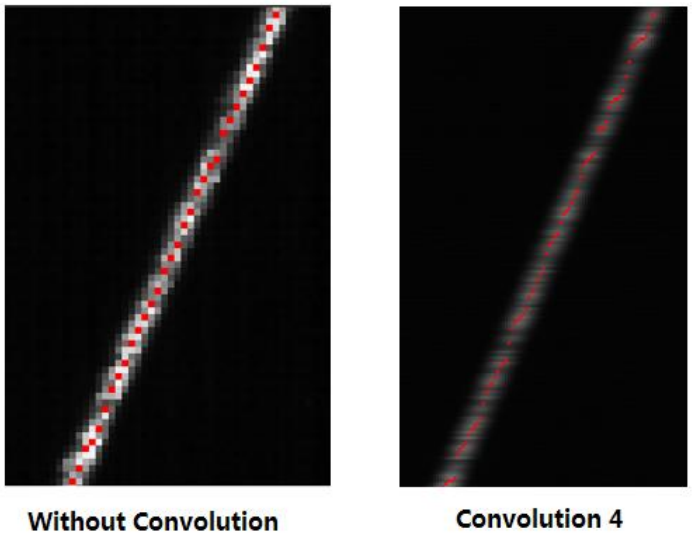
9.1 Set Profile Algorithm Parameters

The device supports setting profile related algorithm parameters. Refer to the table below for details.
Go to **All Feature** → **Algorithm Control** → **Profile Algorithm Control** to set related parameters.

Table 9-1 Profile Algorithm Parameters

Parameters	Description
Profile Type	**Center Point** can be selected currently.  **Figure 9-1 Center Point**
Point Select Mode	If the device extracts multiple laser points from one column in the image, you can select different point modes to extract effective laser points. Point mode includes best, top, bottom, widest, nearest, and farest. ● Best: If multiple laser points are extracted from the same column, select the point with the largest average gray level; if the average gray level is the same, select the point with the largest line width; if the average gray level and line width are the same, select the point with the highest pixel brightness; if the average gray level, line width and the brightest value are the same, then select the top point. The Best is recommended for the general scene. ● Top: When more than one laser point is extracted from the same column, select the top laser point. ● Bottom: When multiple laser points are extracted from the same column, select the bottom laser point. ● Widest: When multiple laser points are extracted from the same column, select the point with the largest line width; if the line widths are the same, the brightest point with the same line width is preferred; if the line widths are the same, and the brightest values of the laser lines are also the same, then select the center

	point of the laser line with the highest average brightness. ● Nearest: Set **Gray Threshold Sub** first. If the average gray level of 2 laser points is higher than the threshold, the closest laser point is preferred; if the average gray level of 1 of the laser points is lower than or equal to the threshold, the brighter one is selected. ● Farest: Set **Gray Threshold Sub** first. If the average gray level of 2 laser points is higher than the threshold, the farthest laser point is preferred; if the average gray level of 1 of the laser points is lower than or equal to the threshold, the brighter one is selected.
Gray Threshold Sub	It should be configured when **Nearest** or **Farest** is selected as **Point Select Mode**.
Algorithm Sensitivity	There are four modes. ● Wide mode: Min. line width: 1 Max. line width: 200 Binary threshold: 10 Gradient threshold: 2 ● Medium mode: Min. line width: 1 Max. line width: 40 Binary threshold: 20 Gradient threshold: 10 ● Narrow mode: Min. line width: 2 Max. line width: 20 Binary threshold: 30 Gradient threshold: 30 ● Custom mode: Set min. line width, max. line width, binary threshold, and gradient threshold manually.
Min. /Max. Line Width	It is valid when the pixel quantity occupied by continuous laser lines in vertical direction is larger than or equal to min. line width and is smaller than or equal to max. line width. If **Custom** is selected as **Algorithm Sensitivity**, you can set the value. It is recommended to set 1 as the min. line width, and the max. value cannot exceed 255.
Binary Threshold	The device only selects the pixel points of laser lines whose gray value is larger than or equal to this parameter. If **Custom** is selected as **Algorithm Sensitivity**, you can set the value. When the overexposure is severe, increasing the value is recommended.
Gradient Threshold	The device will search for laser line pixel points nearby only when the absolute value of the gray gradient is greater than or equal to

	the gradient threshold.
Halo Gray Threshold	It is used for calculate the halo width, which is the number of pixels exceeding halo threshold. If the halo width is greater than the max. laser line width, the laser center point in the halo will be regarded as the noise and will not be extracted.  **Figure 9-2 Halo**
Step Distance	For sensor and system coordinates, it refers to the distance of adjacent frames, and the unit is μm. For rotation coordinates, it refers to the angular spacing of adjacent frames, and the unit is 0.01°.
Row Convolution Template	**Convolution1/2/3/4** can be selected. The larger the value of convolution, the greater the distortion of the laser center point results, and the more severe the laser line edge warping, but the greater the vibration resistance will be.  **Figure 9-3 Row Convolution**
Col Convolution	**Convolution1/2/3/4** can be selected. The larger the value of

Template	convolution, the stronger the filtering effect, and the weaker the device's ability to distinguish laser line adhesion, and the stronger the noise resistance.
Cost Select Point Enable	After the function is enabled, the continuity and integrity of the laser line center point are optimized.
Brightness Calculation Weight	Weight0/1/2/3/4/5 can be selected. The lower the value, the darker and smoother the image is.

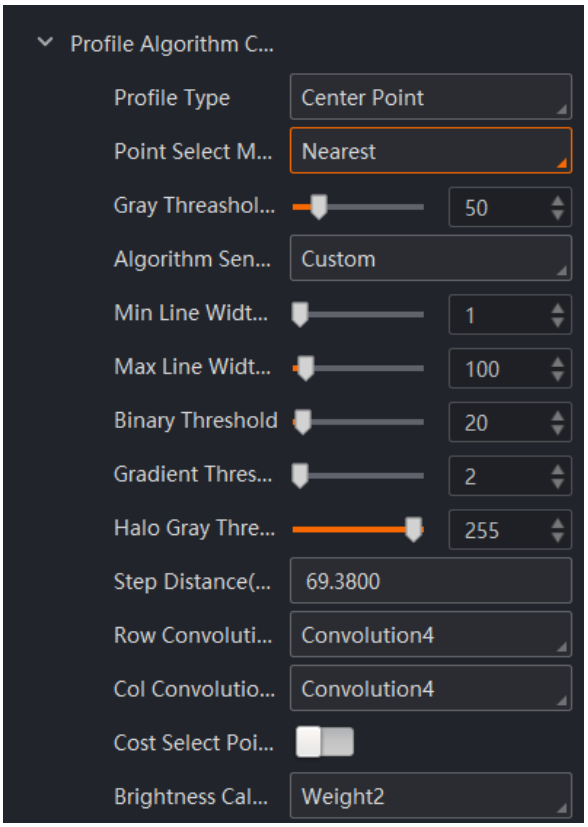


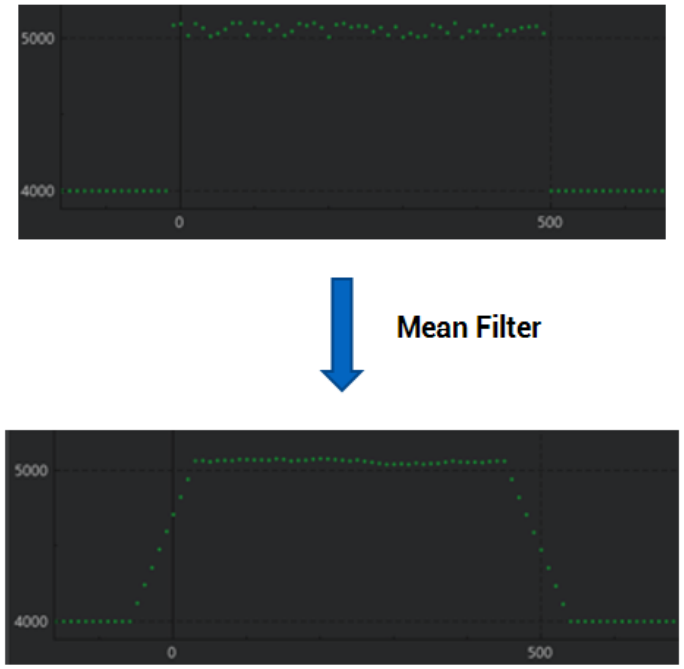
Figure 9-4 Profile Algorithm Parameters

9.1.1 Set Profile Filter

The device supports setting filter window and filtering profile points.

Table 9-2 Profile Filter Parameters

Parameters	Description
Mean Filter Window Size	It is a mean filter window size. 3/5/7/9 point or OFF can be selected.

	 **Figure 9-5 Mean Filter**
Median Filter Window Size	It is a median filter window size. 3/5/7/9 point or OFF can be selected.  **Figure 9-6 Median Filter**
Outliers Filter Window Size	It is an outliers filter window size. 3/5/7/9 point or OFF can be selected.

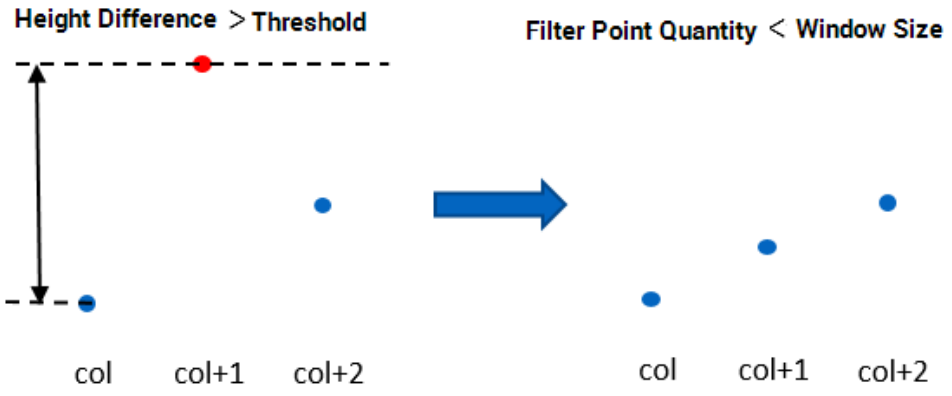


Figure 9-7 Outliers Filter

9.1.2 Set Interpolation and Expansion

The device supports interpolation and expansion for point cloud data to increase repeatability.

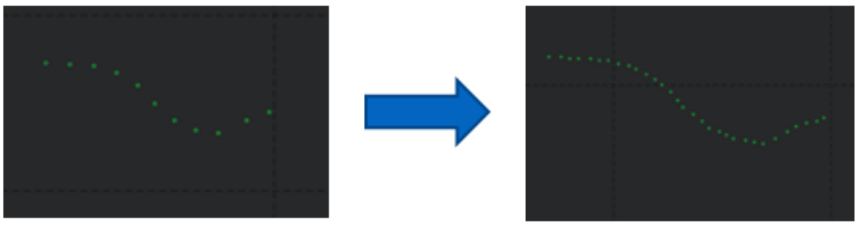


Figure 9-8 Interpolation

Table 9-3 Interpolation and Expansion Parameters

Parameters	Description
X/Y Interp Num	It refers to the number of interpolation points in X/Y direction. 1/2/3 point or OFF can be selected. The set number of points can be inserted evenly. When the frame rate does meet the requirements, it is recommended to execute interpolation in Y direction.
Expand Num	It refers to number of expansion points that supports expanding number of points on the point cloud edge.
Expand Hole Threshold	Expansion of point cloud data may cause the disappearance of the hole characteristics, which will affect the hole measurement. After you set this parameter, the expansion will not be executed for the hole greater than the threshold.

9.1.3 Set Continuity Filtration

The device supports continuity filtration to remove noise.

Table 9-4 Continuity Filtration Parameters

Parameters	Description
Continuity Open Enable	After the function is enabled, the noise will be removed.
Continuity Mode Selector	You can select Aggressive, Moderate, Mild, and Custom. ● Aggressive: Window size: 16 Thick threshold: 3 Height threshold: 1 ● Moderate: Window size: 8 Thick threshold: 3 Height threshold: 2 ● Mild: Window size: 4 Thick threshold: 3 Height threshold: 8 ● Custom: It can segment the laser line by the height difference or line width difference of adjacent points. The laser segments smaller than the window size will be removed.
Continuity Window Size	When **Custom** is selected as **Continuity Mode Selector**, you can set the parameter. It sets the continuous filtering window size. The laser segments smaller than the window size will be removed.
Continuity Thick Threshold	When **Custom** is selected as **Continuity Mode Selector**, you can set the parameter. It sets the continuous filtering thickness threshold. If the line width difference of adjacent laser points is larger than this value, the segmentation will be performed.
Continuity Height Threshold	When **Custom** is selected as **Continuity Mode Selector**, you can set the parameter. It sets the continuous filtering height threshold. If the height difference of adjacent laser points is larger than this value, the segmentation will be performed.

9.1.4 Set Center Data Fill

The device supports center data fill to fill the invalid data.

Table 9-5 Center Data Fill Parameters

Parameters	Description
Invalid Center Data Fill Enable	After this function is enabled, for the invalid data that meet the window and threshold requirements, the data will be filled by connecting the valid laser point lines on both sides.
Invalid Center Data Fill Window Size	It sets the width of the invalid data fill window. The invalid data smaller than this width can be filled.
Invalid Center Data Fill Threshold	It sets the invalid data filling threshold. The invalid data can be filled when the slope of the valid laser lines on both sides is less than this value.

9.1.5 Set Average Gray Calculate Control

The device supports setting two ratios of average gray to improve image brightness.

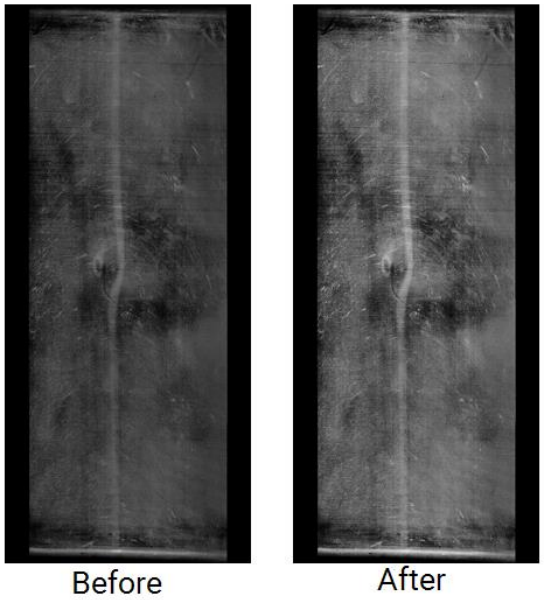


Figure 9-9 Average Gray Calculate Control

The diagram of two ratios of average gray is shown below. The X-axis refers to the original average gray, and the Y-axis refers to two ratios of average gray.

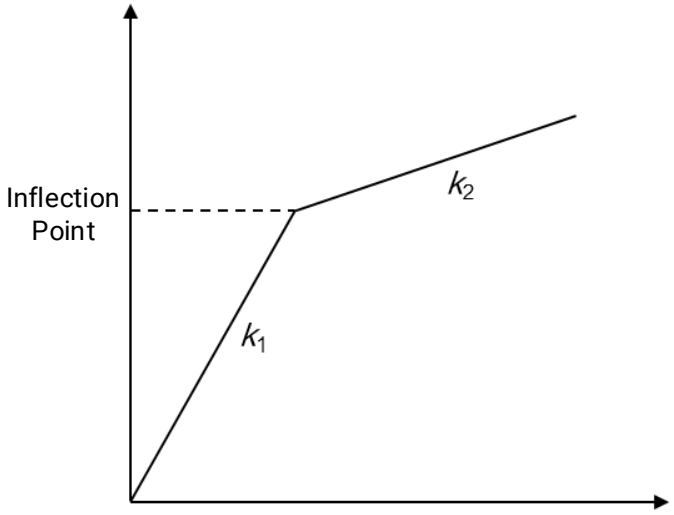


Figure 9-10 Average Gray Calculate Control

Table 9-6 Average Gray Calculate Control Parameters

Parameters	Description
Average Gray Calculate	It refers to the Y-axis of the inflection point of two lines.
Average Gray Main Ratio	It refers to the ratio of the first line (from the original point to the inflection point).
Average Gray Sub Ratio	It refers to the ratio of the second line (from the infection point to the end point).

9.2 Set Depth Image Algorithm Parameters

The device supports setting parameters for outputted depth images. Refer to the table below for details.

Go to **All Feature** → **Algorithm Control** → **Range Image Control** to set related parameters.

Table 9-7 Depth Image Algorithm Parameters

Parameters	Description
Coord 3D Type	It sets the coordinate's three-dimensional type, including sensor coord type, system coord type, and rotation coord type. ● Sensor coord type: It is a coordinate type that is set from the factory. ● System coord type: It is a coordinate type that the line, static, or dynamic calibration are executed for the device. ● Rotation coord type: It is a coordinate type that the rotation calibration is executed for the device. **Note**

	Before system calibration, you need select **Sensor Coord Type** as **Coord 3D Type**.
X Offset	It refers to the deviation in X direction from depth image origin point, and the unit is μm.
Y Offset	It refers to the deviation in Y direction from depth image origin point, and the unit is μm.
Z Offset	It refers to the deviation in Z direction from depth image origin point, and the unit is μm.
X Scale	It refers to the sampling interval in the depth image's X direction, and the unit is μm/pixel.
Y Scale	It refers to the sampling interval in the depth image's Y direction, and the unit is μm/pixel.
Z Scale	It refers to the sampling interval in the depth image's Z direction, and the unit is μm/pixel.
X Range	It refers to the measurement range in the depth image's X direction, and the unit is μm.
Update Measure Range And Scale	After drawing the ROI, you can click **Execute** in here, and the device will automatically calculate and set X/Y/Z offset and X range.
Range Image Height	It sets a depth image's contour quantity, and the unit is pixel.
Output Image Height Type	It selects height output mode for the depth image, including real type and setting type. ● Real type: After trigger is completed, the device outputs depth images based on actual contour quantity. If the actual contour quantity is larger than the range image height, then the device will output according to the range image height. ● Setting type: After trigger is completed, the device outputs depth images based on range image height. If the actual contour quantity is larger than range image height, then the device will output according to the range image height.
Frame Timeout	It sets the device's trigger stopping time. ● If it is 0, the device will wait until next trigger signal. ● If it is not 0 and the device does not receive next trigger signal within configured time, and then trigger is stopped.

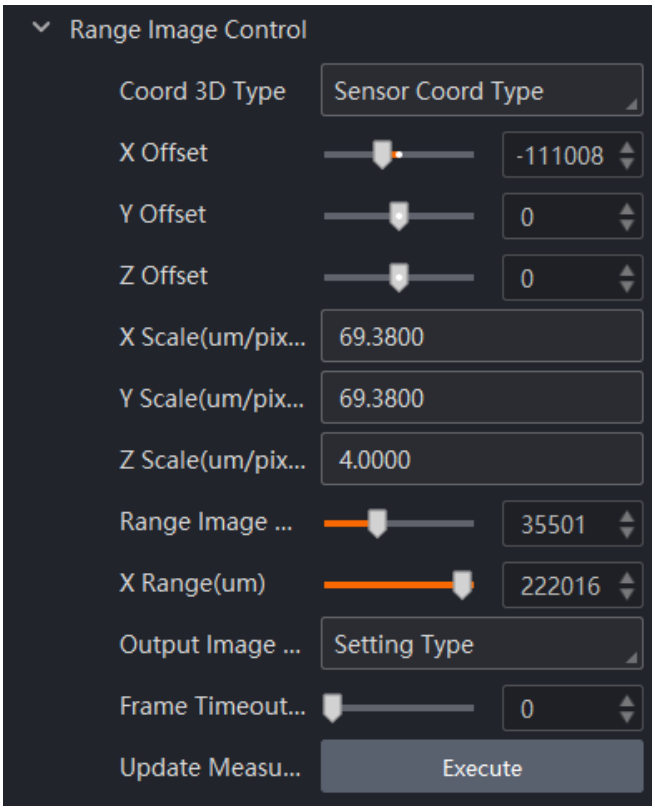


Figure 9-11 Depth Image Algorithm Parameters

Chapter 10 Device Calibration

Errors may occur during the device installation process, which may affect the accuracy of outputted data. These errors can be corrected via system calibration. At the same time, calibrate the scanning direction and speed to get the point cloud data in the system coordinates.

10.1 Preparation

Before performing system calibration, the following preparations should be done.

- Make sure that the contour of laser lines on the measured objects are clearly visible. You can check if the current profile data is correct via the client software.
- Complete the ROI settings, and the horizontal range, min. height and max. height values of measured objects should be within the ROI. At the same time, the ROI should not be too large for the consideration of the device's frame rate. Refer to the section ***Set ROI*** for details.

Note

When performing the dynamic calibration, laser lines on datum plane are not needed. Otherwise, the calibration result may be inaccurate.

10.2 System Calibration

The system calibration can correct the installation deviation and datum plane of the device, and get the three-dimensional data in the system coordinate system.

System calibration is divided into line calibration, static calibration, dynamic calibration, and rotation calibration. For multi-camera scene, dynamic stitching calibration and static stitching calibration are also available. Different calibration methods are suitable for different scenarios.

- **Line calibration** is used to correct the profile and flatten it to Z=0 plane.
- **Static calibration** is applicable for obtaining the surface of the rotating body, that is, the relative position of the device and measured objects is not changed.
- **Dynamic calibration** is applicable for measuring the contour of objects on the linear conveyor belt, that is, the relative position of the device and measured objects is changed.
- **Rotation calibration** is applicable for rotating platform and other motion systems, such as turntable inspection scenes. It can correct the image distortion caused by the inconsistency of the line speed of the object at different positions on the turntable, and further correct the error in the direction of rotation on the basis of static calibration.
- **Dynamic stitching calibration** is used when relative movement exits between the multiple cameras and calibration object, to realize the unification of the coordinate system of multiple cameras based on the physical dimension of the calibration object. Special

calibration object should be used.

- **Static stitching calibration** is used when the contour data of calibration object is obtained by multiple cameras, to realize the unification of the coordinate system of multiple cameras based on the physical dimension of the calibration object. Special calibration object should be used.

Note

- The system calibration has an angle limitation. If the angle is too large, it may result in calibration result error.
- Refer to the ***3DMVS Client Software User Manual*** for details.

Chapter 11 Trigger Input

11.1 Set Trigger Mode

The device supports 4 types of trigger mode, including internal trigger, line trigger, frame trigger, and line trigger + frame trigger. Go to **Scan Control** → **Trigger Control** and set **Trigger Selector** and **Trigger Mode** to select different trigger modes.

Table 11-1 Trigger Mode Description

Trigger Mode	Trigger Selector	Trigger Mode	Description
Internal Trigger	Line Start	Off	The device acquires a frame of original image via internal signals, extracts a piece of valid profile data, and finally stitches multiple profile data to output a depth image.
	Frame Burst Start	Off	
Line Trigger	Line Start	On	The device acquires a frame of original image via external signals, extracts a piece of valid profile data, and finally stitches multiple profile data to output a depth image.
	Frame Burst Start	Off	
Frame Trigger	Line Start	Off	After receiving an external signal, the device starts to acquire images. The device acquires a frame of the original image via internal signals, extracts a piece of valid profile data, and finally stitches multiple profile data to output a depth image.
	Frame Burst Start	On	
Line Trigger + Frame Trigger	Line Start	On	After receiving an external signal, the device starts to acquire images. The device acquires a frame of the original image via external signals, extracts a piece of valid profile data, and finally stitches multiple profile data to output a depth image.
	Frame Burst Start	On	

11.2 Set Trigger Source

Apart from internal trigger, other trigger modes' trigger sources are external signals, and you need to set trigger source. Trigger source includes software, hardware, encoder, and frequency converter. Go to **Scan Control** → **Trigger Control**, and set **Trigger Source** according to actual demands.

Note

- Before selecting specific trigger sources, you should set **Trigger Selector** and **Trigger Mode** first.
- Software is valid for frame trigger only, encoder and frequency converter are valid for line trigger only, and hardware is valid for both frame trigger and line trigger.
- In the trigger mode of line trigger + frame trigger, if same trigger source is selected for line trigger and frame trigger, the device does not generate images. In this condition, you need to select different trigger sources.

Table 11-2 Trigger Source Description

Trigger Source	Corresponding Parameter	Description
Software Trigger	Software	The software sends the trigger signal to the device via GigE interface.
Hardware Trigger	Line 0/3/6	External device connects the device via its I/O interface, and external device sends the trigger signal to the device via this interface.
Encoder Control	Encoder Module Out	The encoder sends the trigger signal to the device.
Frequency Converter	Frequency Converter	The frequency converter sends the trigger signal to the device.

11.2.1 Set Software Trigger

Steps

1. Go to **Scan Control** → **Trigger Control**, and set **Frame Burst Start** as **Trigger Selector**.
2. Set **On** as **Trigger Mode**, and set **Software** as **Trigger Source**.
3. Click **Execute** in **Trigger Software** to send trigger commands to the device.

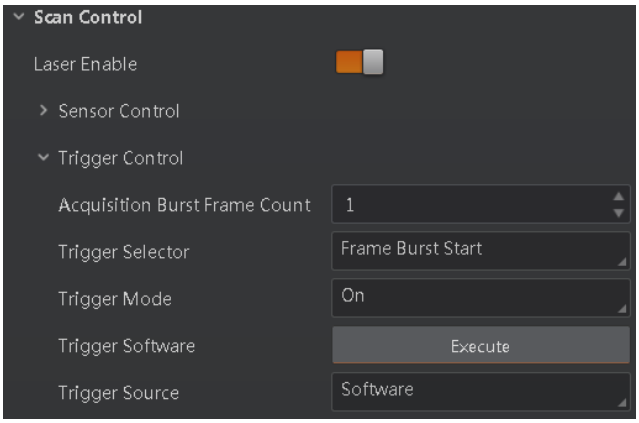


Figure 11-1 Set Software Trigger

Note

You can set **Acquisition Burst Frame Count**, **Trigger Delay**, and **Trigger Duration** for the software. Refer to section ***Set Trigger Related Parameters*** for details.

11.2.2 Set Hardware Trigger

Steps

1. Go to **Scan Control** → **Trigger Control**, and set **Frame Burst Start** or **Line Start** as **Trigger Selector**.
2. Set **On** as **Trigger Mode**, and set **Line 0**, **Line 3** or **Line 6** as **Trigger Source**.

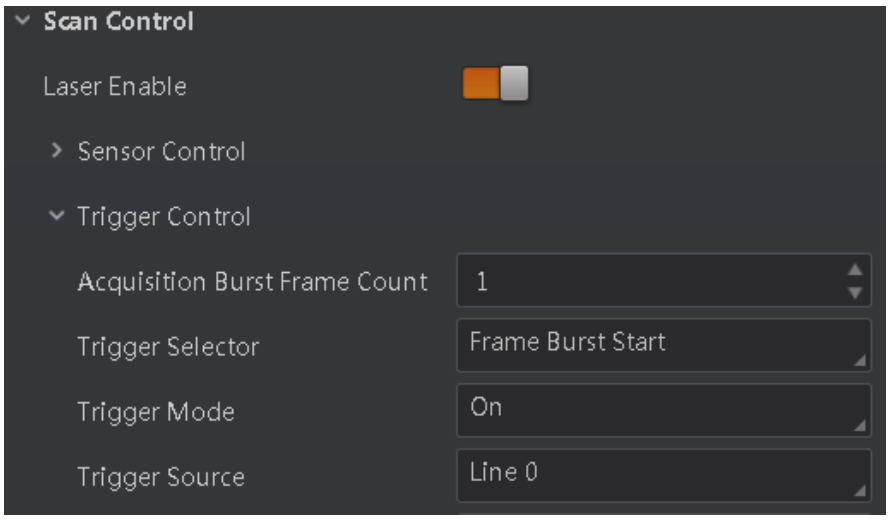


Figure 11-2 Set Hardware Trigger

Note

You can set **Acquisition Burst Frame Count**, **Trigger Activation**, **Trigger Delay**, **Trigger Duration**, and **Trigger Debouncer** for the hardware. Refer to section ***Set Trigger Related Parameters*** for details.

11.2.3 Set Frequency Converter Control

Note

You need to consider the device's scan frequency when setting related parameters of the frequency converter in case the final trigger signal exceeds the device's max. scan frequency.

The device supports using the frequency converter module as the trigger source when **Line Start** is selected as **Trigger Selector**.

In this condition, the hardware trigger signal or shaft encoding control signal frequency can be converted into the frame trigger or line trigger signal frequency required by the device via the frequency converter module, thus triggering the device.
The frequency converter module includes a pre-divider, a multiplier and a post-divider, which all act on the input signal in turn.

- Pre-divider: The input signal first enters the pre-divider module, which reduces source signal frequency via integer division, and then the signal is sent to the Multiplier module. The pre-divider module reduces periodic jitter on the input signal, and signals above 100 kHz must go through this module to reduce the frequency for the multiplier can only receive signals in the range of 10 kHz to 100 kHz frequency range.
- After the signal is processed by the pre-divider, it is sent to the multiplier. The multiplier multiplies the signal by an integer to increase its signal frequency, and then the signal is sent to the post-divider.
- Post-divider reduces signal frequency via an integer factor, and uses the newly generated frequency signal as the device's trigger signal.

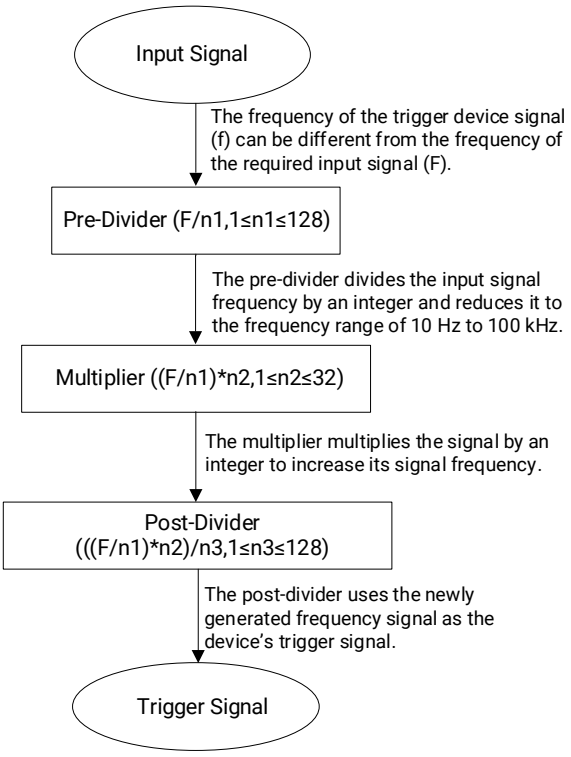


Figure 11-3 Frequency Converter Process

Steps

1. Go to **Scan Control** → **Trigger Control**, and set **Line Start** as **Trigger Selector**.
2. Set **On** as **Trigger Mode**, and set **Frequency Converter** as **Trigger Source**.
3. Set **Line 0**, **Line 3**, **Line 6** or **Encoder Module Out** as **Input Source**, and set **Rising Edge** or **Falling Edge** as **Signal Alignment**.
4. Set **PreDivider**, **Multiplier** and **PostDivider** according to actual demands.

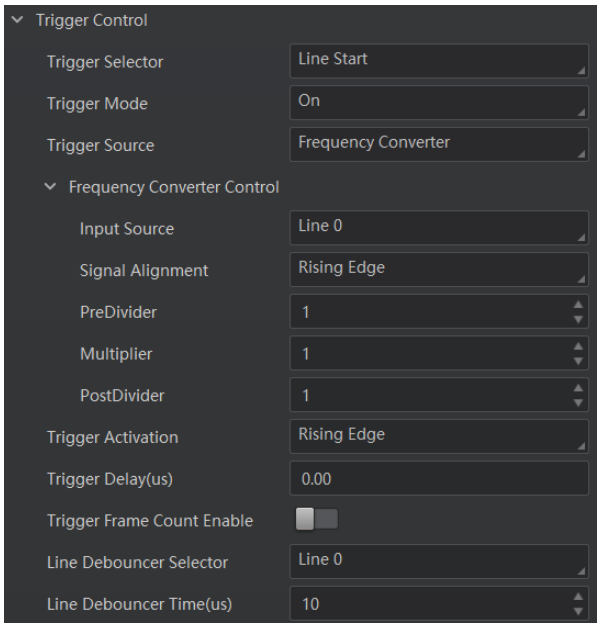


Figure 11-4 Set Frequency Converter Control

Note

You can set **Acquisition Burst Frame Count**, **Trigger Activation**, **Trigger Delay**, and **Trigger Debouncer** for the frequency converter. Refer to section ***Set Trigger Related Parameters*** for details.

11.2.4 Set Encoder Control

The device supports using the encoder as the trigger source when **Line Start** is selected as **Trigger Selector**. After processed by the encoder, the device receives the line trigger signal converted from signal A and signal B with phase difference. The encoder logics is shown below.

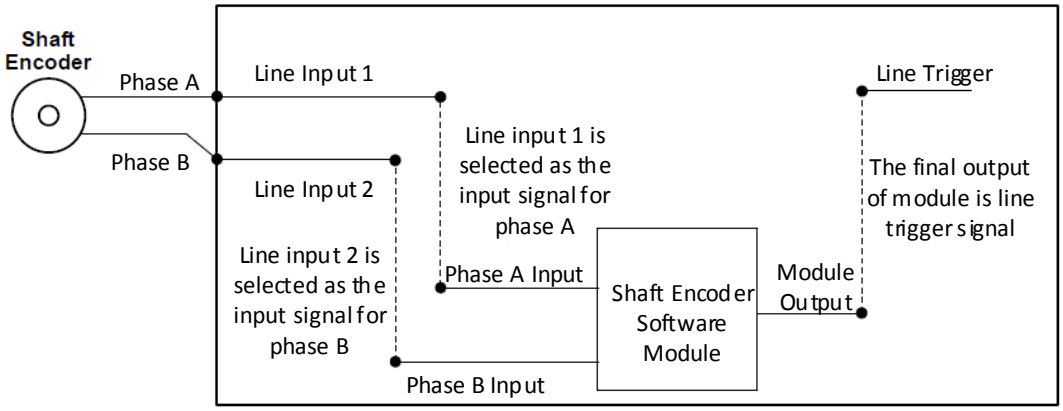


Figure 11-5 Encoder Logics

Steps

1. Go to **Scan Control** → **Trigger Control**, and set **Line Start** as **Trigger Selector**.
2. Set **On** as **Trigger Mode**, and set **Frequency Converter** as **Trigger Source**.
3. Set **Encoder Module Out** as **Input Source**.
4. Set **Encoder Source A** and **Encoder Source B**.

Note

It is recommended to select **Line 3** and **Line 6** for source A and source B respectively.

5. Set **Encoder Trigger Mode**.
- **Any Direction** means that both forward and backward direction will trigger.
- **Forward Only** mean that only forward direction will trigger.
- **Backward Only** mean that only backward direction will trigger.

6. Set **Encoder Counter Mode**.
- **Ignore Direction** means that both forward and backward direction will count.
- **Follow Direction** means that the forward direction is valid, and **Encode Counter** will increase.
- **Backward Direction** means that the backward direction is valid, and **Encode Counter** will increase.

7. (Optional) Set max. counter value in **Encoder Counter Max**.

Note

- The range of **Encoder Counter Max.** may differ by device models.
- After reaching the max. value, it will be cleared automatically or you can clear manually by clicking **Encoder Counter Reset**.

8. (Optional) Set E**ncoder Max Reverse Counter** to avoid outputting images if the object moves backward accidently during measurement, and click **Execute** in **Encoder Reverse Counter Reset** to let the device to output images again.

Note

It is recommended to select the default settings for **Encoder Counter Mode**, **Encoder Counter Mode**, and E**ncoder Max Reverse Counter**.

11.3 Set Trigger Related Parameters

When line trigger or frame rigger is enabled, you can set burst frame count, trigger activation, trigger delay, trigger duration, and trigger debouncer. Available parameters may differ by trigger sources and trigger modes. Refer to tables below for details.

- When the frame trigger is enabled, trigger sources and supported trigger parameters are shown below.

Table 11-3 Frame Triger Sources and Related Parameters

Trigger Source / Parameter	Software Trigger	Hardware Trigger
Acquisition Burst Frame Count	√	√
Trigger Activation	×	√
Trigger Delay	√	√
Trigger Duration	√	√
Trigger Debouncer	×	√

- When the line trigger is enabled, trigger sources and supported trigger parameters are shown below.

Table 11-4 Line Triger Sources and Related Parameters

Trigger Source / Parameter	Hardware Trigger	Frequency Converter Control
Trigger Activation	√	√
Trigger Delay	√	√
Trigger Debouncer	√	×

11.3.1 Set Acquisition Burst Frame Count

When the frame trigger is enabled, setting the device's burst frame count is available. Go to **Scan Control** → **Trigger Control**, and set **Acquisition Burst Frame Count** according to actual demands.

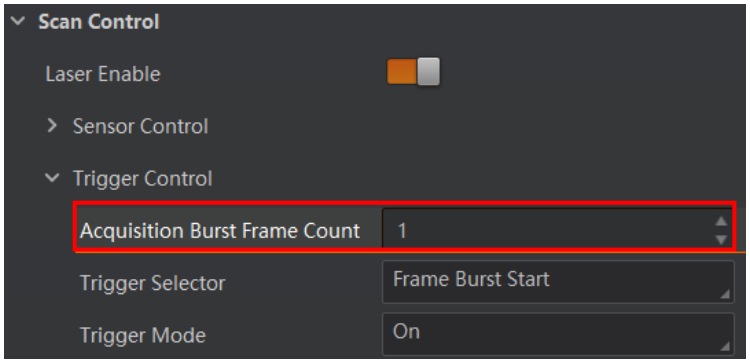


Figure 11-6 Set Burst Frame Count

When **Acquisition Burst Frame Count** is 1, it is in single frame trigger mode. When **Acquisition Burst Frame Count** is larger than 1, it is in multi-frame trigger mode. If **Acquisition Burst Frame Count** is n and when inputting one trigger signal, the device stops acquiring after outputting n frame images. The sequence diagram of burst frame count is

shown below.

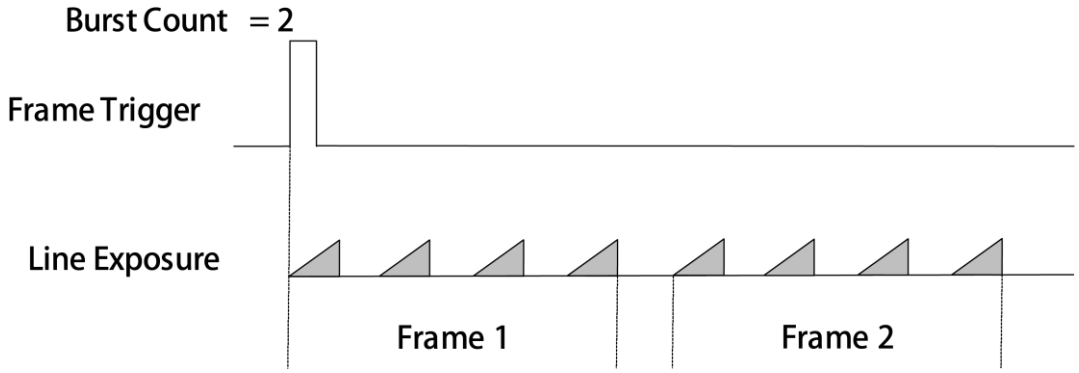


Figure 11-7 Sequence Diagram of Burst Frame Count

Note

The sequence diagram above use the rising edge as trigger activation and the device's contour quantity is 4.

11.3.2 Set Trigger Activation

The device supports trigger in the rising edge, falling edge, level high, or level low of the external signal. The principle and parameter of trigger activation are shown below.

Table 11-5 Trigger Activation Principle

Trigger Activation	Description
Rising Edge	When the level signal given by external device is on rising edge, the device receives the signal and triggers.
Falling Edge	When the level signal given by external device is on falling edge, the device receives the signal and triggers.
Level High	When the level signal given by external device is on level high, the device is acquiring images.
Level Low	When the level signal given by external device is on level low, the device is acquiring images.

Go to **Scan Control** → **Trigger Control**, and set **Rising Edge**, **Falling Edge**, **Level High** or **Level Low** as **Trigger Activation** according to actual demands.

Note

Rising edge and falling edge are available in frame trigger mode or line trigger mode, and you can also set the trigger delay. Level high and level low are only available in frame trigger mode, and you cannot set the trigger delay.

11.3.3 Set Trigger Delay

You can set trigger delay from device receiving trigger signal to device responding. Its sequence diagram is shown below.

Note

The sequence diagram below uses the rising edge as trigger activation.

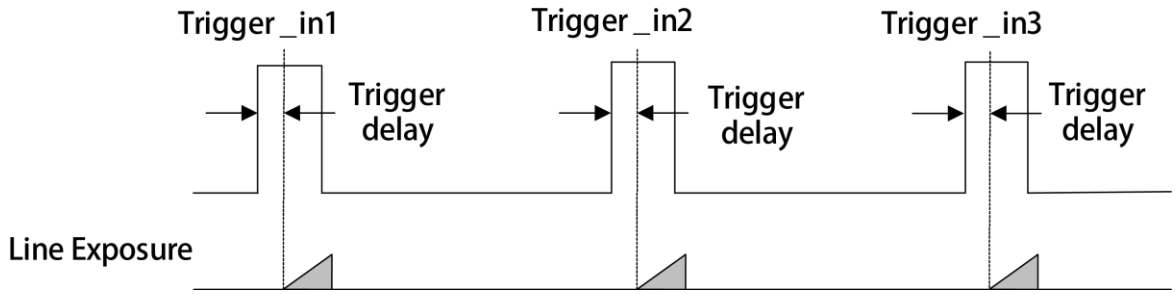


Figure 11-8 Sequence Diagram of Trigger Delay

Go to **Scan Control** → **Trigger Control**, and set **Trigger Delay** according to actual demands.

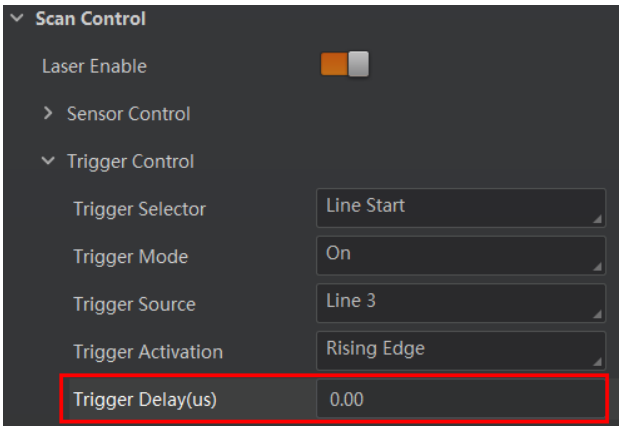


Figure 11-9 Set Trigger Delay

11.3.4 Set Trigger Duration

You can set the duration of the trigger signal in **Trigger Duration** (unit: μs).
For edge trigger, the device will continue to generate images in the set time period after a trigger signal (rising edge or falling edge) is received.
For level trigger, the device will continue to generate images in the set time period after the level duration has expired.

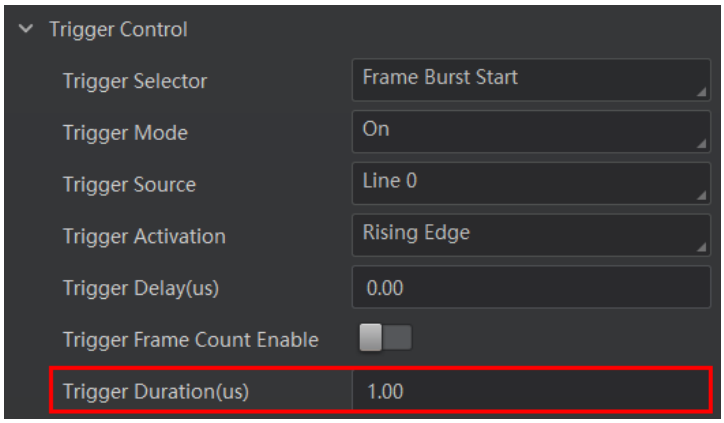


Figure 11-10 Set Trigger Duration

11.3.5 Set Trigger Debouncer

When the device receives hardware trigger signals, signal bounce may occur and cause false trigger. Thus, it is necessary to debounce trigger signals.
Go to **Scan Control** → **Trigger Control**, select **Line 0**, **Line 3** or **Line 6** as **Line Debouncer Selector**, and set **Line Debouncer Time** according to actual demands.

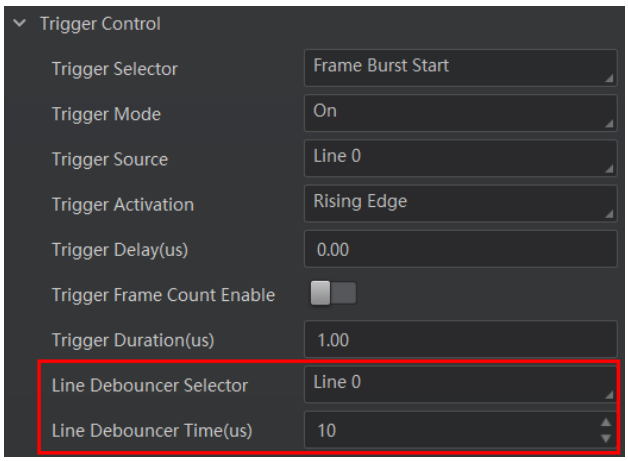


Figure 11-11 Set Trigger Debouncer

If the configured **Line Debouncer Time** is larger than the time of trigger signal, the trigger signal will be ignored. The sequence diagram of trigger debouncer is shown below.

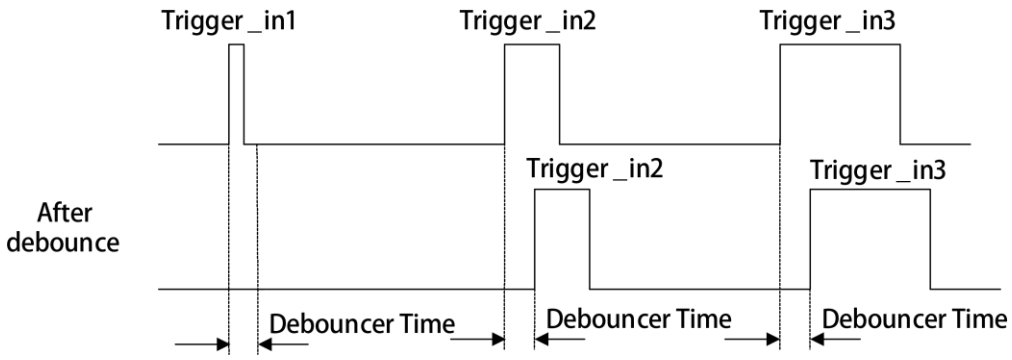


Figure 11-12 Sequence Diagram of Trigger Debouncer

Note

The sequence diagram above uses the rising edge as trigger activation.

Chapter 12 I/O Electrical Feature

12.1 Differential Input Circuit

The device's Line 0/3/6 are differential input signals that support single-ended input. The internal circuit of Line 0/3/6 is shown below.

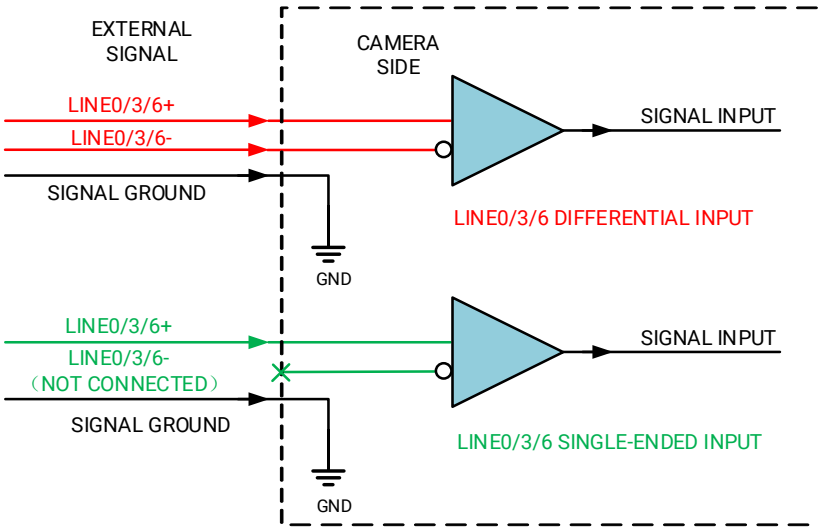


Figure 12-1 Differential Input Circuit

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

● RS-422 Standard Input

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

RS-422 standard defines the connection of the bus structure, and the inputs of several devices can be connected to the RS-422.

Up to 10 devices can be connected at the same time, of which only one device is the main dispenser and other devices are receivers. The circuit length between the receiver and the bus should be as short as possible. The bus must have a 120 Ω terminal resistance.

When the device is the last receiver on the bus structure, the device's terminal resistance needs to be enabled, and the rest devices' terminal resistance need to be disabled. Multiple terminal resistance should not be enabled on the bus structure, which will reduce signal reliability and may cause damage to the RS-422 device.

● TTL & LVTTL Standard Input

If the differential input adopts TTL & LVTTL standard signal, the input terminal's 120 Ω terminal resistance must be disabled, and its input electrical feature requirement is shown below.

Table 12-1 Electrical Feature Requirements

Voltage Range	Definition
0 V to 1.1 V	Level low
3.2 V to 5 V	The voltage is not stable, and it is recommended not to use.
5 V to 24 V	Level high

12.2 Differential Output Circuit

The device's Line 1 is differential output signal, and its internal circuit is shown below.

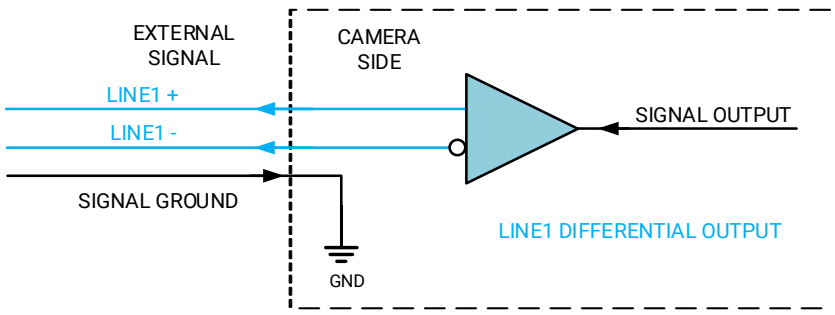


Figure 12-2 Differential Output Circuit

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

12.3 Wire Device

The device can be connected to an encoder via differential input signals to trigger and acquire images. The device's Line 0/3/6 can receive differential signals or single-ended signals.

Note

When there is a large amount of interference in the field and the IO signal interference occurs, it is necessary to perform signal grounding of the idle signals.

12.3.1 Differential Signal

The electrical feature and wiring of the differential signal are shown below.

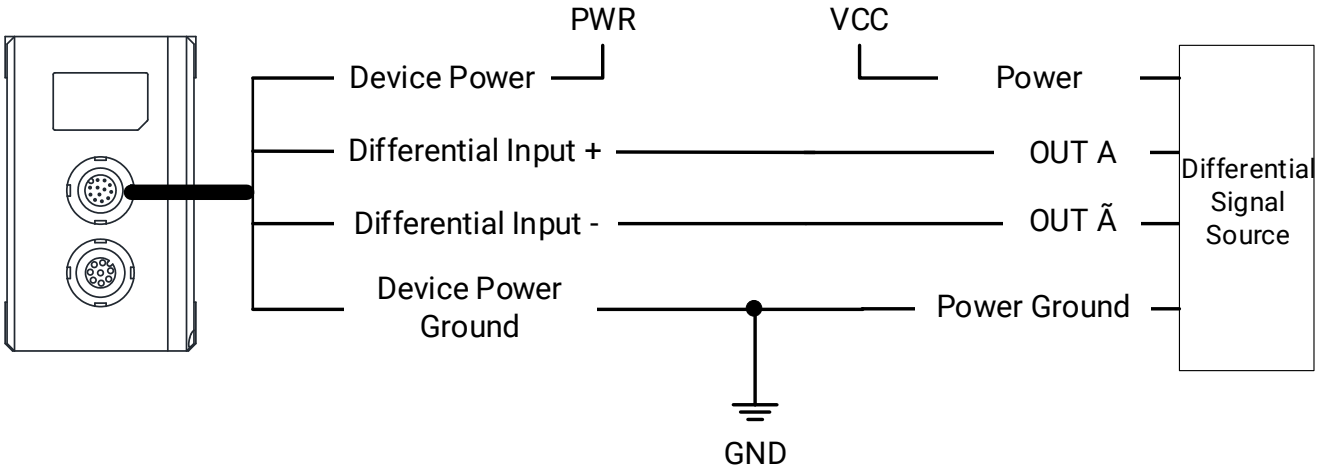


Figure 12-3 Differential Signal Source

Table 12-2 Electrical Feature of Differential Signal

Parameter Name	Description
Max. Voltage	13 V
Level Threshold	Low level: < 0.2 V High level: > 0.2 V

12.3.2 Single-Ended Signal

The electrical feature and wiring of the single-ended signal are shown below.

Table 12-3 Electrical Feature of Single-End Signal

Parameter Name	Description
Max. Voltage	30 V
Level Threshold	Low level: < 1.3 V High level: > 1.7 V

If PNP single-ended signal source provides the differential input signal, and differential input signal is used as single-ended input, its wiring is shown below. The VCC of PNP type single-ended signal source is 5 VDC, 12 VDC, or 24 VDC.

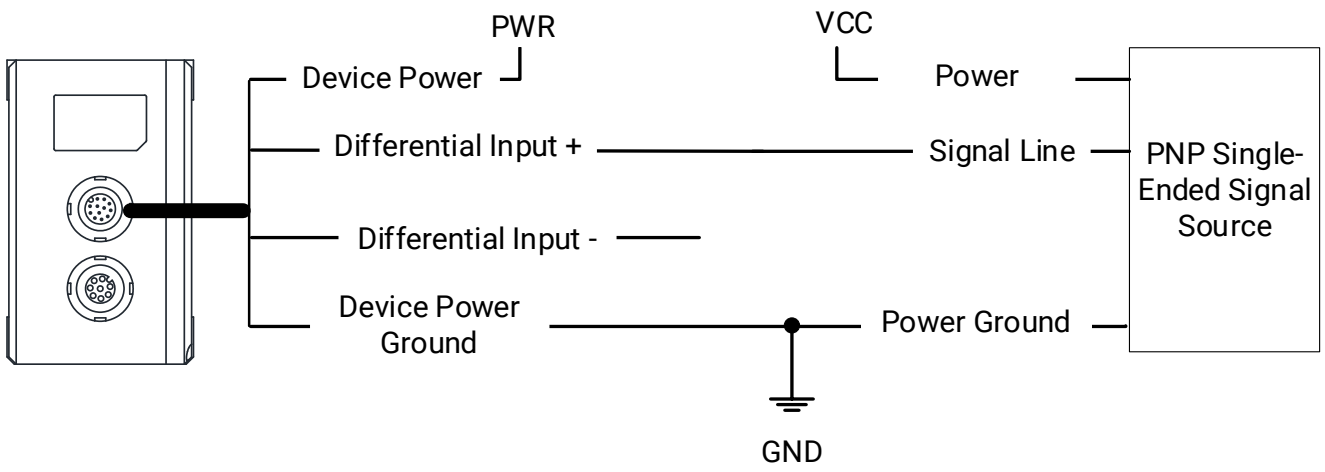


Figure 12-4 PNP Single-Ended Signal

If NPN single-ended signal source provides the differential input signal, and differential input signal is used as single-ended input, its wiring is shown below. The VCC of NPN type single-ended signal source is 5 VDC, 12 VDC, or 24 VDC.

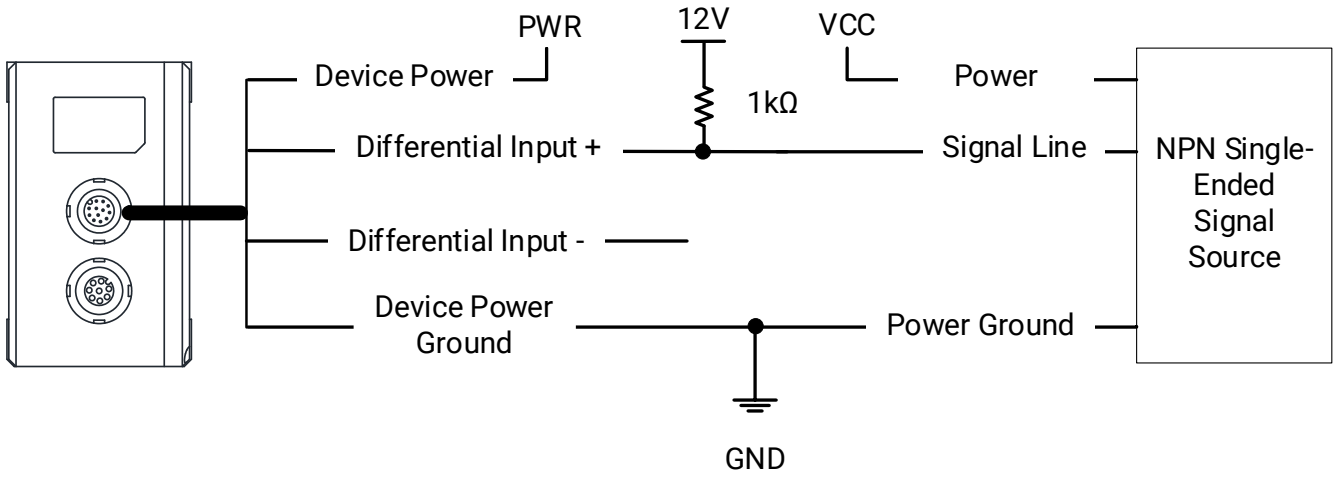


Figure 12-5 NPN Single-Ended Signal

Note

For single-ended signal, the Differential Input - of the device should be suspended, and it is recommended that the suspended wire should be closed with an insulating cap.

Chapter 13 Other Functions

13.1 User Set Customization

The device supports 4 sets of parameters, including 1 default set and 3 user sets. The relation among 4 sets of parameters is shown below.

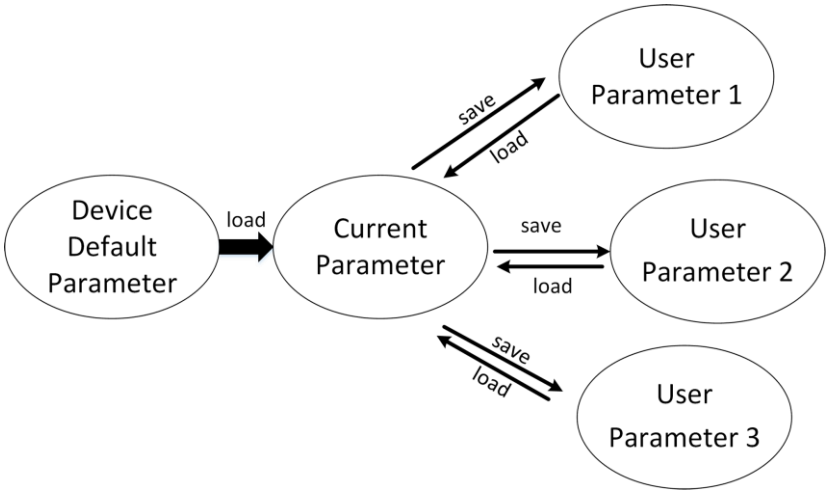


Figure 13-1 Parameter Relation

You can save parameters, load parameters and set user default as shown below.

- **Save Parameters**

Steps

1. Go to **User Set Control**, and select a user set in **User Set Selector**. Here we take selecting **User Set 1** as an example.
2. Click **Execute** in **User Set Save** to save parameters.

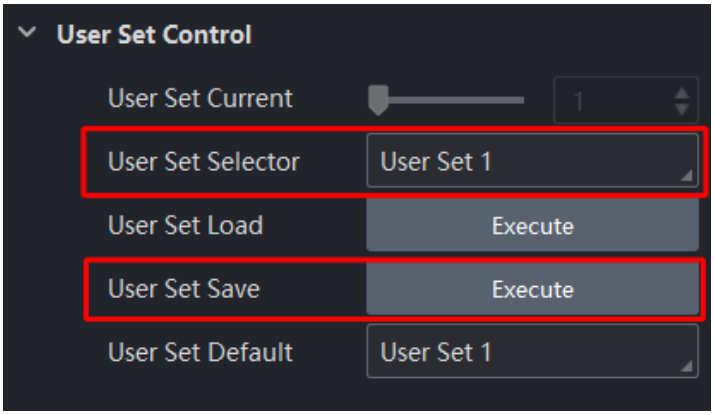


Figure 13-2 Save User Set

- **Load Parameters**

Steps

1. Go to **User Set Control**, and select a user set in **User Set Selector**. Here we take selecting **User Set 1** as an example.
2. Click **Execute** in **User Set Load** to load parameters to the device.

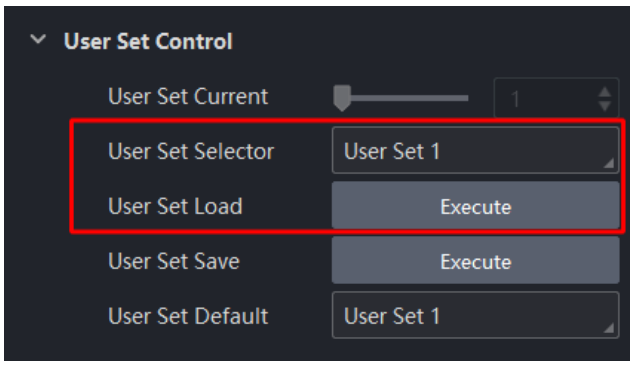


Figure 13-3 Load User Set

Note

Loading parameters is available when connecting with the device but without acquisition.

- **Set User Default**

You can also set default parameter by selecting parameter from drop-down list of **User Set Default**, as shown below.

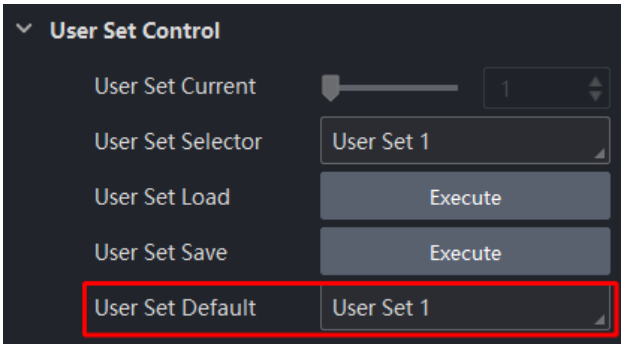


Figure 13-4 Set User Default

13.2 Update Firmware

The device supports updating the firmware via the client software.

Note

- Use the firmware package of the corresponding device model for updating.
- Do not disconnect the device with PC during updating.
- The device will reboot automatically after updating.

Steps

1. Run the client software, and click **Device Manger** on the control toolbar to open the device list window.
2. Select the device that needs to be updated.

Note

Make sure that the device that needs to be updated is in available status.

3. Click **Upgrade** to open the updating window.

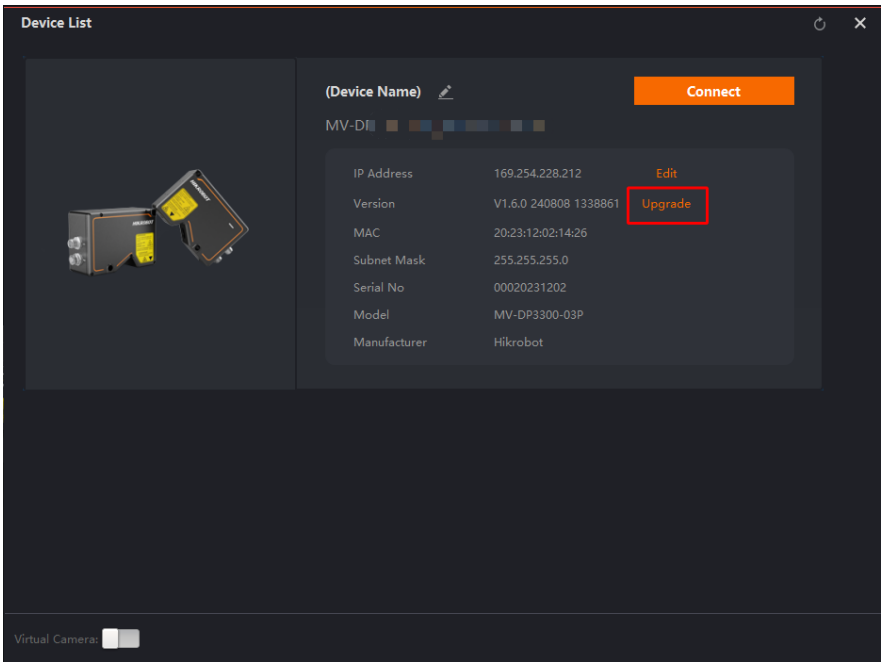


Figure 13-5 Device List Window

4. Click to select the firmware file (dav format), and click **Upgrade** to update the firmware.

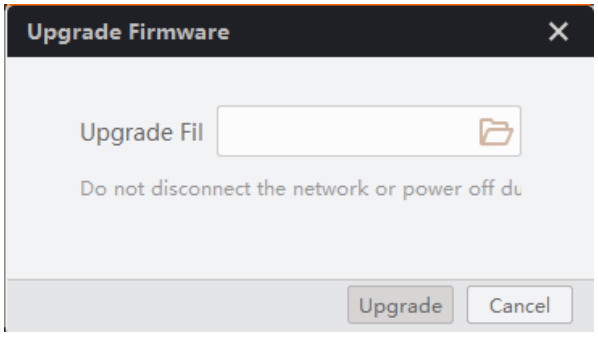


Figure 13-6 Update Firmware

13.3 Chunk Function

The device can embed image information into image data via the chunk function. The supported embedded information includes image, frame counter, line point number, line number, intensity, thickness, first frame ID, laser point, trigger end, image timestamp, and exposure timestamp. Refer to the table below for details.

Table 13-1 Chunk Information Description

Embedded Information	Definition	Byte	Status	Data Format
Image	Image data information	Vary according to actual quantity	Enabled always	Origin image / point cloud data
Frame Counter	Frame counting result	4	Disable by default	32-bit integer without symbols
Line Point Num	Contour points in one line	4	Enabled in point cloud data Enabled in depth data when **Chunk Mode Active** is enabled	32-bit integer without symbols
Line Num	Contour quantity	4	Enabled in point cloud data Enabled in depth data when **Chunk Mode Active** is enabled	32-bit integer without symbols
Intensity	Contour brightness	Vary according to actual contour quantity	Enabled in point cloud data Enabled in depth data when **Chunk Mode Active** is enabled	Line Num * Line Point Num
Thickness	Laser line width	Vary according to actual contour quantity	Enabled in origin image	Line Num * Line Point Num

Embedded Information	Definition	Byte	Status	Data Format
First Frame ID	First frame ID of contour data	4	Enabled in point cloud data Enabled in depth data when **Chunk Mode Active** is enabled	32-bit integer without symbols
Laser Point	Laser center point	Vary according to actual image width	Enabled in origin image	Image width *2*4 (X/Y each 4-byte)
Trigger End	Trigger end signal	4	Enabled in point cloud data Enabled in depth data when **Chunk Mode Active** is enabled	32-bit integer without symbols
Image Timestamp	Origin image timestamp	8	Enabled in origin image Disabled in point cloud data and depth data	8-bit number without symbols
Expo Timestamp	Contour data timestamp	64 * Contour quantity	Disabled in origin image Manually enable or disable in point cloud data and depth data	64 * Line Num

Steps

1. Go to **Scan Control** → **Chunk Data Control**, and set **Chunk Selector** according to actual demands.
2. Enable **Chunk Enable**.

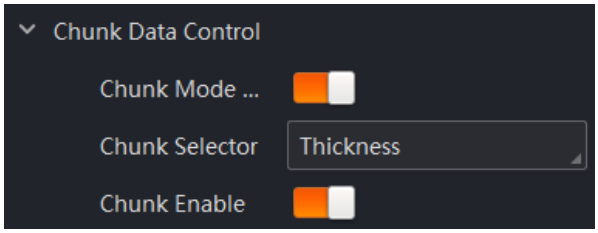


Figure 13-7 Chunk Function

3. Repeat steps above if multiple embedded information need to embed.

13.4 File Access Control

The file access function can import or export the device's calibration files and save them in mfa format. The device's calibration files include user set file, sensor calibration file (LSL Sensor Calibrate LUT), system calibration file (LSL System Calibrate), external dependency file (Device Extend Config), device encryption file (Device Enc File), license notice (Opensource Notice, exporting only), and mapping file (Feature Language Map).

Steps

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

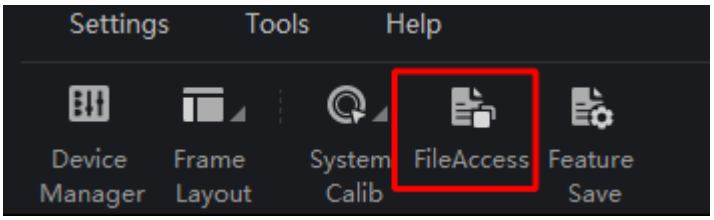


Figure 13-8 File Access

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

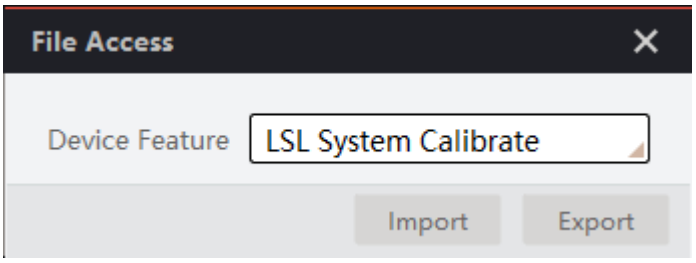


Figure 13-9 Import or Export

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

13.5 Device Control

Note

The specific device control parameters may differ by device models.

In the **Device Control** attribute, you can view device information, edit device name, reset device, etc. Most of parameters can be read only. The specific parameters that can be read and written in **Device Control** attribute are shown below.

Table 13-2 Parameter Description

Parameters	Read/Write	Description
Device User ID	Read and write	It refers to the device name and is empty by default. You can set according to your preference. ● If device user ID is empty, the client software displays the device model. ● If you set it, the client software displays the user ID you set.
Device Link Heartbeat Mode	Read and write	It enables heartbeat mode or not. It is recommended to enable it. After the function is enabled, if there is no communication and heartbeat time exceeds, it will be regarded as device lost.
Device Stream Channel Packet Size (B)	Read and write	Set the packet size of streaming data of receiving.
Device Reset	Read and write	Click **Execute** to reset the device.
Device Temperature Selector	Read and write	You can select device component to view its temperature. Currently, mainboard and sensor can be selected.

13.6 Transport Layer Control

The device's transport layer control attribute allows you to view and set parameters related with transport layer. Refer to the table below for specific parameters.

Table 13-3 Parameter Description

Parameters	Read/Write	Description
Payload Size (B)	Read only	It is the device's load size.
GEV MAC Address	Read only	It is the MAC address of the network interface.
GEV Current IP Configuration LLA	Read only	It indicates whether the Link Local Address IP configuration scheme is activated on the given network interface.
GEV Current IP Configuration DHCP	Read and write	It indicates whether the DHCP IP configuration scheme is activated on the given network interface.

GEV Current IP Configuration Persistent IP	Read and write	It indicates whether persistent IP configuration scheme is activated on the given network interface.
DEV PAUSE Frame Reception	Read and write	It controls whether incoming pause frames are handled on the given logical link.
GEV Current IP Address	Read only	It is the current IP address for the given network interface.
GEV Current Subnet Mask	Read only	It is the current subnet mask of the given interface.
GEV Current Default Gateway	Read only	It is the default gateway IP address to be used on the given network interface.
GEV Number Of Interfaces	Read only	It indicates the number of physical network interfaces supported by this device.
GEV Persistent IP Address	Read and write	It indicates the persistent IP address for this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Persistent Subnet Mask	Read and write	It indicates the persistent subnet mask associated with the persistent IP address on this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Persistent Default Gateway	Read and write	It indicates the persistent default gateway for this network interface. It is only used when the device boots with the persistent IP configuration scheme.
GEV Link Speed	Read only	It indicates the speed of transmission negotiated by the given network interface in Mbps.
GEV Stream Channel Count	Read only	It indicates the number of stream channels supported by this device.
GEV Heartbeat Timeout (ms)	Read and write	It indicates the current heartbeat timeout in milliseconds.
GEV Heartbeat Disable	Read and write	It disables the GEV Heartbeat.
GEV SCPS Packet Size (B)	Read and write	It specifies the stream packet size (in bytes) to send on this channel.
GEV SCPD	Read and write	It indicates the delay (in timestamp counter units) to insert between each packet for this stream channel.

Chapter 14 FAQ (Frequently Asked Question)

14.1 Why there is no device listed after I run the client software?

Problem

Run 3DMVS client software, there is no listed device.

Reason

- The device is powered off.
- Network exception.

Solution

- Check the device power connection to make sure the device is powered up normally.
- Check the network connection to make sure the device can be connected to the network normally. PC and the device are in the same network segment.

14.2 Why the image is very dark?

Problem

All black or too dark during preview.

Reason

- The laser is not enabled.
- Too small value of the exposure and gain.

Solution

- Enable the laser.
- Increase the exposure and gain properly.

14.3 Why the image quality is very poor during the live view?

Problem

The image quality is very poor during the live view.

Reason

- The network may be Fast Ethernet.
- Packet loss occurs.

Solution

- Check if the network transmission speed is 1 Gbps or not.
- Go to **Settings** → **Resend Packet** in the menu bar of the client software, enable **Resend Packet**, and increase **Max. Packet Resending Percent** and **Timeout Period** properly.

14.4 Why the image is black and without the laser line in origin image mode?

Problem

The image is black and there is no laser line in the origin image mode.

Reason

The position of the laser line exceeds the field of view.

Solution

Adjust the height between the device and measured object, and make sure that the object is within the measurement range.

14.5 Why fail to save images or single frame point cloud?

Problem

Saving images or single frame point cloud failed.

Reason

- The client software has no permission to read and write the system disk (C).
- There is no profile data.

Solution

- Run the client software as the administrator.
- Adjust exposure and algorithm parameters.

14.6 Why exception occurs when previewing the point

cloud?

Problem

Exception occurs when previewing the point cloud.

Reason

- The configuration of video card is too low.
- The version of video card driver is too old.

Solution

- Use a discrete video card.
- Update the video card driver.

14.7 Why depth images cannot be obtained during preview?

Problem

Depth images cannot be obtained during its preview.

Reason

- The device has not obtained profile data.
- Improper algorithm parameters for depth images.

Solution

- Adjust exposure and algorithm parameters, and switch to the depth image after you can view contours.
- Adjust X offset and X scale parameters to let the depth image be in the center of the image.

Chapter 15 Revision History

Table 15-1 Revision History

Version	Document No.	Revision Date	Revision Details
V2.1.0	UD40172B	Oct. 28, 2024	● Edit Section 1.4 Laser Precaution ● Edit Chapter 3 Appearance ● Edit Chapter 5 Installation ● Edit Chapter 8 Image Debugging ● Edit Chapter 9 Algorithm Parameters ● Edit Chapter 10 Device Calibration ● Edit Chapter 11 Trigger Input ● Edit Chapter 13 Other Functions

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