CONTRASTECH

Mars Cameralink Area Scan Cameras User Manual

V2.2.0, Feb. 2022

PREFACE

Purpose of This Manual

This Manual is a basic description of Mars Cameralink Area Scan Cameras, which mainly includes the product description, quick installation guide and Simple introduction of SDK(iCentral).This manual may be updated due to product upgrades or other reasons. Please ask your sales engineer for the latest version of the manual if you need it.

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Disclaimer

The information and specifications described in this manual are subject to change without notice.

Latest Manual Version

For the latest version of this manual, see the Download Center on our web site at:
www.contrastech.com.

Technical Support

For technical support, e-mail: support@contrastech.com.

Warranty

To ensure that your warranty remains in force, adhere to the following guidelines:

Do not remove the camera's serial number label
If the label is removed and the serial number can't be read from the camera's registers, the warranty is void.

Do not open the camera housing
Do not open the housing. Touching internal components may damage them.

Prevent ingress or insertion of foreign substances into the camera housing
Prevent liquid, flammable, or metallic substances from entering the camera housing. If operated with any foreign substances inside, the camera may fail or cause a fire.

Avoid electromagnetic fields
Do not operate the camera in the vicinity of strong electromagnetic fields. Avoid electrostatic charging.

Clean with care
Avoid cleaning the sensor if possible.

Handle this camera with care.
Do not abuse the camera. Avoid striking, shaking, etc. The camera could be damaged by improper handling.

Read the manual
Read the manual carefully before using the camera

Contents

CHAPTER 1 Product Description

Product Introduction

Mars series area scan cameras, latest developed by ContrasTech in 2016, are equipped with the most popular data interfaces in the Vision Market: the Gigabit Ethernet interface with 100 meter cable length, the USB 3.0 interface with plug and play capability and Camera Link high-speed transmission interface -- a stable and mature industrial-grade connection bus. All of these interfaces are standardized and offer the option to provide power and data to the camera via one single cable. The cameras also offer separate input/output ports for triggering or flash control.

Mars series area scan CameraLink industrial cameras, which use high-performance photosensitive chips, transmit image data through the CameraLink data interface, and are compatible with any application development tools that meet the CameraLink protocol and GenICam standard, with a maximum theoretical transfer rate of 5.4GB/s It can meet the transmission rate requirements in most industrial applications, and can work stably in various harsh environments. It is an industrial large area scan camera with high reliability and high cost performance. With this variety of sensors and interfaces, combined with the extensive features offered, Mars is a fit for a wide range of vision applications

Product Features

- Camera Link supports Deca, Full, Medium, Base, and can provide a maximum theoretical bandwidth of 5.44G;
- Supports software trigger, external trigger, mixed mode, free run mode and etc.;
- Supports sharpness, noise reduction, gamma correction, LUT, black level correction, brightness, contrast and other ISP functions;
- Supports interpolation algorithm, white balance algorithm, color conversion matrix, hue, saturation and etc. for color camera;
- Supports various output formats for image data and supports ROI, binning, mirror and etc.;
- Conforms to Camera Link protocol and GenICam standard;
- Supports PoCL power supply and DC 12V~24V wide-range power supply for Cameras.

Mechanical Dimensions

The dimensions is in millimeters:

- Fig. 1-1: Mechanical Dimensions (in mm) for Cameras with 29 * 29 * 43.8mm housing (without 6-pin IO).
- Fig. 1-2: Mechanical Dimensions (in mm) for Cameras with 29 * 29 * 43.8mm housing (with 6-pin IO).
- Fig. 1-3: Mechanical Dimensions (in mm) for Cameras with 29 * 44 * 58mm housing (single port).
- Fig. 1-4: Mechanical Dimensions (in mm) for Cameras with 29 * 44 * 58mm housing (dual port).
- Fig. 1-5: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 65mm housing (M58 interface).
- Fig. 1-6: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 54mm housing (M58 interface).
- Fig. 1-7: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 54mm housing (F interface).
- Fig. 1-8: Mechanical Dimensions (in mm) for Cameras with 100 * 100 * 66mm housing (M72 interface).

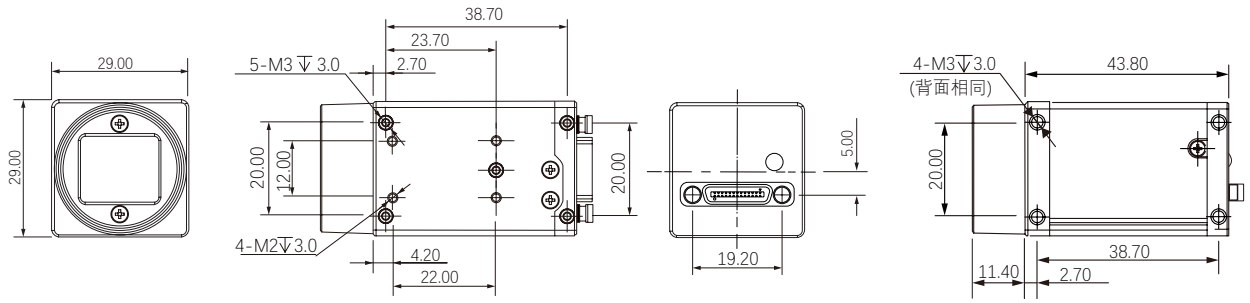


Fig. 1-1: Mechanical Dimensions (in mm) for Cameras with 29 * 29 * 43.8mm housing (without 6-pin IO).

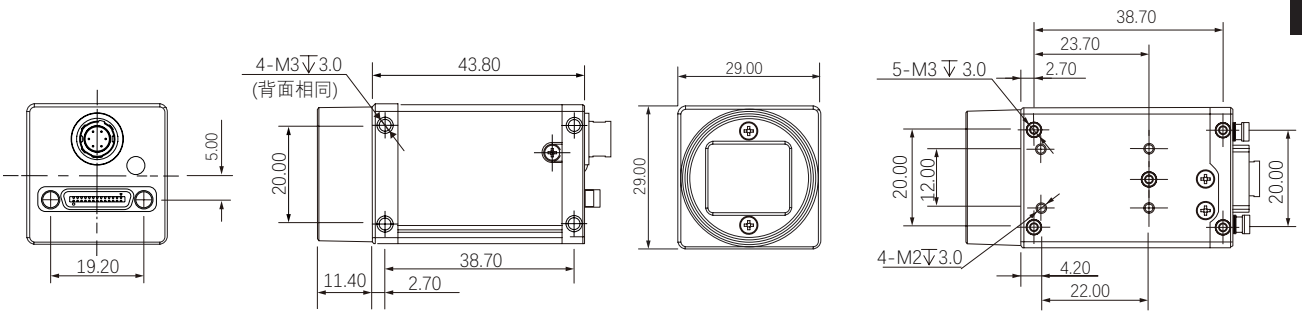


Fig. 1-2: Mechanical Dimensions (in mm) for Cameras with 29 * 29 * 43.8mm housing (with 6-pin IO).

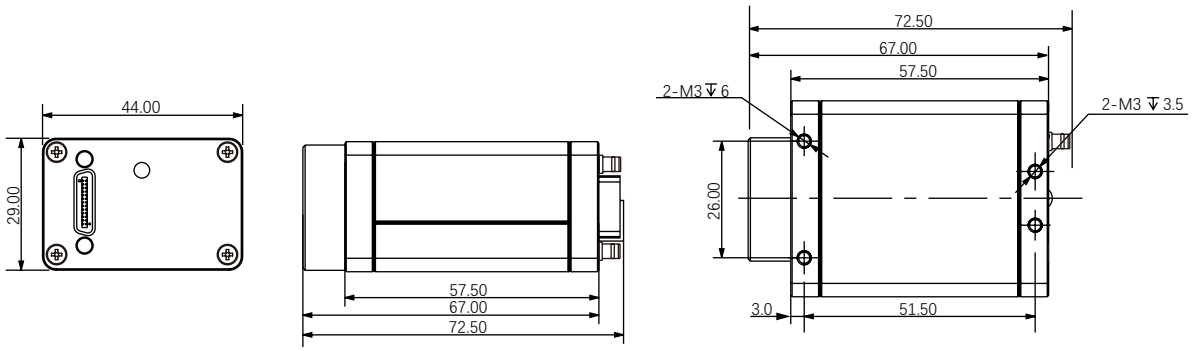


Fig. 1-3: Mechanical Dimensions (in mm) for Cameras with 29 * 44 * 58mm housing (single port).

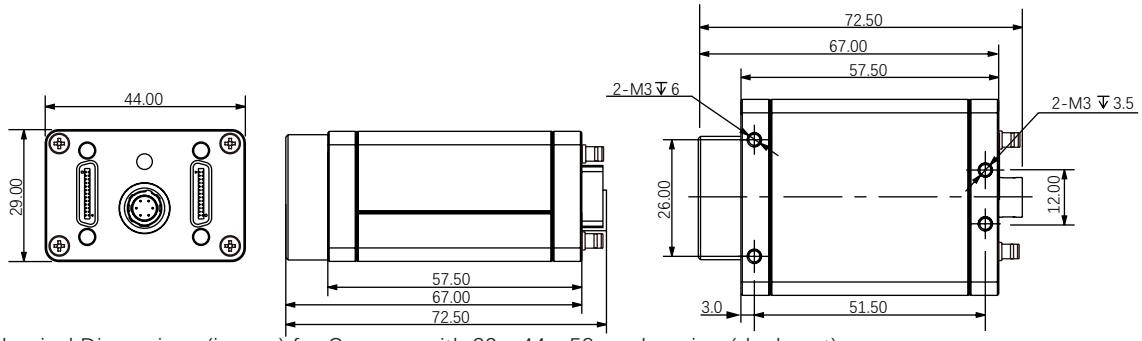


Fig. 1-4: Mechanical Dimensions (in mm) for Cameras with 29 * 44 * 58mm housing (dual port).

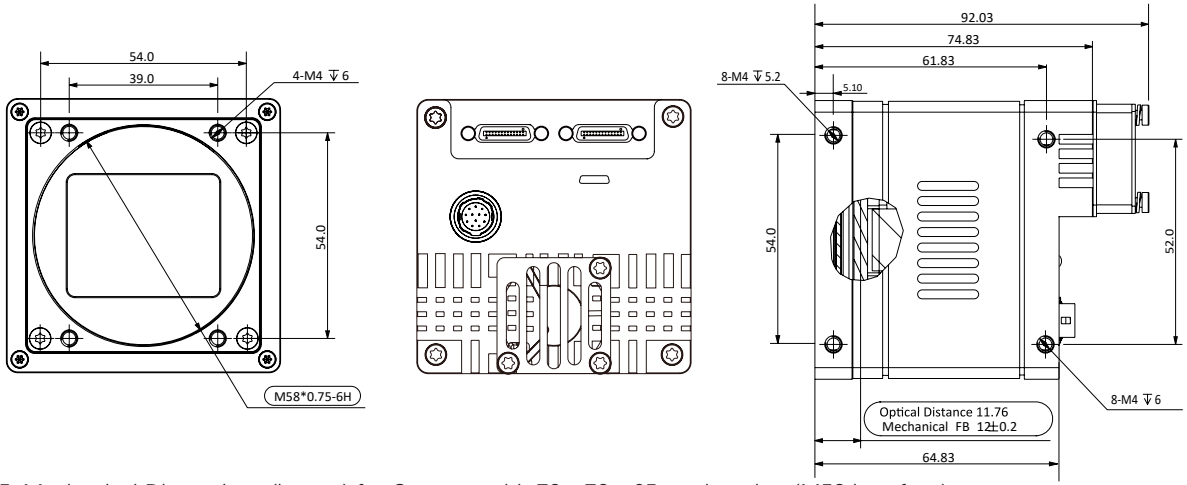


Fig. 1-5: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 65mm housing (M58 interface).

Mechanical Dimensions

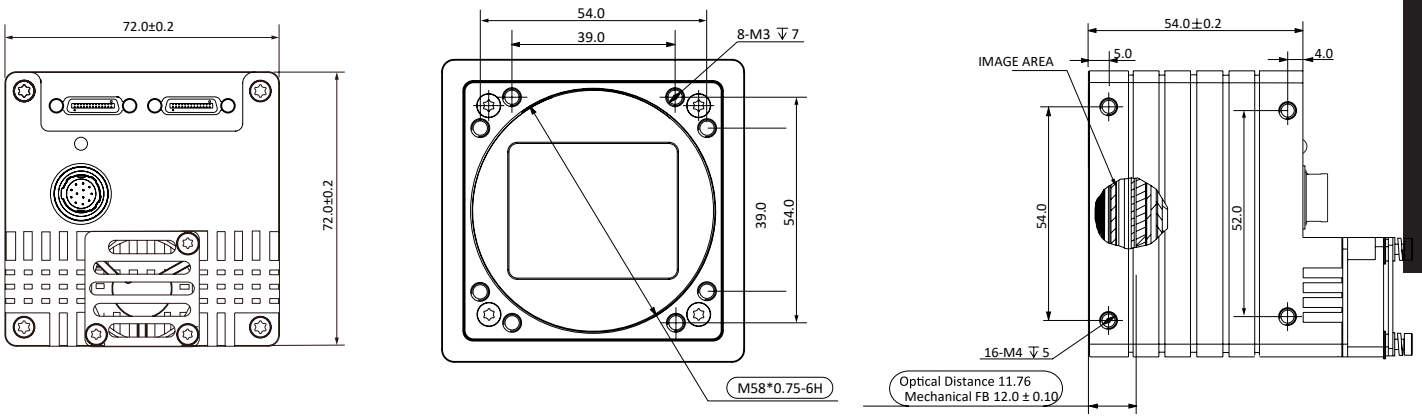


Fig. 1-6: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 54mm housing (M58 interface).

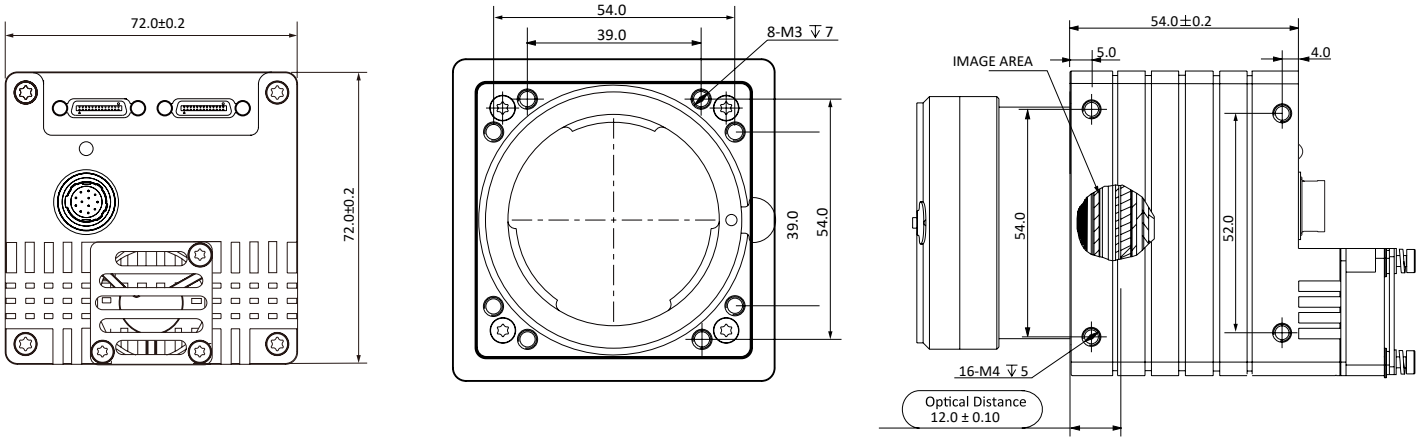


Fig. 1-7: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 54mm housing (F interface).

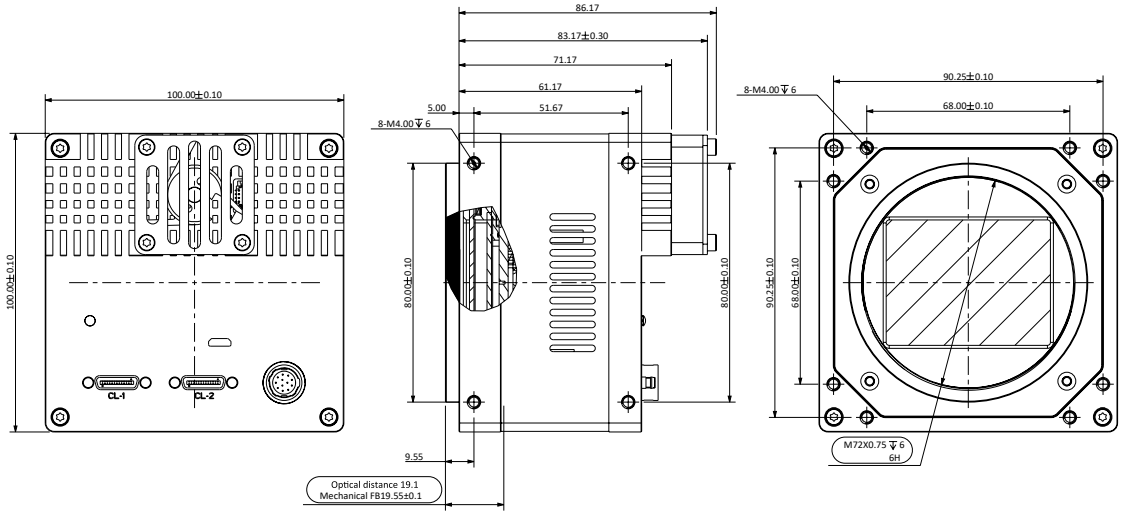


Fig. 1-8: Mechanical Dimensions (in mm) for Cameras with 100 * 100 * 66mm housing (M72 interface).

Status LED Description

Mode	Status LED		Description
Normal	Red	Fast Flashing Red	The device is starting.
	Blue	Low-light Blue	IP has been assigned, Software API is not connected with the device.
		High-light Blue	API is connected with the device, free mode, No image transmission
		Fast Flashing Blue	API is connected with the device, free mode, with image transmission
		Slow Flashing Blue	Using trigger mode.
	Red ↔ Blue	Flashing Alternately Red and Blue	Firmware is upgrading.
Abnormal	Red	Steady Red	Device malfunction
		Slow Flashing Red	The Network is disconnected.

Electrical Standard

	Description
Data Output	Camera Link maximum rate 850MB/s (extend-full 80-bit interface clock rate up to 85MHz)
Synchronization	Via hardware trigger, via software trigger, or free run
Exposure Time Control	Via hardware trigger or programmable via the camera API
Camera Power Requirements	PoCL(Powered by Cameralink frame grabber), +10~13VDC, <4W +6~+24VDC/1A, <1% ripple,via the camera's 6-pin Hirose connector[1], SELV and LPS compliant. Cable must be at least a 26 AWG cable.
Input / output interface	1 opto-isolated input line, 1 opto-isolated output line and 1 GPIO
Weight	/
Lens Adapter	C-mount/F-mount/M58

1. The power supply must meet SELV and LPS specifications.

Pin	Designation	Function
1	-	+6V~26V DC Camera Power
2	Line1	Opto-isolated IN
3	Line2	GPIO (can be set to operate as an input or an output).
4	Line0	Opto-isolated OUT
5	GND	Opto-isolated I/O Ground
6	-	DC Camera Power Ground

Avoiding EMI and ESD Problems

The cameras are frequently installed in industrial environments. These environments often include devices that generate electromagnetic interference (EMI) and they are prone to electrostatic discharge (ESD). Excessive EMI and ESD can cause problems with your camera such as false triggering or can cause the camera to suddenly stop capturing images. EMI and ESD can also have a negative impact on the quality of the image data transmitted by the camera.

To avoid problems with EMI and ESD, you should follow these general guidelines:

- Always use high quality shielded cables. The use of high quality cables is one of the best defenses against EMI and ESD.
- Try to use camera cables that are only as long as necessary and try to run the camera cables and power cables parallel to each other. Avoid coiling camera cables. If the cables are too long, use a meandering path rather then coiling the cables.
- Avoid placing camera cables parallel to wires carrying high-current, switching voltages such as wires supplying stepper motors or electrical devices that employ switching technology. Placing camera cables near to these types of devices can cause problems with the camera.
- Attempt to connect all grounds to a single point, e.g., use a single power outlet for the entire system and connect all grounds to the single outlet. This will help to avoid large ground loops. (Large ground loops can be a primary cause of EMI problems.)
- Use a line filter on the main power supply.
- Install the camera and camera cables as far as possible from devices generating sparks. If necessary, use additional shielding.
- Decrease the risk of electrostatic discharge by taking the following measures:
  - Use conductive materials at the point of installation (e.g., floor, workplace).
  - Control the humidity in your environment. Low humidity can cause ESD problems.

Precautions

NOTICE

Cleaning of the sensor and the housing

Sensor

Avoid cleaning the surface of the camera's sensor if possible. If you must clean it:

- Before starting, disconnect the camera from camera power and I/O power.
- Use a soft, lint-free cloth dampened with a small amount of high-quality window cleaner.
- Because electrostatic discharge can damage the sensor, you must use a cloth that won't generate static during cleaning (cotton is a good choice).
- Make sure the window cleaner has evaporated after cleaning, before reconnecting the camera to power.

Housing

To clean the surface of the camera housing:

- Do not use solvents or thinners; they can damage the surface.
- Use a soft, dry cloth that won't generate static during cleaning (cotton is a good choice).
- To remove tough stains, use a soft cloth dampened with a small amount of neutral detergent; then wipe dry.

NOTICE

An incorrect plug can damage the 6-pin connector.

The plug on the cable that you attach to the camera's 6-pin connector must have 6 female pins.

Using a plug designed for a smaller or a larger number of pins can damage the connector.

NOTICE

Avoid dust on the sensor.

The camera is shipped with a plastic cap on the lens mount. To avoid collecting dust on the camera's IR cut filter (color cameras) or sensor (mono and mono NIR cameras), make sure that you always put the plastic cap in place when there is no lens mounted on the camera.

To avoid collecting dust on the camera's IR cut filter (color cameras) or sensor (mono cameras), make sure to observe the following:

- Always put the plastic cap in place when there is no lens mounted on the camera.
- Make sure that the camera is pointing down every time you remove or replace the plastic cap, a lens or a lens adapter.
- Never apply compressed air to the camera. This can easily contaminate optical components, particu-larly the sensor.

CHAPTER 2 Installation and Setup

Software Installation

System Requirements

The Mars Camera Software Suite for Windows requires that one of the following operating systems is installed on your computer:

- Windows 7 (32 bit or 64 bit)
- Windows 10 (32 bit or 64 bit)

Brief Introduction of Mars Camera Software Suite

The options available with the Mars Camera Software Suite let you change parameters and control the camera by using a stand alone GUI (known as iCentral) or by accessing the camera from within your software application using the API.

The Mars Camera Software Suite is designed for use with all Mars cameras with both the GigE and USB 3.0. The iCentral offers reliable, real time image data transport into the memory of your computer at a very low CPU load.

The Mars Camera Software Suite includes several tools that you can use to change the parameters on your camera, including iCentral and API for different programming languages (C#/C++/.NET).

Installation Steps:

1. Download the iCentral from the ContrasTech website:

http://www.contrastech.com/en/service.html

2. Launch the downloaded installer.

3. Follow the instructions on the screen. The installer will guide you through the installation process.

During installation, you can choose whether to install the software for use with a GigE camera or a USB 3.0 camera.

Hardware Installation

Installing a Cameralink Camera

i	If you use a firewall on your computer, disable the firewall for the network adapter to which your camera is connected.

The installation procedures assume that you will be making a peer-to-peer connection between your camera and a computer. Make sure that the following items are available before starting the installation:

- A Mars Cameralink Camera;
- As applicable, a power supply and a Cameralink frame grabber;
- As applicable, a suitable lens for the camera;
- A computer with a Cameralink frame grabber installed; (The computer must be equipped with an appropriate operating system.);
- A standard Cameralink cable(CAT 6 or better).

You should perform the software installation procedure first and the hardware installation procedure second.

Steps:

1. Mount a lens with adapter onto your camera. For lenses, make sure that the lens is screwed into the camera's lens adapter as far as it will go;
2. Connect the camera to the computer and power.

   If you are using PoCL:

   a. Connect one end of a CL cable to the CL1 connector of the Cameralink frame grabber and connect the other end of the cable to the CL connector of the camera.If you need to connect 2 interfaces, the corresponding Cameralink cable interface also corresponds to the camera interface.

   b. Connect the power supply plug of the Cameralink frame grabber to the power supply port of the PC motherboard. (Cameralink frame grabber needs to support PoCL)

   If you are using 6-Pin Hirose cable:

   a. Connect one end of a CL cable to the CL1 connector of the Cameralink frame grabber and connect the other end of the cable to the CL connector of the camera.If you need to connect 2 interfaces, the corresponding Cameralink cable interface also corresponds to the camera interface.

   b. Plug the 6-pin/12-pin connector of the cable from your power supply into the 6-pin/12-pin connector of the camera.

   c. Switch on the power supply.

CHAPTER 3 Features

Frame Rate

Frame rate, in area scan cameras, is the number of images the camera outputs every second.

■ Influential Facts for Frame Rate

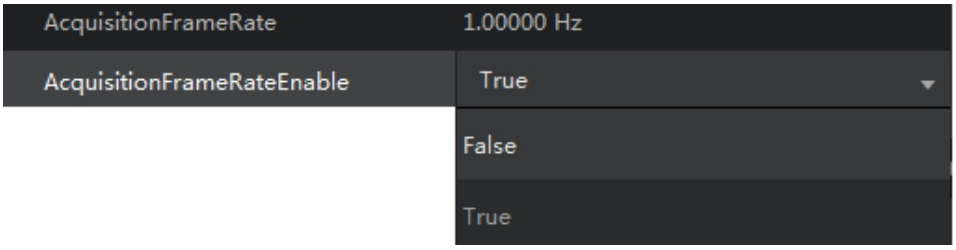
- Bandwidth: The bigger the bandwidth, the bigger the transmission data volume and the higherthe frame rate.
- Pixel format: Different pixel formats takes up different amount of storage. Under the same environment, the more torage is occupied, the lower the frame rate becomes.
- Image resolution: Relates to the camera sensor features, affected by the image size as well.

With the smaller image size, the frame rate gets higher.

- Exposure time: The longer the exposure time, the lower the frame rate and vice versa.

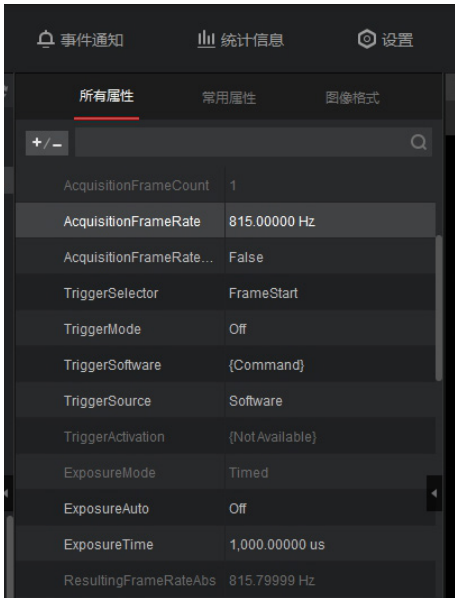
■ Configuring Frame Rate

- AcquisitionFrameRateEnable is the parameter for enabling frame rate acquisition. True means enable and False means disable.



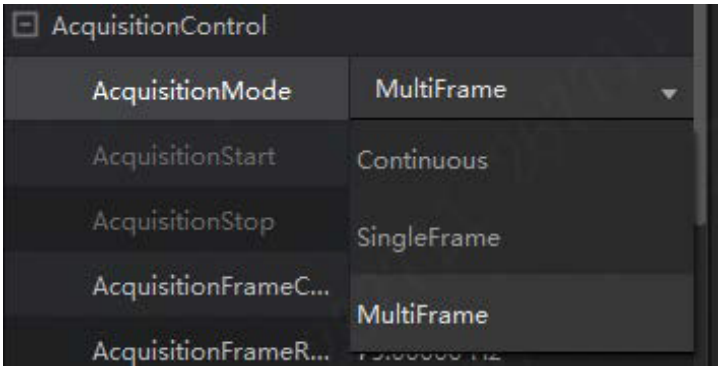
- AcquisitionFrameRate defines capture rate of frames.
- ResultingFrameRateAbs defines the largest speed of capturing frames allowed.

i	When the value of AcquisitionFrameRate exceeds that of ResultingFrameRateAbs, the camera captures images at the frame rate of ResultingFrameRateAbs value. Opposite of that, the camera captures images at the frame rate of AcquisitionFrameRate value.



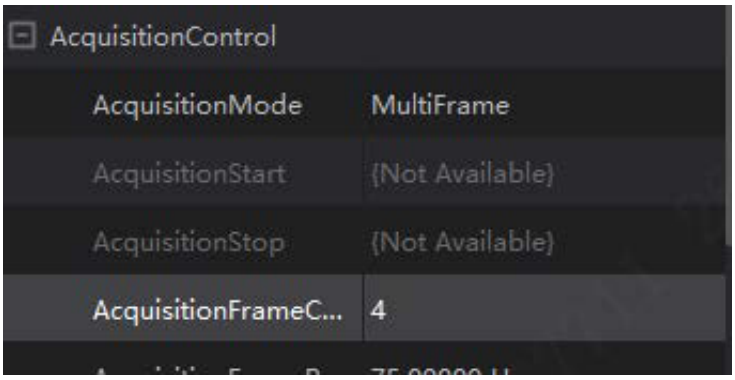
Acquisition Mode

Acquisition mode of the camera includes Continuous, Single Frame and MultiFrame.Configurations are as follows.



Parameter	Working Principle
SingleFrame	The camera starts capturing and stops after one capture.
Continuous	● The camera starts and keeps capturing. ● Manual operation is required for stopping the capture.
MultiFrame	You can set the number of frames to be captured in AcquisitionFrameCount (1–255). ● The camera starts and keeps capturing. ● You can manually stop capturing before the set volume is reached.

AcquisitionFrameCount needs to be configured for MultiFrame. Enter a reasonable number as needed.



Trigger Mode

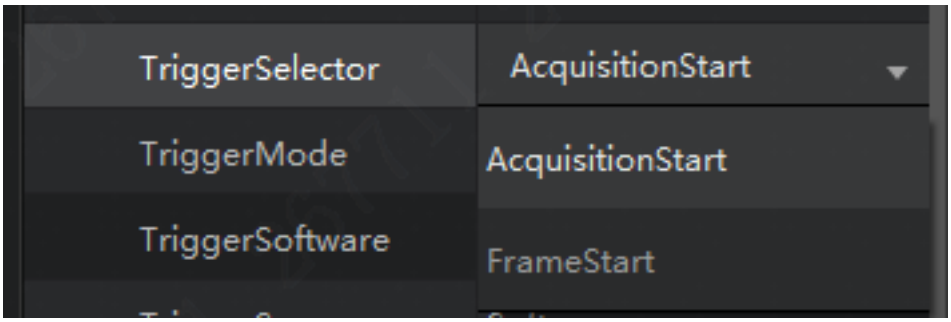
The trigger mode of the camera includes SoftwareTrigger (software trigger) and LineN (hardware trigger).

For area scan cameras, N is 1 or 2, and for large area scan cameras, it is 5, 6 or 7.

■ Trigger Type

Select FrameStart (frame trigger) or AcquisitionStart (image capture trigger) under TriggerSelector.

- FrameStart：Single frame capture. One trigger signal captures one frame.
- AcquisitionStart：Continuous capture. One signal triggers continuous captures.



Trigger Mode

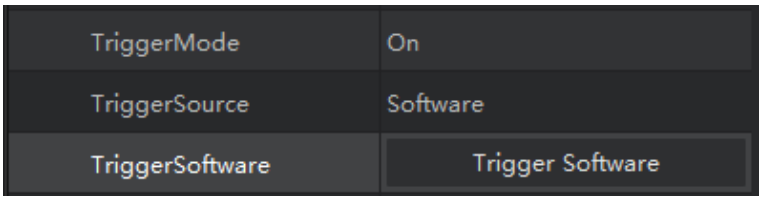
■ Trigger Source

- Software trigger: Trigger signal comes from software.
- Hardware trigger: Trigger signal comes from external devices through I/O port. For the detailed number of signal channels for each camera I/O port, refer to the electrical specifications of the camera.

Step 1 Enable TriggerMode.

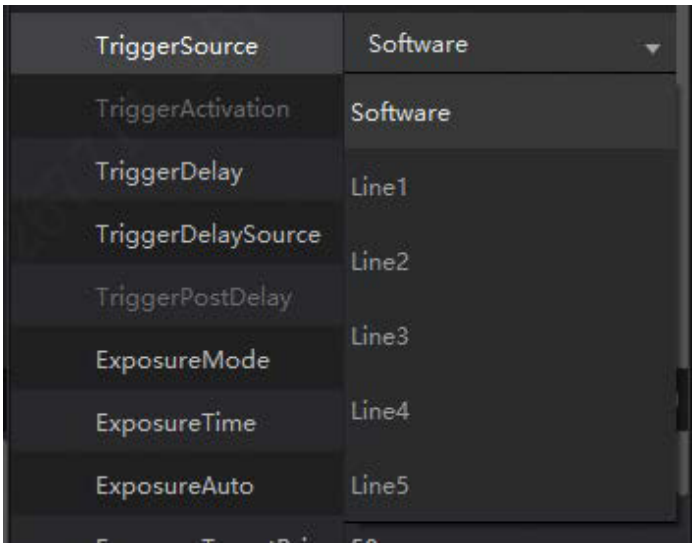
Step 2 Set TriggerSource to Software.

Each click on TriggerSoftware gets a frame.



Step 3 (Optional) Set TriggerSource to LineN.

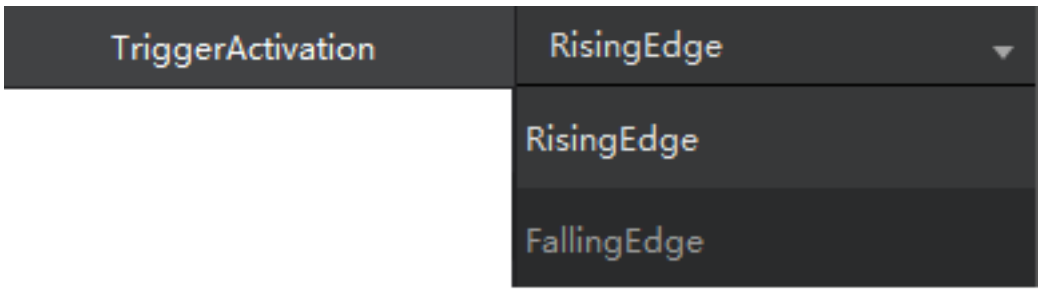
Each trigger signal from external devices gets a frame.



Step 4 When hardware trigger is enabled, you can select trigger signal through TriggerActivation.

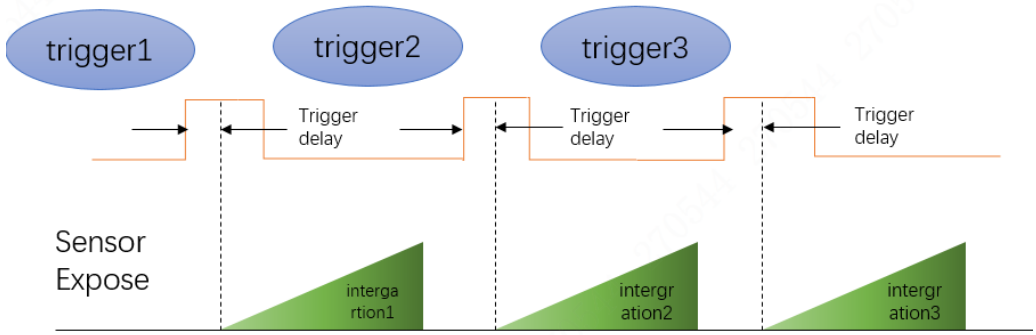
- RisingEdge: Press the trigger board to send trigger signal.
- FallingEdge: Release the trigger board to send the signal.

Step 5 You can send the trigger signal as needed after setting the trigger source.

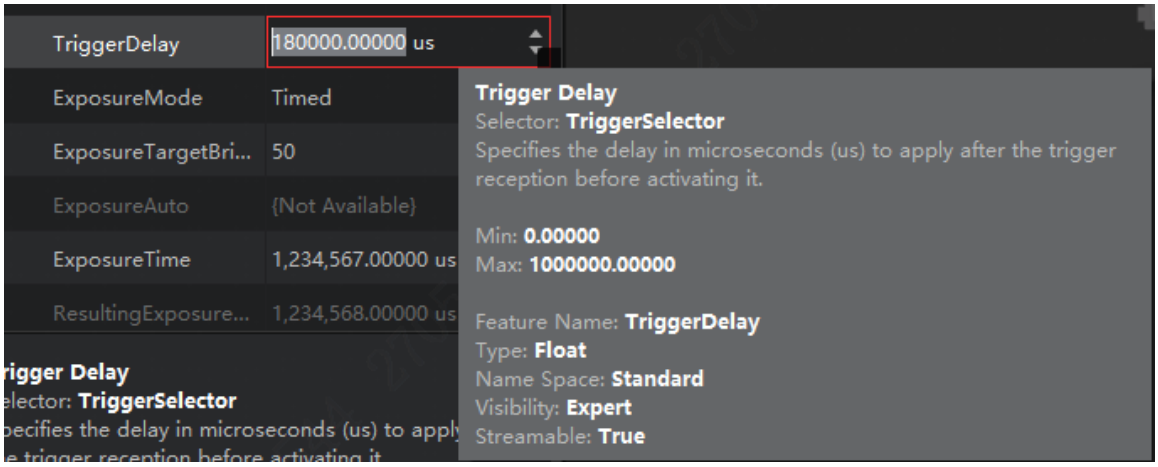


Trigger Delay

You can set delay time from the camera receiving the trigger signal to responding to the signal to capture.



The trigger signal is rising edge in the following figure. The delay time is configured through Trigger Delay with μs as unit and ranges from 0 μs–10000000 μs, namely, 0 s–10 s.

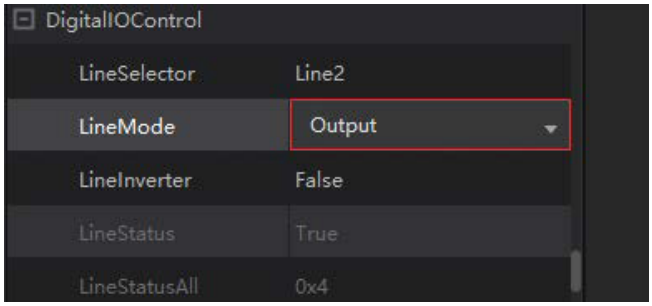


Output Signal

The camera contains 1 opto-isolated output Line 0 and 1 Line 2 which can be set to input or output.

Step 1 Under Digital IO Control, set Line 2 as Line Selector.

Step 2 Set Line Mode to Output.



The output signal triggered by the camera can be used as switch on/off signal to control external devices such as alarm light, light source and PLC. Trigger signal can be sent out through electrical level reversal and Output signal. Configure parameters by Digital IO Control.

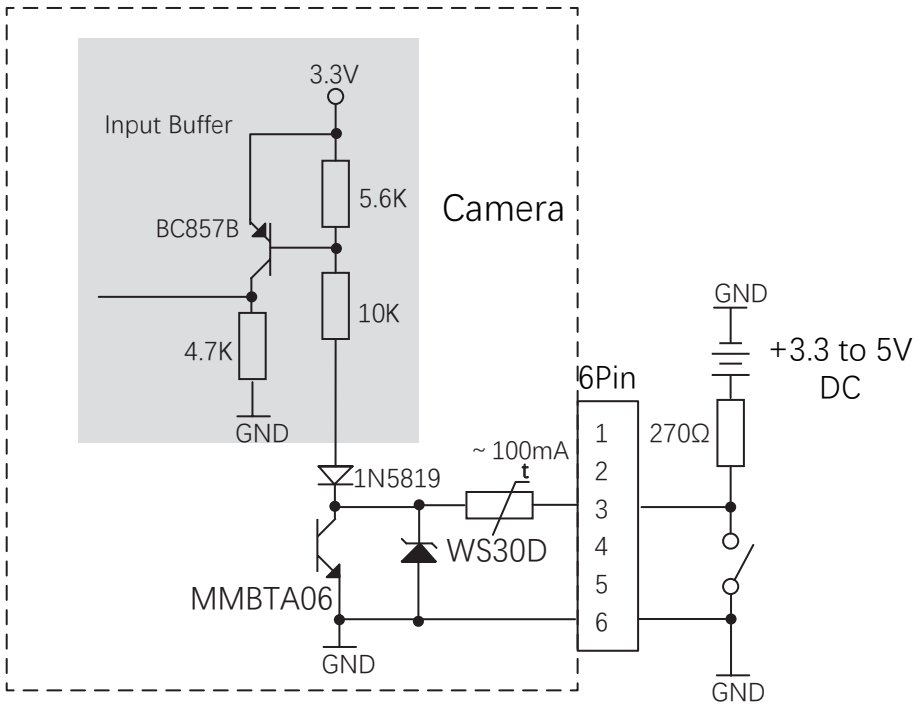
IO Feature

■ Bidirectional I/O Circuit

Line2 is a bidirectional I/O which can be used as an input or out signal.

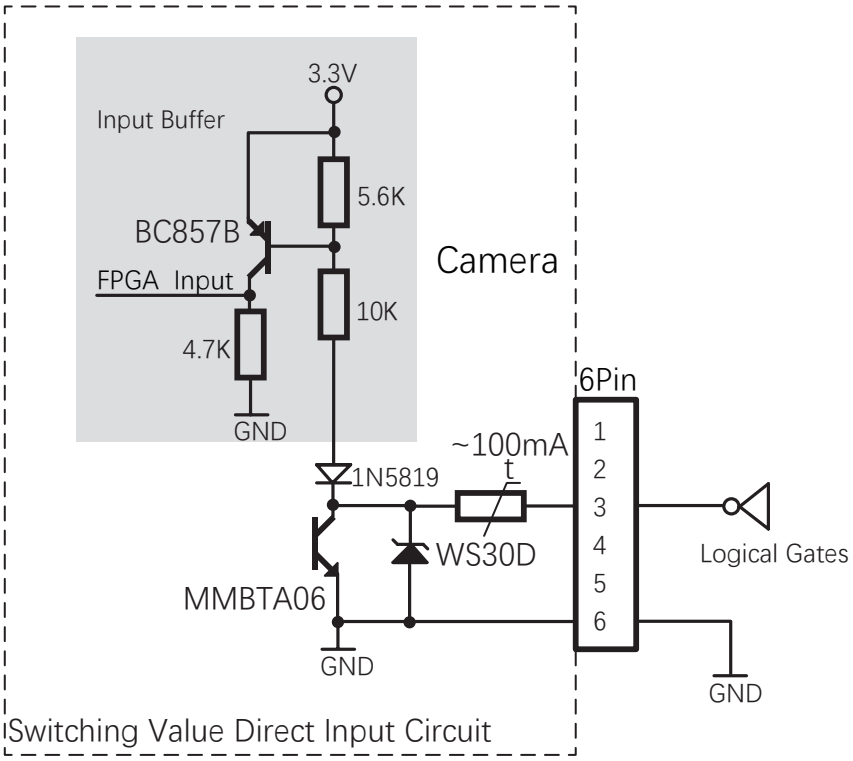
- The external circuit must be able to input up to 2 mA sink current with voltage under 0.8 VDC. No more than 100 uA sink current for high level input.
- Up to 50 mA sink current when the IO port is used as output.

GPIO input

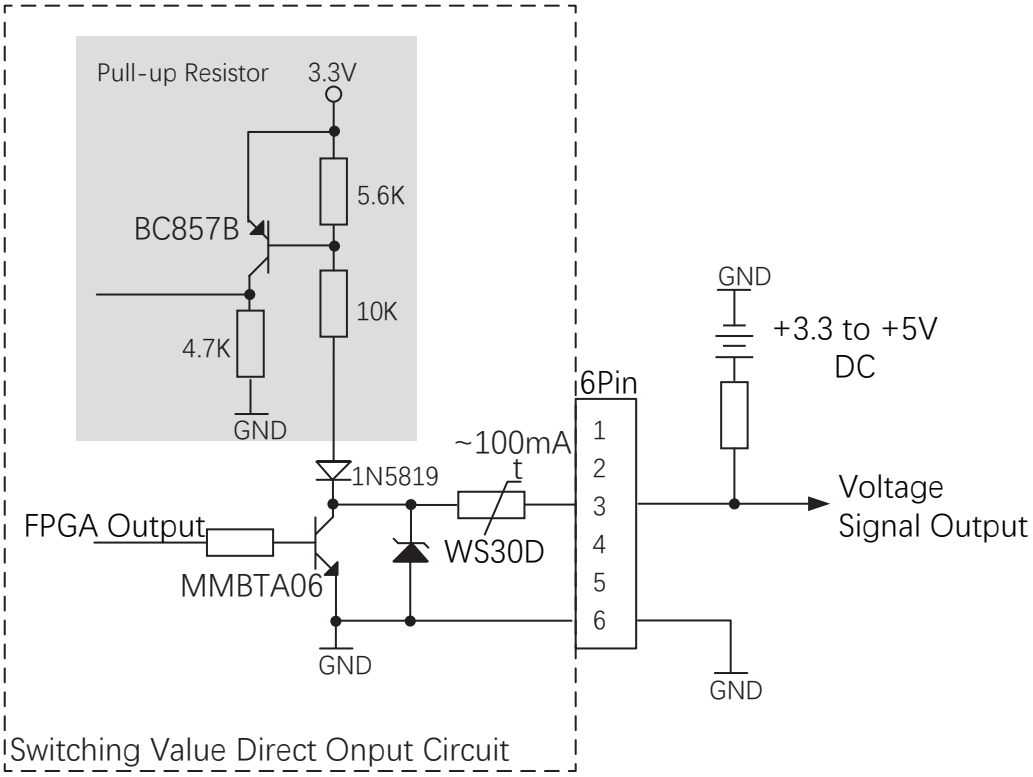


IO Feature

5 V TTL Figure 3-19 logic level input circuit



GPIO output



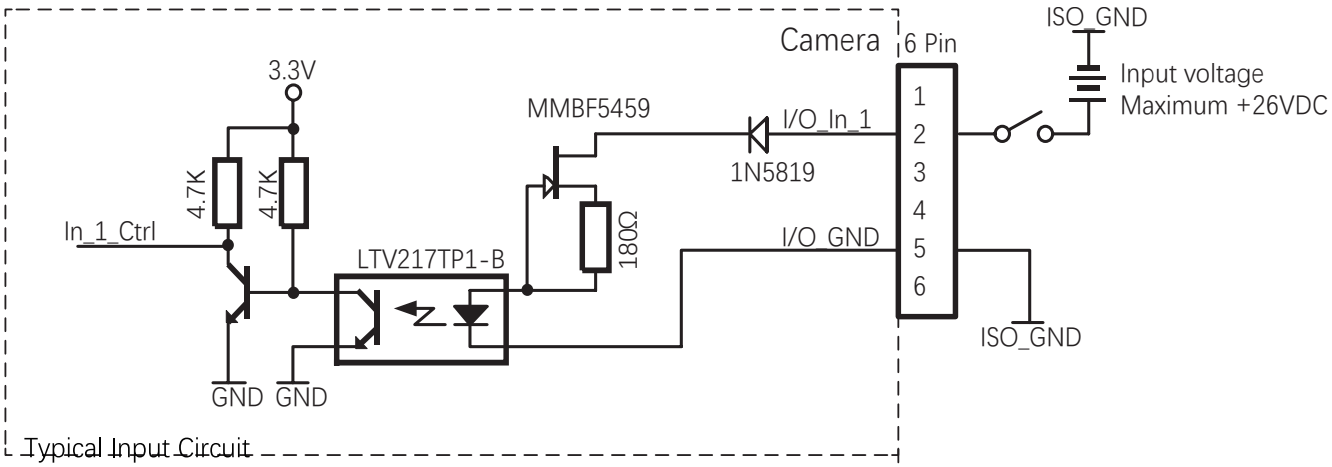
Voltage	Description
+30.0VDC	Extreme voltage. Output voltage cannot exceed the value. Otherwise, the device might be damaged.
+3.3~+24VDC	The security working voltage range when output.
<3.3VDC	Possible error on I/O output.

IO Feature

■ Opto-isolated Input

Opto-isolator can realize one-way transmission of signal due to that the optocoupler is transmitted in one way. One-way transmission separates the input and output end completely, which eliminates the influence output signals have on the input end, leading to high anti-interference performance and strong working stability of the opto-isolator.

Line1 of the camera I/O signal is opto-isolated input and can sustain up to 25 mA current.

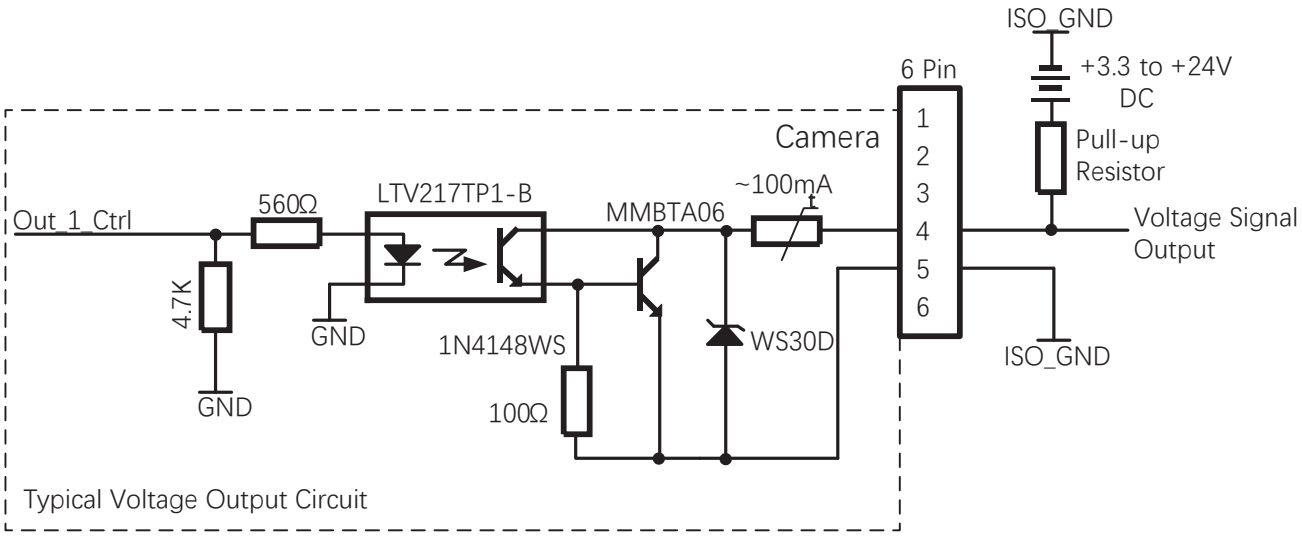


Voltage	Description
0 ~ 24 VDC	Security working voltage range for I/O input.
0 ~ 1.4 VDC	Logic 0.
> 1.4 ~ 2.2 VDC	The input status reverses, and the logic status inside the voltage range is unsure.
> 2.2 VDC	Logic 1.

- Avoid the input voltage being inside 1–1.5 V, under which the circuit is not stable.
- The breakdown voltage is 30 V. keep the voltage stable.
- The sink current of the opto-isolated I/O input port is 5 mA–15 mA.

■ Opto-isolated Output

Line0 of the camera I/O signal is opto-isolated output.



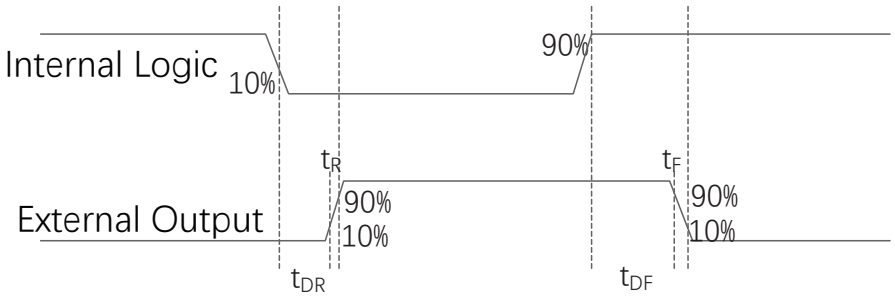
IO Feature

The highest output current of Line0 is 25 mA.

The pull-up resistance value complies with the maximum allowed current of the opto-isolated output port under the defined voltage. The larger the resistance value, the smaller the optocoupler forward voltage drop, the more slowly the output wave changes and the weaker the ability to power external devices. The recommended optocoupler value is 270 Ω, 560 Ω and 1 kΩ when the voltage is 5 V, 12 V and 24 V respectively.

The rising and falling time, delay time of rising and falling edge are shown as below below:

when the pull-up voltage is 1 kΩ.



The electrical specifications of the opto-isolated output are shown in below table when the external voltage is 3.3 V and resistance is 1 kΩ.

External Voltage (V)	Rising Time t_R (μs)	Falling Time t_F(μs)	Rising Edge Trigger Delay t_{DR} (μs)	Falling Edge Trigger Delay t_{DF} (μs)
5	19.70	3.20	39.9	8.06
12	24.06	5.22	44.8	11.8
24	30.11	8.10	44.8	53.2

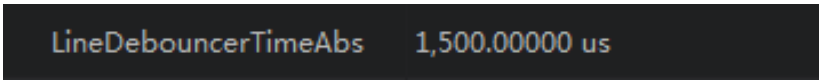
- The optocoupler output delay is the time delay from FPGA internal logic output to external opto-isolated output pin.
- Rising edge trigger delay is the time delay from the 10% of the FPGA pin output level to the 90% of the external output signal amplitude.
- Falling edge trigger delay is the time delay from the 90% of the FPGA pin output level to the 10% of the external output signal amplitude.
- Rising time is the time delay from the 10% of the external output signal amplitude to 90%.
- Falling time is the time delay from the 90% of the external output signal amplitude to 10%.
- Values mentioned above are measured when the environment temperature is 25° C.

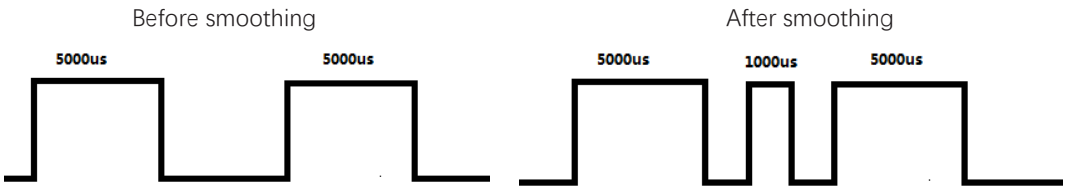
i	The maximum allowed continuous current for the opto-isolated output port is 50 mA. Any current exceeds the extreme value might result in port damage.

IO Smoothing

LineDebouncerTimeAbs: IO port smoothing. Only available under input mode, it filters the level signals of the cable connected to the corresponding port based on the defined value. If the signal value is lower than the defined value, it will be filtered.

For example, set the LineDebouncerTimeAbs value to 1500 us.





When the LineDebouncerTimeAbs value is higher than that of the high-low level, as the above example, the smoothing level is higher than 5000 us, the camera has no stream. Do not set the LineDebouncerTimeAbs value higher than that of the high-low level.

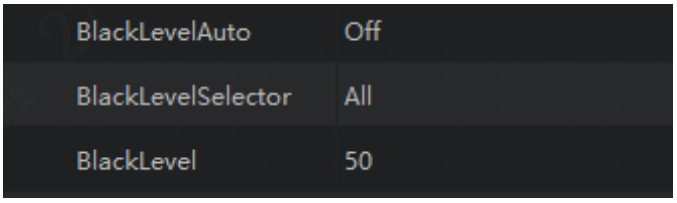
Black Level

The camera supports black level which can adjust the gray level deviation of the output data and decides the average gray level when the sensor is not photosensitive. Different ADC bit depth modes corresponds to different black level parameter range of the camera.

Configure black level.

Step 1 Select Once or Continuous under Analog Control > Black Level Enable.

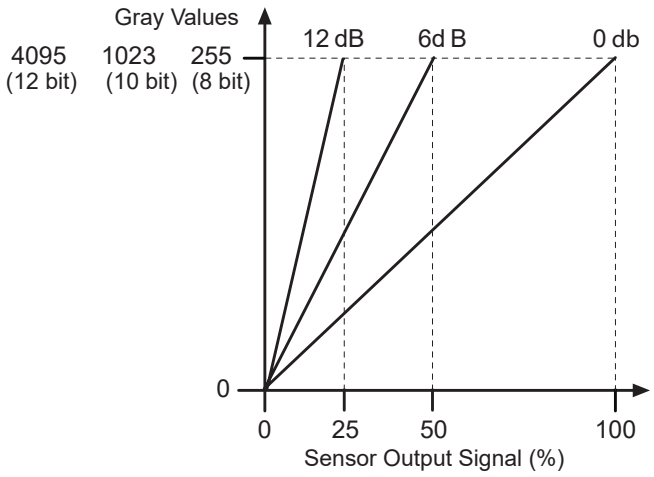
Step 2 Enter the value in Black Level as needed.



Gain

Gain contains analog gain and digital gain. Analog gain can amplify the analog signal, and digital gain can amplify the signal after ADC (Analog to Digital Conversion).

Analog gain amplifies the signal, with higher value comes the stronger gain, higher brightness and more noise. Digital gain amplifies signals after ADC, same as analog gain, the higher the value, the stronger the gain, the higher the brightness and the more the noise. Compares to analog gain, the noise of digital gain is even more.



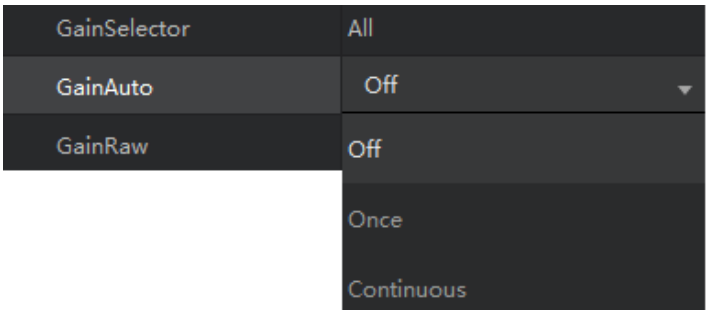
Gain

■ Analog Gain

Analog gain parameter settings include Off, Once and Continuous.

Analog Gain Mode	Parameter	Working Mode
Manual	Off	Adjusts analog gain based on the set value of GainRaw.
Automatic once	Once	Runs analog gain adjustment automatically for a period and then stops based on the current situation.
Continuous	Continuous	Runs analog gain adjustment continuously and automatically based on the current situation.

Select GainAuto mode.



The gain of the camera depends on the value of the GainRaw parameter. GainRaw is adjusted in integers. Minimum settings vary based on camera model and whether vertical binning is enabled. The maximum setting depends on the bit depth of the set pixel data format.

Note that the effective pixel bit depth of the YUV pixel data format is 8 bits.

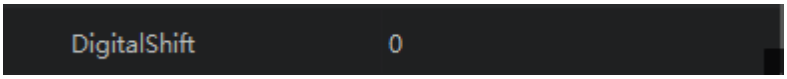
Use AnalogControl via iCentral to set GainRaw parameter values:

1. Set GainSelector to All.
2. Set the GainRaw parameter to the desired value. (0 to 6: magnification)

You can set it from the application software using the API.

■ Digital Gain

Set the DigitalShift parameter among 0–4. The higher the value, the stronger the gain, the higher the brightness and the more the noise.



White Balance

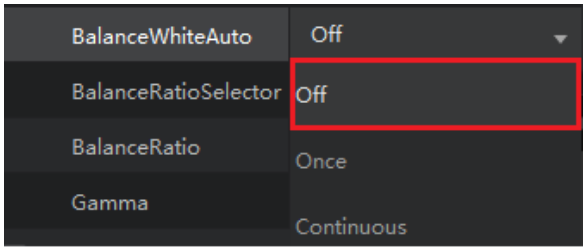
White balance renders the intensities of colors on images captured under different lights through adjusting the corresponding R/G/B value. It keeps the white parts of the image white under different color temperature.

White balance supports Off, Once and Continuous mode.

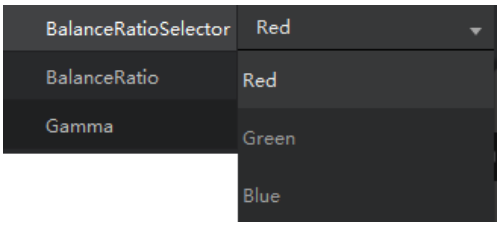
WB Mode	Parameter	Working Mode
Manual	Off	Manually set the value of Red, Green and Blue channels under BlackRatioSelector and BalanceRatio.
Automatic once	Once	Runs white balance adjustment automatically for a period and then stops based on the current situation.
Continuous	Continuous	Runs white balance adjustment continuously and automatically based on the current situation.

You can use white balance to correct the image when the color is much different from the actual objects.

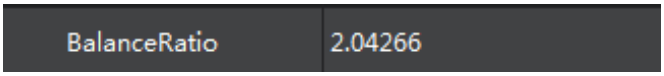
Step 1 Set BalanceWitheAuto to Off.



Step 2 Select R/G/B channels to be adjusted under BlackRatioSelector.



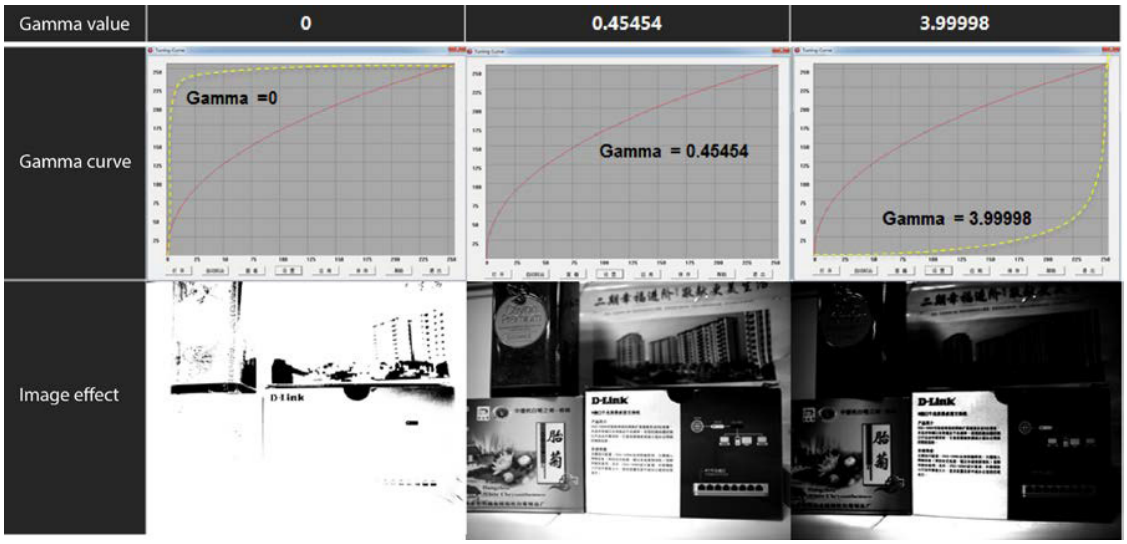
Step 3 Adjust the BalanceRatio to a reasonable value among 0–15. Do the same for R/G/B.



- Save the parameters after correction to avoid repeated configuration in case of unexpected occasions.
- You need to do white balance correction again if the light source or color temperature changes on the camera position.

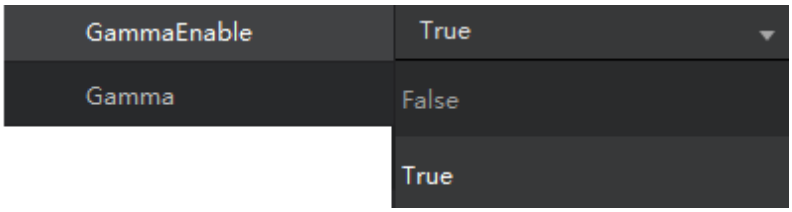
Gamma

Gamma is used to correct the influence caused by nonlinear response of monitors on image. The smaller the value, the brighter the image. Gamma coefficient ranges from 0 to 3.99998.



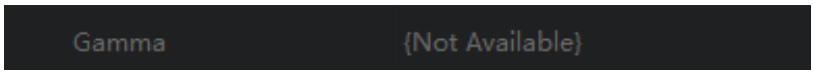
Configure parameters.

Step 1 Set GammaEnable to True.



Step 2 Adjust Gamma value until the brightness meets the requirements.

Step 3 Gamma value is not valid when setting GammaEnable to False.



Gamma and LookUpTable are on opposite sides. When Gamma is enabled, LUT is unavailable. To make it available, set Gamma value to 1.

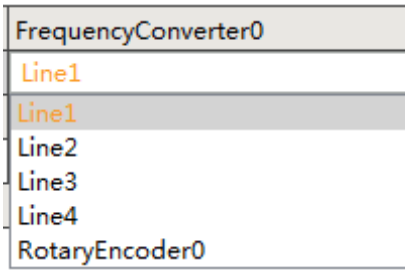
Frequency Converter

You can manage the frequency converter function.

FrequencyConverterControl	
FrequencyConverterSelector	FrequencyConverter0
InputSource	Line1
Divider	1
Multiplier	1

Parameter	Description
FrequencyConverterSelector	Select frequency converter.
InputSource	Select the input signal source for the frequency converter to process.
Divider	Configure the divider index.
Multiplier	Configure the multiplier index.

- Currently this function is not available.
- Enable the frequency converter. Multiplier first and then divider. For example, the image line height is 2048, trigger frequency is 2048, and the actual frame rate is (2048/2048 × Multiplier) /Divider = 1 frame.
- If we set the divider value to 2, then the frame rate is 0.5. Set multiplier value to 2 then the frame rate is 2.



FrequencyConverterControl		
FrequencyConverterSelector		FrequencyConverter0
InputSource	输入源	Line1
Divider	分频	1
Multiplier	倍频	1

Testimage (Test Mode)

The camera supports test mode. When the test mode is enabled, the camera outputs images set by internal programs instead of images captured in real time. When the real-time images are abnormal, you can check whether the images output from test mode have the same issue to locate the problem. The test mode is disabled and the camera outputs real-time captured images by default.

- You can enable the test mode from Image Format Control > Test Pattern.
- After enabling it, the image displayed on the application window of the capture card switches to test image (decided by test mode). Black and white line scan camera provides test image formats such as Mono Bar, Check board, Oblique Mono Bar and Vertical Color Bar.
- For color cameras, aside from the above 4 formats, Gradual Color Bar and Horizontal Color Bar are also supported.

Supported test images vary from different models.

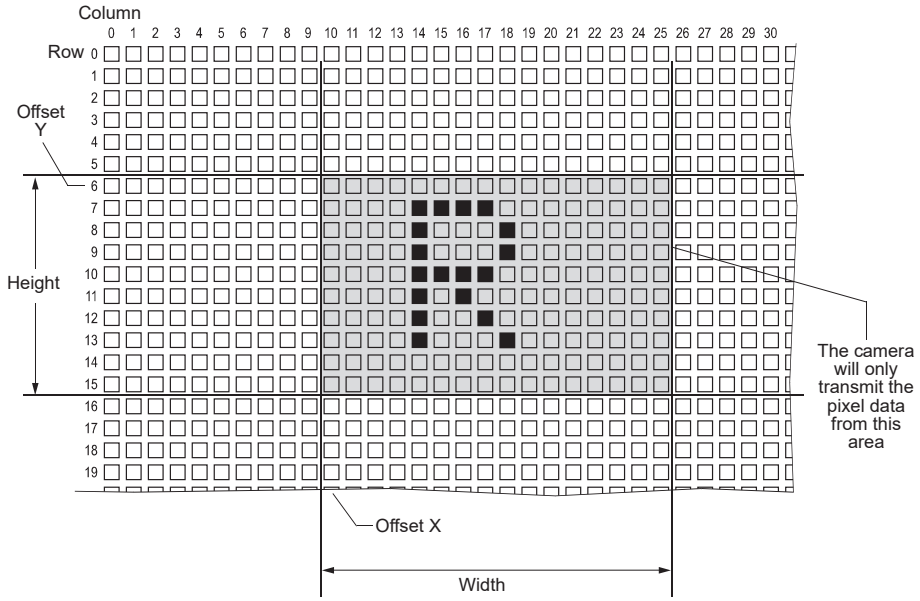
Image Area of Interest (AOI)

The image Area of Interest (AOI) feature lets you specify a portion of the sensor array and after each image is acquired, only the pixel information from the specified portion of the array is read out of the sensor and into the camera's image buffer.

The area of interest is referenced to the top left corner of the sensor array. The top left corner is designated as column 0 and row 0 as shown below.

The location and size of the area of interest is defined by declaring an offset X (coordinate), a width, an offset Y (coordinate), and a height. For example, suppose that you specify the offset X as 10, the width as 16, the offset Y as 6, and the height as 10. The area of the array that is bounded by these settings is shown below.

The camera will only transmit pixel data from within the area defined by your settings. Information from the pixels outside of the area of interest is discarded.



One of the main advantages of the AOI feature is that decreasing the height of the AOI can increase the camera's maximum allowed acquisition frame rate.

Set AOI

You can change the size and position of the AOI by changing the values of the camera's OffsetX, OffsetY, Width and Height parameters.

- Offset X: Determines the starting column of the area of interest.
- Offset Y: Determine the starting line of the area of interest.
- Width: Determines the width of the area of interest.
- Height: Determines the height of the area of interest.

See the camera datasheet for general information on sensor size and resolution.

Reverse Image

The camera's reverse X and reverse Y functions let you flip the captured images horizontally and/or verti-cally before they are transmitted from the camera.

Note that the reverse X and reverse Y functions may both be enabled at the same time if so desired.

Reverse X

The Reverse X feature is a horizontal mirror image feature. When the Reverse X feature is enabled, the pixel values for each line in a captured image will be swapped end-for-end about the line's center.

The image below shows a normal image on the left and an image captured with reverse X enabled on the right.

Normal Image

Mirror image

Reverse Y

The Reverse Y feature is a vertical mirror image feature. When the Reverse Y feature is enabled, the lines in a captured image will be swapped top-to-bottom.

The image below shows a normal image on the left and an image captured with reverse Y enabled on the right.

Normal Image

Mirror image

You can enable the Reverse X and Reverse Y functions by setting the ReverseX and ReverseY parameter values through iCentral. You can also use the API to set parameter values in the application software.

Configuration Sets

The camera can store three user sets. They serve as convenient storage locations for the camera user and have no impact on the operation of the camera.

The values are designated as Default, UserSet1 and UserSet2.

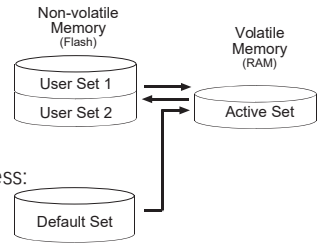
You can use iCentral application to easily set the parameters.

Active Set: The active set is the camera's current parameter settings. It is located in the camera's volatile memory and the settings are lost if the camera is reset or if power is switched off.

Default Set: The default set is the camera's factory optimized configuration. It is saved in a permanent file in the camera's non-volatile memory. It is not lost when the camera is reset or switched off.

User Sets: There are two reserved areas in the camera's non-volatile memory available for saving configuration sets. A configuration set saved in a reserved area is commonly referred to as a "user set" .

The two available user sets are called User Set 1 and User Set 2.



■ Saving User Sets

Saving the current active set into a user set in the camera's nonvolatile memory is a three step process:

- Make changes to the camera's settings until the camera is

operating in a manner that you would like to save.

- Set the UserSetSelector parameter to UserSet1, or UserSet2.
- Execute a UserSetSave command to save the active set to the selected user set.

Saving an active set to a user set in the camera's non-volatile memory will overwrite any parameters that were previously saved in that user set.

You can set the UserSetSelector parameter and execute the UserSetSave command via iCentral. You can also set the parameters from within your application software by using the API that we provide.

■ Loading Saved Set or the Default Set into the Active Set

If you have saved a configuration set into the camera's non-volatile memory, you can load the saved set from the camera's non-volatile memory into the camera's active set.

When you do this, the loaded set overwrites the parameters in the active set. Since the settings in the active set control the current operation of the camera, the settings from the loaded set will now be controlling the camera.

You can also load the default set into the camera's active set.

To load an UserSet or the default set into the active set:

- Set the UserSetSelector parameter to UserSet1, UserSet2, or Default.
- Execute a UserSetLoad command to load the selected set into the active set.

You can set the UserSetSelector parameter and execute the UserSetLoad command via iCentral. You can also set the parameters from within your application software by using the API that we provide.

i	Loading a user set or default set into the active set is only allowed when the camera is idle, i.e. when it is not acquiring images continuously or does not have a single image acquisition pending. Loading the default set into the active set is a good course of action, if you have grossly misadjusted the settings in the camera and you are not sure how to recover. The default set is optimized for use in typical situations and will provide good camera performance in most cases.

Flat Field Correction

The image quality can be affected by uneven light, fixed-pattern noise of the sensor and noise of uneven responses during using the area scan cameras. FFC (Flat Field Correction) is needed for these situations.

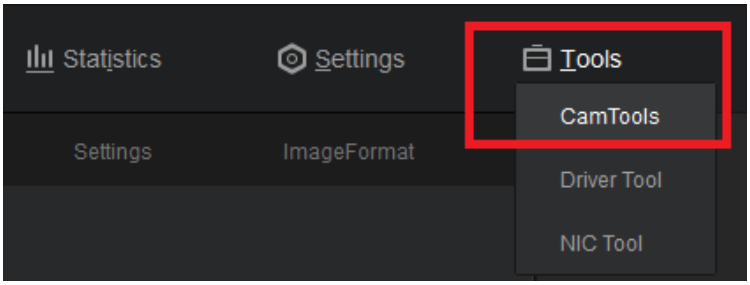
It is mainly for ensuring image balance when applied to area scan cameras.

FFC works by combination of 3 corrections.

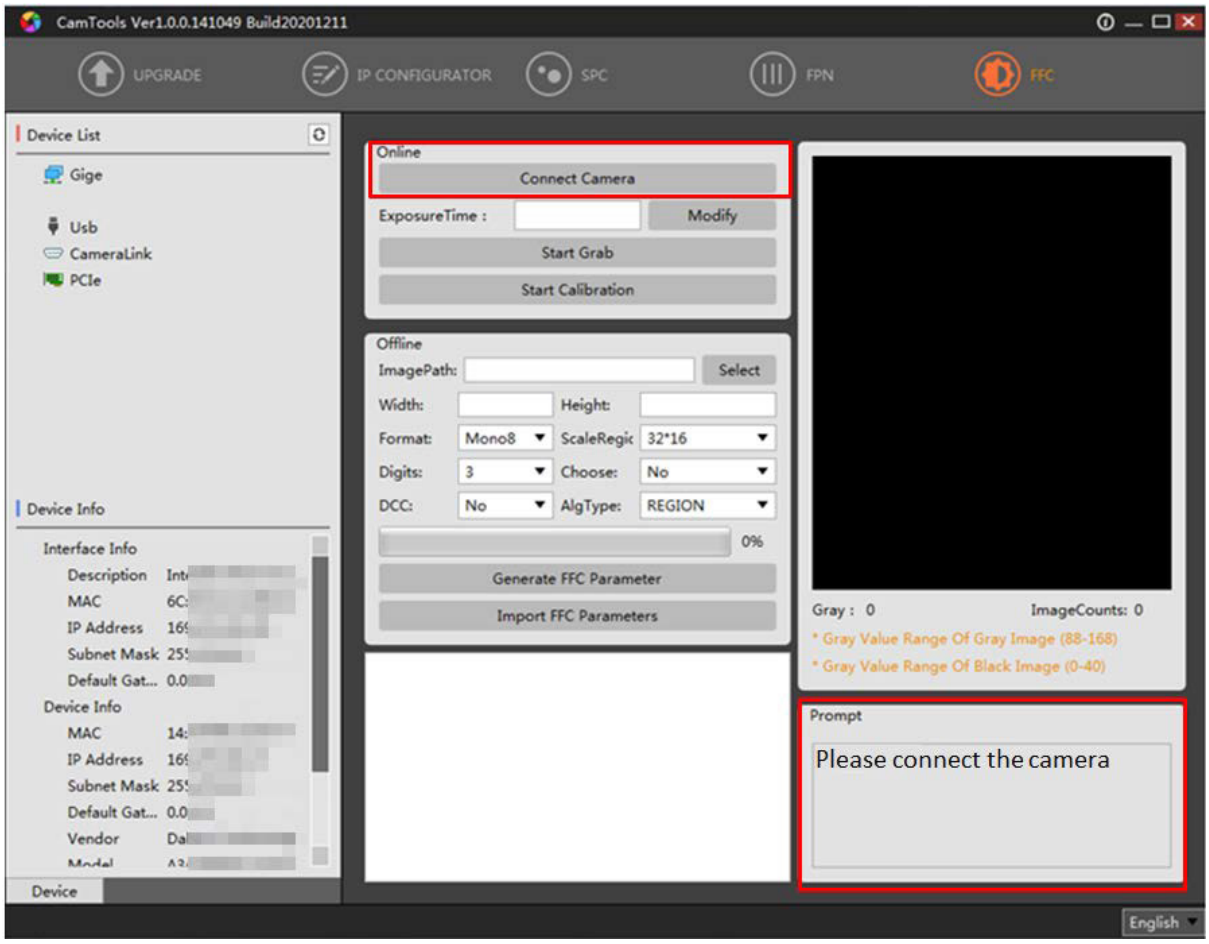
- In dark field, correct fixed-pattern noise.
- In Bright field, correct uneven response.
- In Bright field, correct uneven lens or light.

i	The ratio between the maximum and the minimum brightness of the image which needs FFC cannot exceed 2.

Step 1 Select Tools > Camtools on the top.

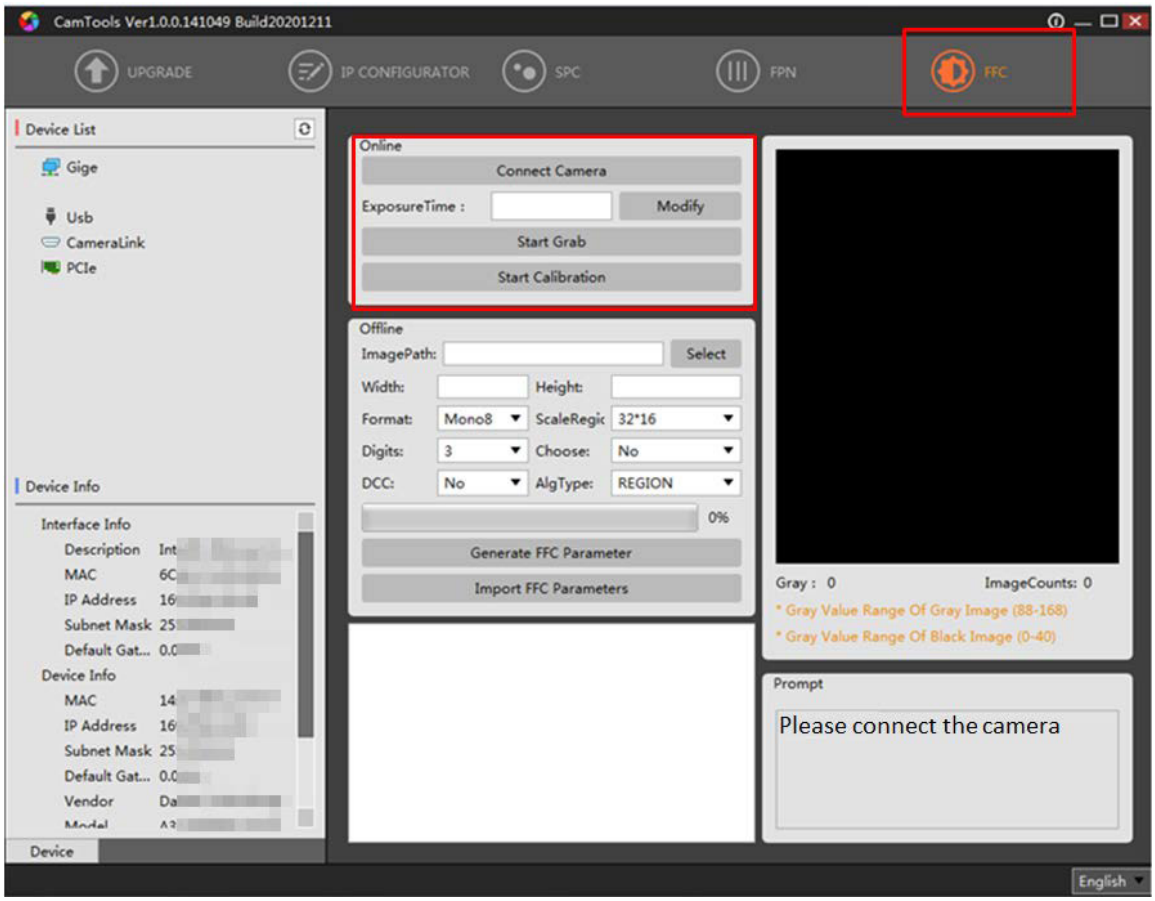


Step 2 Click FFC at the upper-right corner.



Flat Field Correction

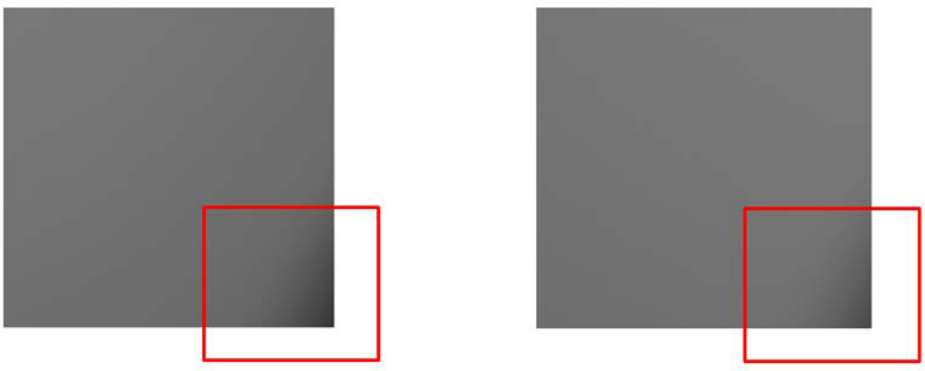
Step 3 After entering the FFC interface, there will be step-by-step instructions prompting at the lower-right corner.



Step 4 Follow the on-screen instructions to complete FFC.

Step 5 FFCEnable dialog box pops up after completing online FFC with ON/OFF option for you to disable it.

Step 6 After the correction, you can see the difference on the brightness of the dark part of the image.



Before

After

CHAPTER 4 Technical Support

Technical Support

If you need advice about your camera or if you need assistance troubleshooting a problem with your camera,it's highly recommended to describe your issue in details and contact us via E-mail at support@contrastech.com

It would be helpful if you can fill-in the following table and send to us before you contact our technical support team.

Camera Model:		Camera's SN:	
Describe the issue in as much detail as possible:			
If known, what's the cause of the issue?			
How often did/does the issue occur?			
How severe is the issue?			
Parameter set	Please connect the camera directly to PC and use iCentral to make note of the parameter when the issue occurred.		

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