



See the possibilities

User Manual

Sweep+ Series - GigE Vision Interface

SW-4000Q-10GE

SW-4000Q-SFP

SW-8000Q-10GE

SW-8000Q-SFP



4CMOS Prism Line Scan Camera

Document Version: 2.4

Date: 2026-08-10

Thank you for purchasing this product.

 Be sure to read this documentation before use.

This documentation includes important safety precautions and instructions on how to operate the unit. Be sure to read this documentation to ensure proper operation.

The contents of this documentation are subject to change without notice for the purpose of improvement.

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About Technical Note



Some additional technical information is provided on the JAI website as Technical Notes. In this manual, if a technical note is available for a particular topic, the above icon is shown. Please refer to the following URL for Technical notes.

<https://www.jai.com/support-software/technical-notes>

Notice/Warranty

Notice

The material contained in this manual consists of information that is proprietary to JAI Ltd., Japan, and may only be used by the purchasers of the product. JAI Ltd., Japan makes no warranty for the use of its product and assumes no responsibility for any errors which may appear or for damages resulting from the use of the information contained herein. JAI Ltd., Japan reserves the right to make changes without notice.

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Warranty

For information about the warranty on the engineering samples, please contact your factory representative.

Certifications

CE Compliance

As defined by the Directive 2004/108/EC of the European Parliament and of the Council, EMC (Electromagnetic compatibility), JAI Ltd., Japan declares that SW-4000Q-10GE, SW-4000Q-SFP, SW-8000Q-10GE, and SW-8000Q-SFP comply with the following provisions applying to their standards.

Model Name	Standards
SW-4000Q-10GE	EN 61000-6-3 (Generic emission standard part 1)
SW-4000Q-SFP	EN 61000-6-2 (Generic immunity standard part 1)
SW-8000Q-10GE	EN 55032:2015 (CISPR32:2015)
SW-8000Q-SFP	EN 55035:2017 (CISPR35:2016)

FCC

Note: For the SW-4000Q-10GE model, the FCC compliance varies depending on the hardware revision number. You can identify the hardware revision number by the last letter of your camera's serial number.

Model Name	Hardware Rev.	Standards
SW-4000Q-10GE	A - C	FCC Part 15, Class B
SW-4000Q-10GE	D or later	FCC Part 15, Class A
SW-4000Q-SFP	Any	FCC Part 15, Class B
SW-8000Q-10GE	Any	FCC Part 15, Class B
SW-8000Q-SFP	Any	FCC Part 15, Class B

FCC Part 15, Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Part 15, Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning

Changes or modifications to this unit not expressly approved by the party responsible for FCC compliance could void the user's authority to operate the equipment.

KC

제조년월은 제품상자의 라벨을 참조하십시오.

 상 호: JAI Ltd. Japan 기자재명칭: Industrial Camera 모 델 명: SW-4000Q-10GE-F 제조사 및 제조국가: JAI Ltd., Japan / JAPAN R-R-JAI-SW-4000Q-10GE	 상 호: JAI Ltd. Japan 기자재명칭: Industrial Camera 모 델 명: SW-4000Q-10GE-M52 제조사 및 제조국가: JAI Ltd., Japan / JAPAN R-R-JAI-SW-4000Q-10GE
 상 호: JAI Ltd. Japan 기자재명칭: Industrial Camera 모 델 명: SW-4000Q-SFP-F 제조사 및 제조국가: JAI Ltd., Japan / JAPAN R-R-JAI-SW-4000Q-SFP	 상 호: JAI Ltd. Japan 기자재명칭: Industrial Camera 모 델 명: SW-4000Q-SFP-M52 제조사 및 제조국가: JAI Ltd., Japan / JAPAN R-R-JAI-SW-4000Q-SFP
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China RoHS

The following statement is related to the regulation on “Measures for the Administration of the Control of Pollution by Electronic Information Products”, known as “China RoHS”. The table shows contained Hazardous Substances in this camera.

 mark shows that the environment-friendly use period of contained Hazardous Substances is 15 years.

重要注意事项

有毒有害物质或元素名称及含量表

根据中华人民共和国信息产业部《电器电子产品有害物质限制使用管理办法》，本产品《有毒有害物质或元素名称及含量表》如下。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
SW-4000Q-10GE	×	○	○	○	○	○
SW-4000Q-SFP						
SW-8000Q-10GE						
SW-8000Q-SFP						
○:表示该有毒有害物质在该部件所有均质材料中的含量均在 GB/T 26572-2011规定的限量要求以下。						
×:表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572-2011规定的限量要求。						

环保使用期限



电子信息产品中含有的有毒有害物质或元素在正常使用的条件下不会发生外泄或突变、电子信息产品用户使用该电子信息产品不会对环境造成严重污染或对其人身、财产造成严重损害的期限。

数字「15」为期限15年。

Usage Precautions

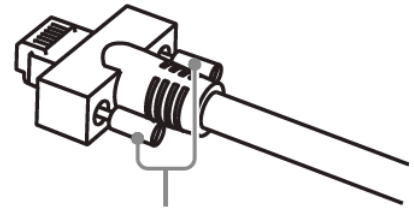
This chapter refers to the precautions for use.

Notes on Cable Configurations

The presence of lighting equipment and television receivers nearby may result in video noise. In such cases, change the cable configurations or placement.

Notes on LAN Cable Connection (10GE Models)

Secure the locking screws on the connector manually, and do not use a driver. Do not secure the screws too tightly. Doing so may wear down the screw threads on the camera. (Tightening torque: 0.147 Nm or less)



Caution: Secure manually. Do not secure too tightly.

Notes on SFP+ Module Installation (SFP Models)

Check the operation manual of the SFP+ module to be used, and attach it or remove it from the camera. The SFP module can be attached to and removed from the camera only when the camera is turned off.

Many SFP modules and fiber optic cables are Class 1 laser products. Do not look into connectors and cables when installing or removing. There is a risk of injury to eyes.

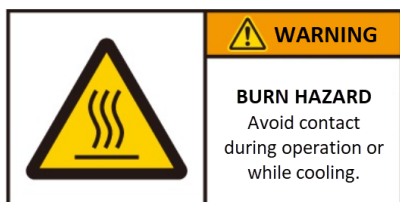
Notes on Temperature Conditions

The guaranteed operating temperature and humidity of this camera are -5°C to +45°C, 20% to 80% (non-condensing). Please make sure the following temperature condition is met when operating the unit.

- 10GE models: The camera's internal temperature should not exceed 101 °C during operation.
- SFP models: The camera's internal temperature should not exceed 65 °C during operation.

If the above temperature conditions are exceeded, take measures to dissipate heat according to your installation environment and conditions.

In addition, when using a SFP model, operating temperature range of SFP+ modules varies depending on the product. Please use it after confirming the specifications in the data sheet of the product to be used.



Depending on the operating environment, the surface of the camera may become very hot during operation. Do not touch the camera during operation and while it is being cooled. Also, make sure that the cable surface and other easily deformable items do not contact the surface of the camera.

Notes on Attaching the Lens



Technical Notes

How to Clean a Sensor

Avoiding Dust Particles

When attaching the lens to the camera, stray dust and other particles may adhere to the sensor surface and rear surface of the lens. Be careful of the following when attaching the lens.

- Work in a clean environment.
- Do not remove the caps from the camera and lens until immediately before you attach the lens.
- To prevent dust from adhering to surfaces, point the camera and lens downward and do not allow the lens surface to come into contact with your hands or other objects.
- Always use a blower brush to remove any dust that adheres.
- Never use your hands or cloth, blow with your mouth, or use other methods to remove dust.

Phenomena Specific to CMOS Image Sensors

The following phenomena are known to occur on cameras equipped with CMOS image sensors. These do not indicate malfunctions.

- **Aliasing:** When shooting straight lines, stripes, and similar patterns, vertical aliasing (zigzag distortion) may appear on the monitor.
- **Blooming:** When strong light enters the camera, some pixels on the CMOS image sensor may receive much more light than they are designed to hold, causing the accumulated signal charge to overflow into surrounding pixels. This “blooming” phenomenon can be seen in the image but does not affect the operation of the camera.
- **Fixed pattern noise:** When shooting dark objects in high-temperature conditions, fixed pattern noise may occur throughout the entire video monitor screen.
- **Defective pixels:** Defective pixels (white and black pixels) of the CMOS image sensor are minimized at the factory according to shipping standards. However, as this phenomenon can be affected by the ambient temperature, camera settings (e.g., high sensitivity and long exposure), and other factors, be sure to operate within the camera’s specified operating environment.

Notes on Exportation

When exporting this product, please follow the export regulations of your country or region.

Features

This camera is a 4CMOS line scan camera mounted on a prism, for the R, G, B and NIR channels. The 10GE model has a 10 Gigabit Ethernet interface. The SFP model has a 10GBASE-R interface that supports 10 Gigabit Ethernet over fiber when an SFP+ module is attached. Supported output formats include 8-bit or 10-bit RGB, as well as YUV422_8 or YUV422_8_UYVY color formats

The following table summarizes the active pixels, pixel size, and maximum line rate.

	4000Q Models	8000Q Models
Active Pixels	4 x 4096 (R, G, B, NIR)	4 x 8192 (R, G, B, NIR)
Pixel Size	TypeA: 7.5 μm x 7.5 μm , TypeB: 7.5 μm x 10.5 μm	3.75 μm x 5.78 μm
Max Line Rate (RGBa8)	73kHz	37kHz
Max Line Rate (YUV422_8 + Mono8)	74kHz	37kHz
Max Line Rate (RGB8 + Mono8)	72kHz	36kHz

Features Overview

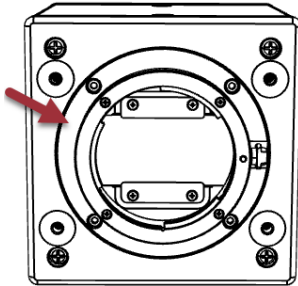
- Prism technology for superior color quality and better color differentiation
- SW-4000Q models: Pixel size can be switched (7.5 μm x 7.5 μm , 7.5 μm x 10.5 μm)
- It can output both video in visible region and video in the near-infrared region.
 - Supports Pixel Format RGBa8, which outputs video in the visible region and video in the near-infrared region as a single stream.
 - Video in the visible region (RGB8, RGB10V1Packed, RGB10p32, YUV422) and video in the near-infrared region (Mono8, Mono10Packed) can be output as a dual stream.
- Supports vertical and horizontal binnings.
- SFP models: Attach an SFP+ module to the camera to enable 10 Gigabit Ethernet connection via fiber optic cable.
- Supports Flat Shading and Color Shading.
- HSI, sRGB, Adobe RGB and XYZ color space conversion.
- Supports direct connection to rotary encoders plus large variety of trigger options.
- Excellent shock and vibration resistance.
- Lens mount: F or M52

Parts Identification

Note: See the "[Dimensions](#)" section for exterior views of this camera.

Lens Mount (F-Mount or M52-Mount)

Mount an F-mount or M52-mount lens here.



- Back flange distance (both F- and M52-mount): 46.5 mm

Note: Before mounting a lens, be sure to refer to [① Lens](#) and confirm the precautions for attaching a lens and the supported lens types.

Connectors

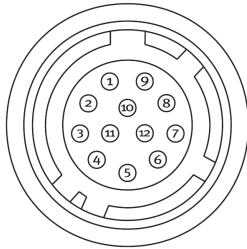
This section displays the pin assignments for each connector.

10GE Models	SFP Models

① DC IN/TRIG Connector (12-Pin Round)

Related Setting Items: [DigitalIOControl](#)

Connect the cable for a power supply or for DC IN / trigger IN here.



Camera side: 12-pin circular connector equivalent to Hirose HR10A-10R-12PB(71) (gold-plated pins)

Cable side: Hirose HR10A-10P-12S(73) (Plug) or equivalent

Pin #	I/O	Signal	Description
1		GND	
2	Power In	DC In (+12V)	DC +10V ~ + 25V
3		GND	
4		Reserved	
5	In	OPT IN1 -	Line 5
6	In	OPT IN1 +	
7	Out	TTL OUT 4	Line 12
8		NC	
9	Out	TTL OUT 1	Line 1
10	In	TTL IN 1	Line 4
11	Power In	DC In (+12V)	DC +10V ~ + 25V
12		GND	

Notes:

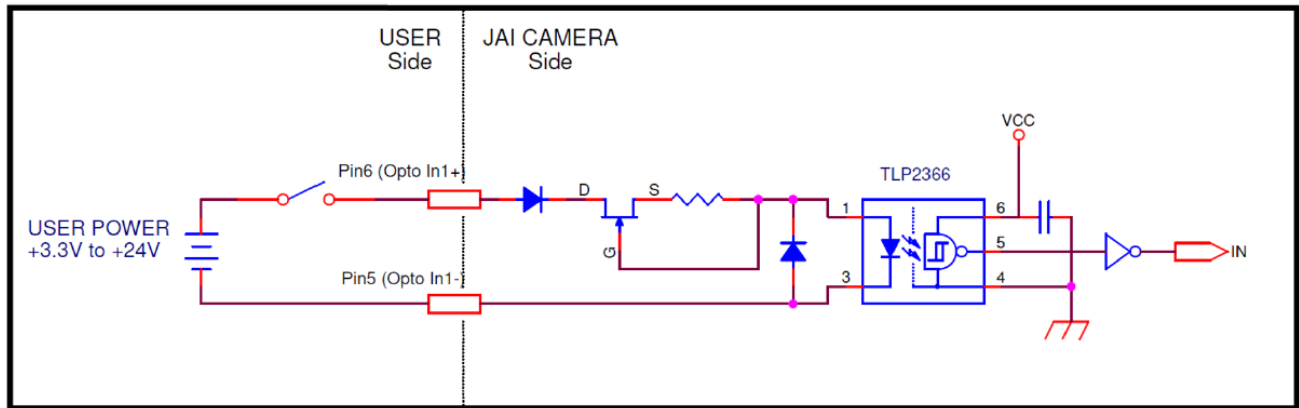
- Be sure to use a power supply that can support the maximum power consumption of this camera. (See "[Specifications](#)").
- The 4000Q and 8000Q models do not support the PoE function.

TTL Signal specification

TTL out signal specification (Typ.)	Output voltage: Low 0.0V, High 5.0V
	Input/Output current: +/-32mA
TTL in signal specification (Typ.)	Input voltage: Low 0.0 ~ 0.8V, High 2.0 ~ 5.5V

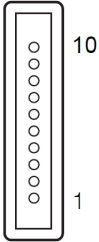
Caution: About Opto In: Check the recommended external input circuit diagram (reference example) and connect correctly. If you connect Opto In 1 and Opto In 2 in reverse, camera may be damaged.

Recommended External Input Circuit Diagram (Reference Example)



② AUX Connector (10-pin)

Connect the cable for DC IN / trigger IN here.

 Camera side: 3260-10S3 (55) Cable side: 3240-10P-C (50)	Pin #	I/O	Signal	Description
	1	Out	TTL OUT2	Line 8
	2	Out	TTL OUT3	Line 9
	3	In	TTL_IN2	Line 10
	4		N.C	
	5	GND	GND	
	6	In	TTL_IN3	Line 13
	7		N.C	
	8		N.C	
	9	GND	GND	
	10	GND	GND	

③ RJ-45 Connector (10GE Models)

The 10GE models support the following Ethernet standards: 1000Base-T, 2.5GBase-T, 5GBase-T, 10GBase-T

Depending on the Ethernet standard to be used, the cable type and the maximum cable length are limited. For details, refer to "[Step 2: Connect Devices](#)".

④ SFP+ Connector (SFP Models)

The camera supports 10GBASE-R Ethernet standards.

Requirements specification for SFP+ module:

- Support 10GBASE-R
- Support Power level 1

Depending on the Ethernet standard to be used, the cable type and the maximum cable length are limited. For details, refer to "[Step 2: Connect Devices.](#)"

LEDs

The table below shows the LED light and camera status.

■ POWER TRIG

Light		Status
	Lit amber	Camera initializing.
	Lit green	Camera in operation.
	Blinking green	During operation in trigger mode, trigger signals are being input. Note: The blinking interval is not related to the actual input interval of the external trigger.

LINK / ACT (10GE Models)

	LED	Light		Status
A: LINK LED Indicates the link status of the network. B: ACT LED Indicates the network communication status	A: LINK		Light off	Network Link is not established.
			Blinking green - slow	1000Base-T Link is established. (Interval 1sec)
			Blinking green - fast	2.5GBase-T Link or 5GBase-T Link is established. (Interval 200 msec)
			Lit green	10GBase-T Link is established.
	B: ACT		Light off	No network communication
			Blinking green	(Tx) Network communication in progress.
			Blinking yellow	(Rx) Network communication in progress.

Mounting Holes

Use these holes when mounting the camera directly to a wall or other structural system.

Location	Description
Bottom	M4, Depth 6mm
Front	M4, Depth 5mm
Top	M4, Depth 6mm

Note: Refer to "[Dimensions](#)" for the location of the mounting holes.

Preparation

Read this section to learn how the camera connects to devices and accessories. The preparation process is described below.

1	<u>Step 1: Install the Software (First Time Only)</u> Install the software for configuring and controlling the camera (eBUS SDK for JAI) on the computer.
2	<u>Step 2: Connect Devices</u> Connect the lens, cable, AC adapter, computer, and other devices.
3	<u>Step 3: Verify Camera Operation</u> Verify whether the camera is turned on and ready for use.
4	<u>Step 4: Verify the Connection between the Camera and PC</u> Verify whether the camera is properly recognized via eBUS Player for JAI.
5	<u>Step 5: Configure Trigger, Exposure, and Line Rate Settings</u> Configure the camera's basic settings by referencing the examples.
6	<u>Step 6: Adjust the Image Quality</u> Perform DSNU, PRNU and other basic settings for image quality.
7	<u>Step 7: Save the Settings</u> Save the current setting configurations in user memory.

Step 1: Install the Software (First Time Only)

When using the camera for the first time, install the software for configuring and controlling the camera (eBUS SDK for JAI) on the computer.

Notes:

- When you install eBUS SDK for JAI, eBUS Player for JAI will also be installed.
- Please refer to JAI's software page (www.jai.com/support-software/jai-software) for OS requirements.

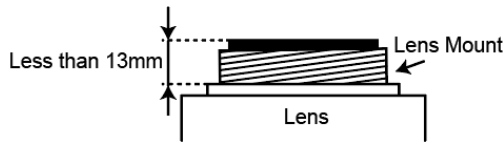
- Download the eBUS SDK for JAI from the JAI website (<https://www.jai.com/support-software/jai-software>).
- Install eBUS SDK for JAI on the computer.

Step 2: Connect Devices

10GE Model	
SFP Model	
<u>① Lens</u> <u>③ LAN Cable (10GE Models)</u> <u>⑤ DC IN / Trigger IN Connection Cable</u> <u>⑦ SFP+ Module (SFP Models)</u> <u>② Mounting</u> <u>④ Network Card (10GE Models)</u> <u>⑥ AC Adapter</u> <u>⑧ Fiber Optic Cable (SFP Models)</u>	

① Lens

F-mount or M-52 mount lenses with lens mount protrusions of 13 mm or less can be attached.



- Back flange distance (both F- and M52-mount): 46.5 mm

Caution: The maximum performance of the camera may not be realized depending on the lens.

Note: The following formula can be used to estimate the focal length: **Focal length = $WD / (1 + W/w)$**

- WD: Working distance (distance between lens and object)
- W: Width of object
- w: Width of sensor

② Mounting

When mounting the camera directly to other device, use screws that match the mounting holes on the camera. ([Mounting Holes](#))

Caution: For heavy lenses, be sure to support the lens itself. Do not use configurations in which its weight is supported by the camera.

③ LAN Cable (10GE Models)

Connect a LAN cable to the RJ-45 connector.

Caution: See the [Notes on LAN Cable Connection \(10GE Models\)](#) topic as well.

The camera supports the following Ethernet standards: 1000Base-T, 2.5GBase-T, 5GBase-T, 10GBase-T

- Use a LAN cable that is Category 5e or higher (Category 6 is recommended).
- Refer to the specifications of the cable for details on its bend radius.
- The longest cable length varies depending on the type of LAN cable and the Ethernet standard. Below, the table shows the relationship diagram between LAN cable type and Ethernet standard. Correctly select the LAN cable type according to the Ethernet standard to be used.

Longest Cable Length

	Cat5e	Cat6/Cat6e	Cat6A	Cat7
1000Base-T	100m	100m	100m	100m
2.5GBase-T	100m	100m	100m	100m
5GBase-T	100m	100m	100m	100m
10GBase-T	-	55m	100m	100m

④ Network Card (10GE Models)

Install this in the computer that will be used to configure and operate the camera. Refer to the instruction manual of the network card, and configure settings on the computer as necessary.

⑤ DC IN / Trigger IN Connection Cable

Performs external I/O such as power supply and trigger input.

⑥ AC Adapter

Connect the AC adapter and the round connector of the connection cable to the DC IN / Trigger IN connector on the camera.

⑦ SFP+ Module (SFP Models)

Check the operation manual of the SFP+ module to be used, and attach it or remove it from the camera. The SFP+ module can be attached to and removed from the camera only when the camera is turned off.

Cautions:

- Many SFP+ modules and fiber optic cables are Class 1 laser products. Do not look into connectors and cables when installing or removing. There is a risk of injury to eyes.
- Do not exceed the operational temperature of this camera (SFP models) and SFP+ module.

⑧ Fiber Optic Cable (SFP Models)

The longest cable length varies depending on the type of 10GBASE-R standard and SFP+ module.

Below shows the relationship between fiber optic cable type and 10GBASE-R standard. Correctly select the fiber optic cable type according to the 10GBASE-R standard and SFP+ module to be used.

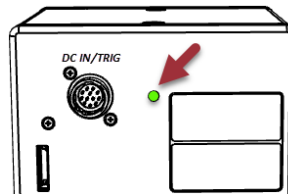
Maximum Fiber Optic Cable Length

- 10GBase-SR : 300m (Fiber optic cable type OM3), 400m (Fiber optic cable type OM4)
- 10GBase-LR : 10km (Fiber optic cable type OS2)
- 10GBase-ER : 40km (Fiber optic cable type OS2)

Step 3: Verify Camera Operation

When power is supplied to the camera while the necessary equipment is connected, the POWER/TRIG LED at the rear of the camera lights amber, and initialization of the camera starts. When initialization is complete, the POWER/TRIG LED lights green.

Verify whether power is being supplied to the camera by checking the rear LED. When properly turned on, the power LED is lit green.



Note: For details on how to read the LEDs, see the [LEDs](#) section.

Step 4: Verify the Connection between the Camera and PC

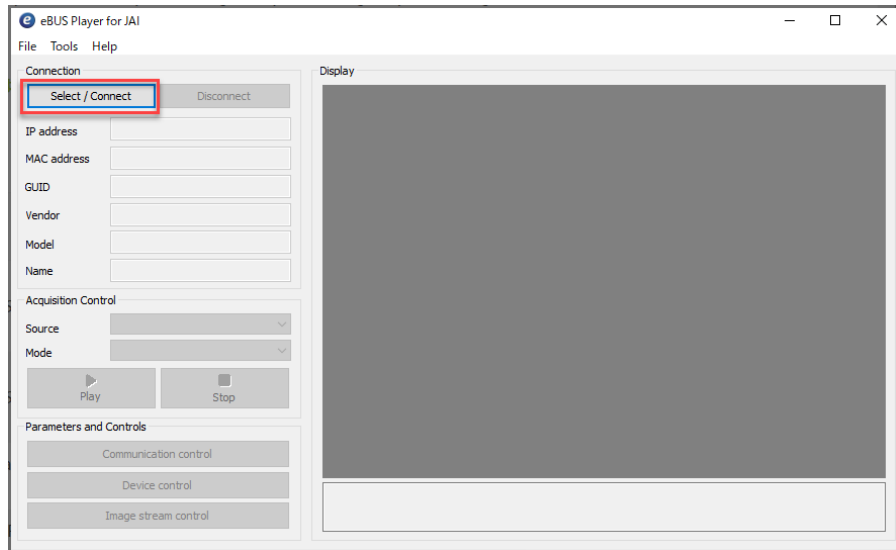
Verify whether the camera is properly recognized eBUS Player for JAI.

1. Launch eBUS Player for JAI.

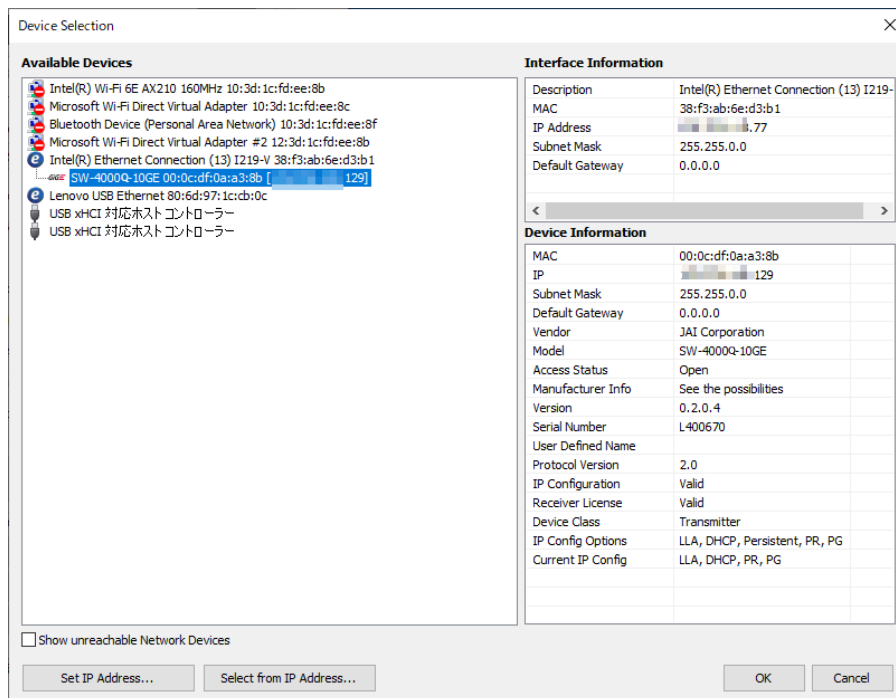


eBUS Player for JAI startup screen appears.

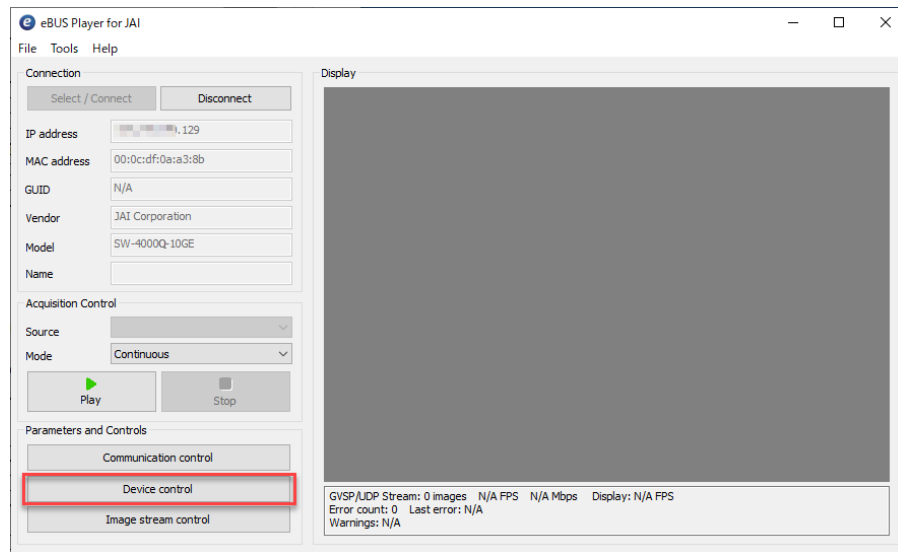
- Click the **Select / Connect** button.



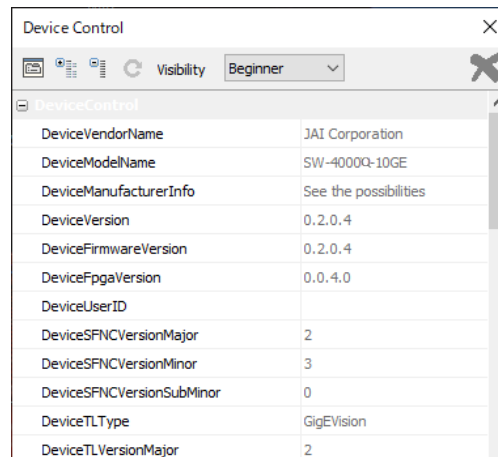
- The connected camera is listed. Please select one camera and click **OK**.



4. Check that the settings of the selected camera are displayed.



5. Click the **Device control** button. The DeviceControl window will be displayed. In this window, you can adjust various settings of the camera.



6. This completes the procedure for verifying whether the camera is properly recognized and whether control and settings configuration are possible.

Step 5: Configure Trigger, Exposure, and Line Rate Settings

Related Setting Items: [AcquisitionControl](#)

This section describes five scenarios for controlling the trigger, exposure, and line rate.

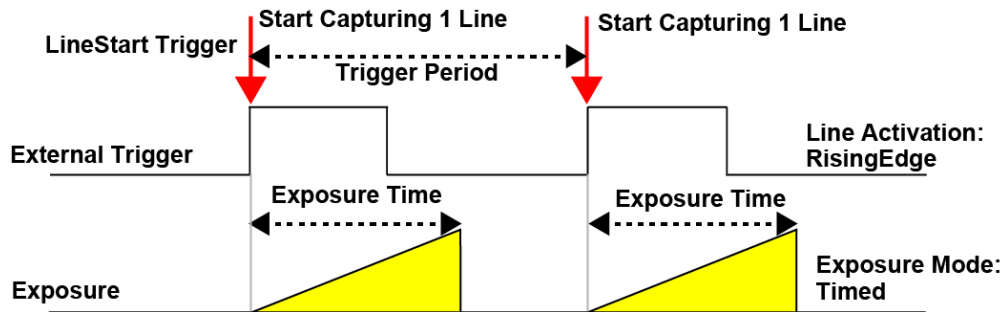
Notes:

- This section is intended to explain the basic relationship between the trigger, exposure, and line rate.
- For detailed timings, see "[Timing Chart](#)".

Trigger	Exposure	Example
ON	Timed	Control via External Triggers with the Specified Exposure Time
	Off	Control via External Triggers without Specifying the ExposureTime
	TriggerWidth	Control via External Triggers with Exposure Time Set to TriggerWidth
Off	Timed	Control without External Triggers with the Specified Exposure Time
	Off	Control without External Triggers without Specifying the Exposure Time

Control via External Triggers with the Specified Exposure Time

In the example below, **TriggerSelector** is set to **LineStart**.



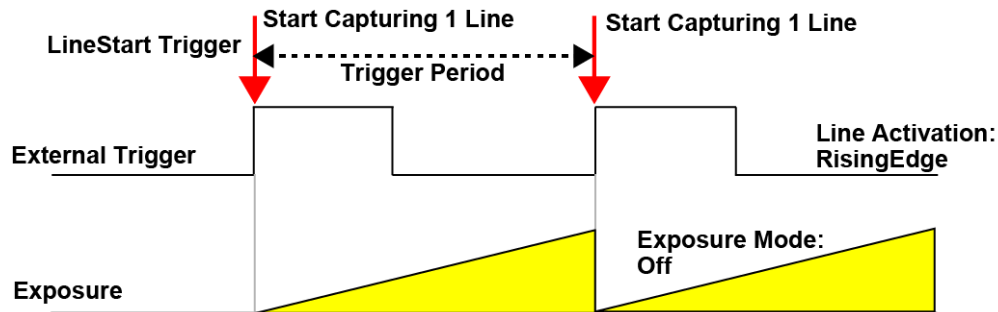
Notes:

- When using external triggers, the line rate is determined by the trigger period.
- The ExposureTime value cannot be longer than the trigger period.
- For details on internal delays, see your model's **ExposureMode: Timed** table ([Timing Chart](#)).

Item	Setting Value / Selectable Range
Trigger Mode	On
Trigger Selector	Line Start
Trigger Source	Any
Trigger Activation	RisingEdge (rising edge of input signal) or FallingEdge (falling edge of input signal)
Exposure Mode	Timed (control via exposure time)
Exposure Time	Varies depending on settings.

Control via External Triggers without Specifying the ExposureTime

In the example below, **TriggerSelector** is set to **LineStart**.



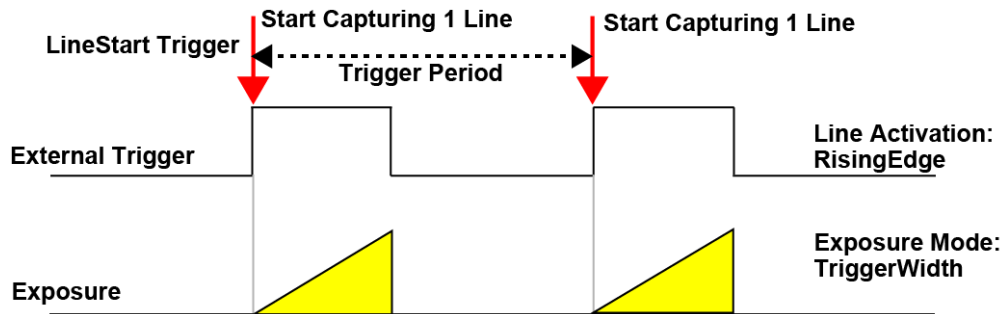
Notes:

- When using external triggers, the line rate is determined by the trigger period.
- The exposure is performed with an exposure time calculated from $1 / (\text{line rate})$.
- For details on internal delays, see your model's **ExposureMode: Off** table ([Timing Chart](#)).

Item	Setting Value / Selectable Range
Trigger Mode	On
Trigger Selector	Line Start
Trigger Source	Any
Trigger Activation	RisingEdge (rising edge of input signal) or FallingEdge (falling edge of input signal)
Exposure Mode	Off

Control via External Triggers with Exposure Time Set to TriggerWidth

In the example below, **TriggerSelector** is set to **LineStart**.



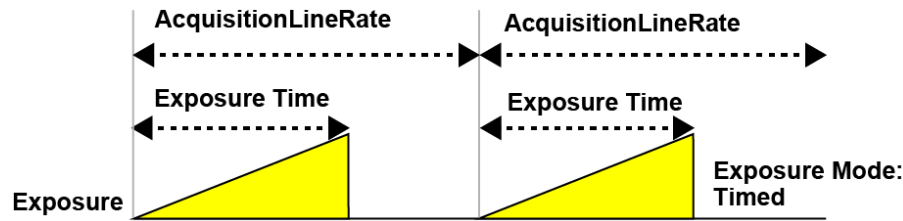
Notes:

- When using external triggers, the line rate is determined by the trigger period.
- For details on internal delays, see your model's **ExposureMode: TriggerWidth** table ([Timing Chart](#)).

Item	Setting Value / Selectable Range
Trigger Mode	On
Trigger Selector	Line Start
Trigger Source	Any
Trigger Activation	LevelHigh (high-level duration) or LevelLow (low-level duration)
Exposure Mode	TriggerWidth (control via trigger width)

Control without External Triggers with the Specified Exposure Time

Configure the settings as follows.



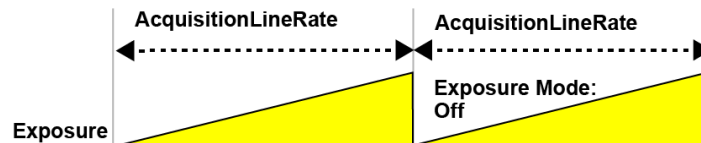
Notes:

- The line rate can be set up to 1 line cycle to match the speed of the object or to lengthen the accumulation time to increase sensitivity.
- The ExposureTime value cannot be longer than the line period.

Item	Setting Value / Selectable Range
Trigger Mode	Off
Exposure Mode	Timed (control via exposure time)
Exposure Time	Varies depending on settings.
Acquisition Line Rate	Varies depending on the PixelFormat and Link speed.

Control without External Triggers without Specifying the Exposure Time

Configure the settings as follows.



Notes:

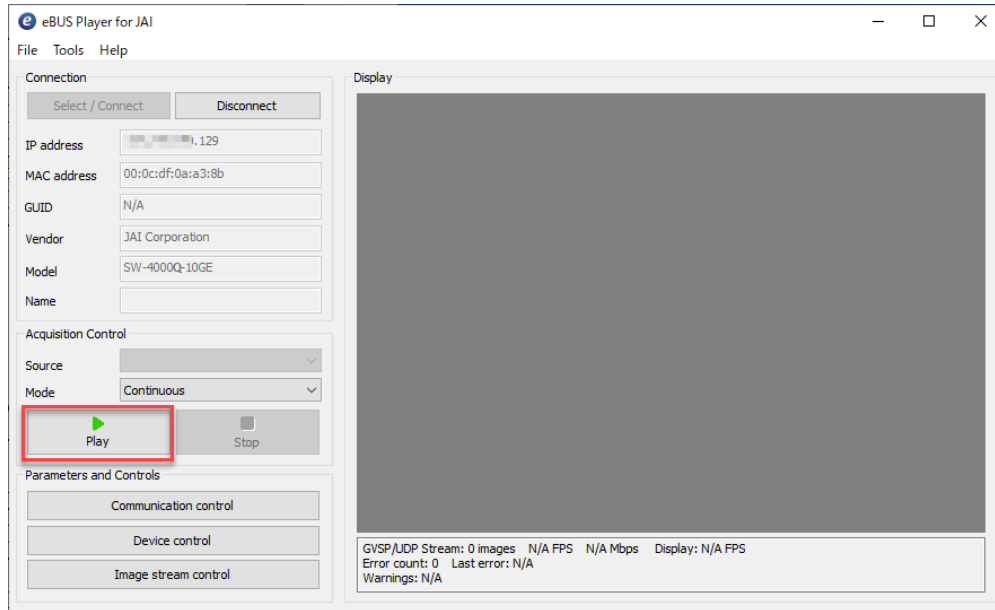
- The line rate can be set up to 1 line cycle to match the speed of the object or to lengthen the accumulation time to increase sensitivity.
- The exposure will be performed with an exposure time equal to 1 / line rate.

Item	Setting Value / Selectable Range
Trigger Mode	Off
Exposure Mode	Off
Acquisition Line Rate	Varies depending on the PixelFormat and Link speed.

Step 6: Adjust the Image Quality

Related Setting Items: [AnalogControl](#)

Display the image captured by the camera. When you click the **Play** button, the camera image appears in the right area.



Note: It is recommended to set **GevGVCPPendingAck** in [Transport Layer Control](#) to True. When a time-consuming process such as white balance is performed, this camera returns an Ack response when the process is completed. In this case, some camera control software may cause a timeout error without waiting for an Ack response from the camera. When the **GevGVCPPendingAck** setting is enabled, if a time-consuming process is performed, the camera immediately returns a Pending Ack response and returns an Ack response when the processing is completed. The Timeout errors are prevented.

To get the best performance from the camera, set the following functions in the following order.

1. [DSNU Correction \(Pixel Black Correct\)](#)
2. [PRNU Correction \(Pixel Gain Correct\)](#)
3. [Adjust the Black Level](#)
4. [Adjust the White Balance](#)

DSNU Correction (Pixel Black Correct)

Related Setting Items: [Correction](#)

DSNU (dark signal non-uniformity) is a variation between pixels in the dark areas generated by the sensor. If the line rate is slowed or a long exposure time is set, the dark current in the sensor may change and the state of the DSNU may change.



1. Place the sensor protection cap on the camera.
2. Start image acquisitions with AcquisitionStart [\[AcquisitionControl\]](#).
3. Specify the user area (User1 ~ User3) to save the black level correction value with **PixelBlackCorrectionMode** ([Correction](#)).

Note: Default saves the correction data set at the factory. You cannot overwrite this data.

4. Execute **CalibratePixelBlackCorrection**. Black level correction data is automatically generated and saved in the user area specified in PixelBlackCorrectionMode.

Caution: This camera may take several minutes or more to complete DSNU correction, especially when the line rate setting is low.

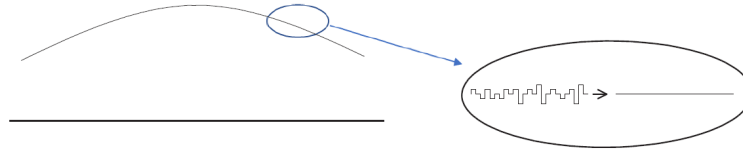
5. You can check the execution result of black level correction by **PixelBlackCalibrationResult**.

Result	Description
Idle	No correction has been performed.
Succeeded	The correction has been successfully completed. The correction data has been saved to the user area specified in PixelBlackCorrection.
Error1 - Image was too bright	Correction failed. The image was too bright.
Error2 - Image was too dark	Correction failed. The image was too dark.
Error3 - Could not calibrated	Could not perform the correction because the camera is in one of the following status: • The image is not being output. • TestPattern[ImageFormatControl] is set to anything other than Off. • PixelBlackCorrectionMode is set to Off or Default.

PRNU Correction (Pixel Gain Correct)

Related Setting Items: [Correction](#)

PRNU (photo response non-uniformity) is a variation between pixels generated by the sensor under bright conditions. If the line rate is slowed or a long exposure time is set, the dark current in the sensor may change and the state of the PRNU may change.



How to Execute

Notes:

- The video level should be between 70% and 90% of the saturation level.
- The lens should be defocused.
- The subject should be a white, flat surface (such as a sheet of white paper).

1. If you want to specify the area to calculate the correction value, configure the area with the **Width** and **OffsetX** settings [[ImageFormatControl](#)]. For more information, see "[ROI \(Regional Scanning Function\)](#)".
2. Specify the user area (User1 ~ User3) to save the gain correction value with **PixelGainCorrectionMode** ([Correction](#)).

Note: **Default** saves the correction data set at the factory. You cannot overwrite this data.

3. Execute **CalibratePixelGainCorrection** and correct the image. Gain correction data is automatically generated and saved in the area specified in **PixelGainCorrectionMode**. Then, the calibration result "Succeeded" is displayed in **PixelGainCalibrationResult**.

Caution: This camera may take several minutes or more to complete PRNU correction, especially when the line rate is low.

4. You can check the execution result of gain correction by **PixelBlackCalibrationResult**.

Result	Description
Idle	No Correction has been performed.
Succeeded	The correction data has been applied and saved in the user area specified in PixelGainCorrectionMode.

Result	Description
Error1 - Image was too bright	Correction failed. The image was too bright.
Error2 - Image was too dark	Correction failed. The image was too dark.
Error3 - Could not calibrated	Could not perform the correction because the camera is in one of the following status: • The image is not being output. • TestPattern[ImageFormatControl] is set to anything other than Off. • PixelGainCorrectionMode is set to Off or Default.

Adjust the Black Level

Related Setting Items: [AnalogControl](#)

Black level correction is a function for adjusting the setup level. When this function is used, the following is performed for the gain mode setting.

1. Select the black level you want to configure in **BlackLevelSelector**. (All, Red, Blue, NIR)
2. Specify the adjustment value in **BlackLevel**. (All: -133 ~ 255; Red/Blue/NIR: -64 ~ 64)

Adjust the White Balance

Related Setting Items: [AnalogControl](#)

Adjust the white balance using the automatic adjustment function.

Automatic White Balance Adjustment

1. Place a white sheet of paper or similar object under the same lighting conditions as the intended subject, and zoom in to capture the white. White objects near the subject, such as a white cloth or wall, can also be used. Be sure to prevent the high-intensity spot lights from entering the screen.
2. If necessary, use **BalanceWhiteAutoWidth** and **BalanceWhiteAutoOffsetX** to configure the white balance adjustment area.
3. Select **Once** or **ExposureOnce** from **BalanceWhiteAuto**.
 - **Once**: The white balance is automatically adjusted by calculating Red / Blue of the Gain control ([AnalogControl](#)). When **IndividualGainMode** = **Off**, the white balance is adjusted based on **DigitalAll** of the Gain setting, and when **IndividualGainMode** = **On**, it is adjusted based on **DigitalGreen** of the **Gain** setting.

- **ExposureOnce**: The white balance is automatically adjusted by calculating Red / Blue of the ExposureTime setting based on the Green ExposureTime setting ([AcquisitionControl](#)).

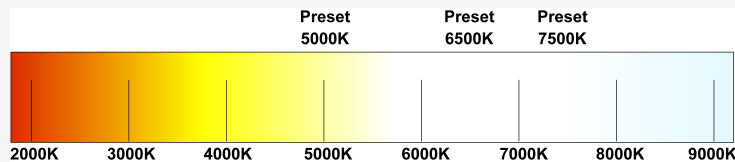
Notes:

- To use the **ExposureOnce** option, **ExposureTimeMode** ([AcquisitionControl](#)) must be set to **Individual**.
- When **RBExposureInterlocked** ([AcquisitionControl](#) is On, the white balance will not be adjusted automatically, however BalanceWhiteAutoResult displays "Succeeded".

- The white balance is automatically adjusted. After the adjustment, "**Succeeded**" is displayed in **BalanceWhiteAutoResult**. Once the adjustment is completed, BalanceWhiteAuto returns to Off.
- The table below shows a list of the adjustment result:

Result	Description
Idle	No adjustment has been performed.
Succeeded	Adjustment was completed successfully. After the adjustment, BalanceWhiteAuto returns to Off.
Error1 - G image was too bright	Adjustment failed. The Green level was too high compared to the Red or Blue level.
Error2 - G image was too dark	Adjustment failed. The Green level was too low compared to the Red or Blue level.
Error3 - Timeout	Adjustment failed. Adjustment was repeated for 10 seconds without success.

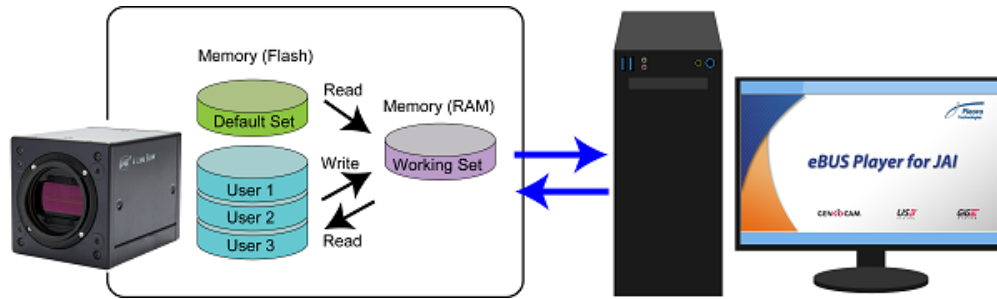
Note: On this camera, the white balance can also be set to "Color Temperature" (**Preset5000K**, **Preset6500K**, **Preset7500K**). When using the Color Temperature option, **IndividualGainMode** [[AnalogControl](#)] must be set to **Off**.



Step 7: Save the Settings

Related Setting Items: [UserSetControl](#)

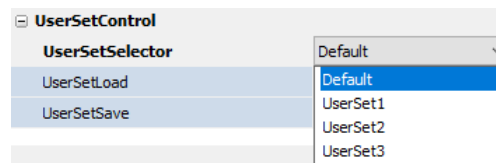
The configured setting values will be deleted when the camera is turned off. By saving current setting values to user memory, you can load and recall them whenever necessary. You can save up to three sets of user settings in the camera. (User Set1 to 3)



Note: The camera has non-volatile flash memory for users to store data; however, images should be saved to a PC or other storage location using eBUS Player for JAI (Image and Video Saving Options).

To Save User Settings

1. Stop image acquisition.
2. Expand **UserSetControl** and select the save destination (UserSet1 to UserSet3) in UserSetSelector.



Note: The factory default setting values are stored in Default and cannot be overwritten.

Caution: Settings can only be saved when image acquisition on the camera is stopped.

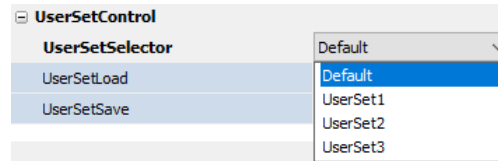
3. Select **UserSetSave** and click the **UserSetSave** button.



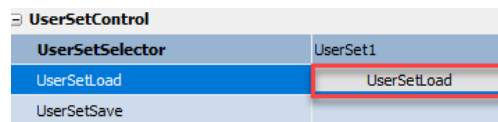
4. The current setting values are saved as user settings.

To Load User Settings

1. Stop image acquisition. User settings can only be loaded when image capture on the camera is stopped.
2. Select the settings to load (UserSet1 to UserSet3) in UserSetSelector.



3. Select **UserSetLoad** and click the **UserSetLoad** button.



4. The selected user settings are loaded.

Note: When selecting **Default** for UserSetSelector, the factory settings are loaded.

Main Functions

This chapter describes the camera's main functions.

Valid Input / Output Combinations

The following signals can be used as sources for each output destination (Trigger Selector, Line Selector, Pulse Generator Selector). The combinations of source signals and output destinations are indicated in the following.

Trigger Selector, Pulse Generator

	Output Destination					
	Trigger Selector					Pulse Generator Selector 0 ~ 3
	Acquisition Start	Acquisition End	Frame Start	Line Start	Frame Transfer Start	
Line4 TTL In1	•	•	•	•	•	•
Line5 Opt In 1	•	•	•	•	•	•
Line 10 TTL In 2	•	•	•	•	•	•
Line 13 TTL In 3	•	•	•	•	•	•
UserOutput0 ~ 3	•	•	•	•	•	•
Action0 ~ 3	•	•	•	•	•	
PulseGenerator 0 ~ 3	•	•	•	•	•	
EncoderTrigger	•	•	•	•	•	•
EncoderDirection						
LogicBlock 0 ~ 1	•	•	•	•	•	•
AcquisitionActive						
ExposureActive						•
LVAL						•

Line Selector

	Output Destination				
	Line Selector				
	Line1 TTL Out 1	Line8 TTL Out2	Line9 TTL Out3	Line12 TTL Out4	Logic Block 0 ~1
Line4 TTL In1	•	•	•	•	•
Line5 Opt In 1	•	•	•	•	•
Line 10 TTL In 2	•	•	•	•	•
Line 13 TTL In 3	•	•	•	•	•
UserOutput0 ~ 3	•	•	•	•	•
Action0 ~ 3					
PulseGenerator 0 ~ 3	•	•	•	•	•
EncoderTrigger	•	•	•	•	•
EncoderDirection	•	•	•	•	
LogicBlock 0 ~ 1	•	•	•	•	• (See Note)
AcquisitionActive	•	•	•	•	•
ExposureActive	•	•	•	•	•
LVAL	•	•	•	•	•
Note: Cannot select the same Logic Block. For example, when configuring LogicBlock0, you cannot select LogicBlock0 from Line Selector.					

ROI (Regional Scanning Function)

Related Setting Items: [ImageFormatControl](#)

The ROI (region of interest) function allows you to output images by specifying the area to scan.

ROI Settings

Specify the area to scan by specifying the Width, Height, Horizontal Offset, and Vertical Offset values ([ImageFormatControl](#)).

The setting ranges for the ROI function's readable area based on the Binning setting are as follows.

- **Width / OffsetX (Pixels)**

Model	BinningHorizontal	Width (Pixel)	Offset X (Pixel)
4000Q Models	1 (Off)	16 ~ 4096, Step 16	0 ~ 4080, Step 16
	2 (On)	8 ~ 2048, Step 8	0 ~ 2040, Step 8
8000Q Models	1 (Off)	16 ~ 8192, Step 16	0 ~ 8176, Step 16
	2 (On)	8 ~ 4096, Step 8	0 ~ 4088, Step 8

- **Height / OffsetY (Lines)**

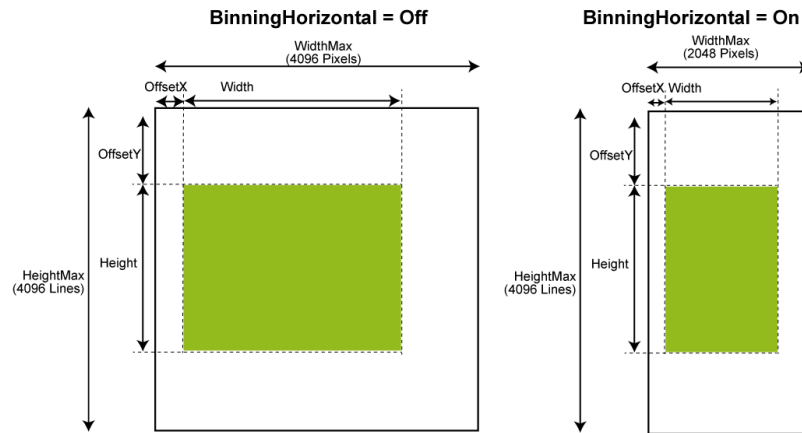
For both the 4000Q and 8000Q models, the setting range is as follows, regardless of the SensorBinningVertical setting.

- **Height:** 1 ~ 4096, Step 1
- **OffsetY:** 0 ~ 4096, Step 1

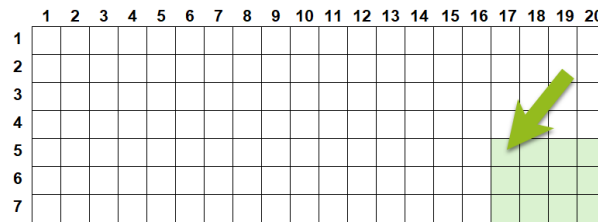
Notes:

- This camera streams Width x Height data as 1 block.
- For details on the relationship between this function and line rate, see "[Maximum Line Rate \(Approximate\)](#)".

■ Example (4000Q Models)



For example, when **OffsetX** is set to 16 and **OffsetY** is set to 4, the first readout pixel is the 17th pixel on Line 5.



Binning Function

Related Setting Items: [ImageFormatControl](#)

The Binning function allows you to combine the signal values of clusters of adjacent pixels to create improved virtual pixels. Using this function results in images with higher sensitivity (Sum Mode).

Binning Off	Binning On (Sum Mode)
	

This camera supports BinningHorizontal and SensorBinningVertical.

Binning Type	Process Method	Supported Mode
BinningHorizontal	Digital (FPGA)	Sum
SensorBinningVertical*	Analog (Sensor)	Sum

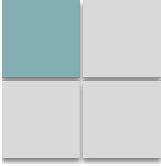
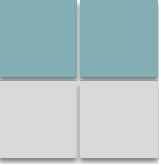
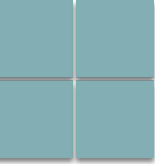
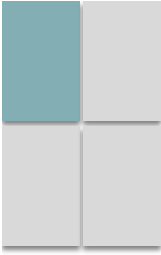
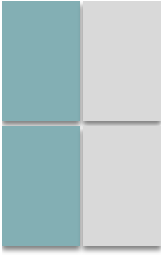
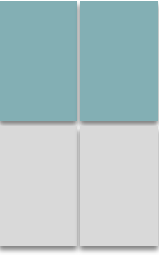
*The vertical resolution will not change even if SensorBinningVertical is set to On (= 2).

Note: Refer to JAI's blog "[Using pixel binning to increase image quality under low light conditions](#)" on how to use the Binning function.

Binning Types

4000Q Models

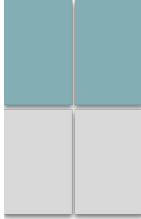
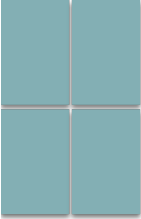
The 4000Q models support the following binning types by combining Type A / Type B Sensor Type and horizontal / vertical binning (BinningHorizontal / Binning Vertical).

Sensor Type	Binning Off	1 x 2	2 x 1	2 x 2
	WidthMax: 4096 pixels		WidthMax: 2048 pixels	
Type A				
	7.5 μ m x 7.5 μ m	7.5 μ m x 15.0 μ m	15.0 μ m x 7.5 μ m	15.0 μ m x 15.0 μ m
Type B				
	7.5 μ m x 10.5 μ m	7.5 μ m x 21.0 μ m	15.0 μ m x 10.5 μ m	15.0 μ m x 21.0 μ m

Note: TypeA / Type B Sensor Type can be configured in **SensorType** ([AnalogControl](#)).

8000Q Models

The 8000Q models support the following binning types.

Binning Off	1 x 2	2 x 1	2 x 2
WidthMax: 8192 pixels		WidthMax 4096 pixels	
			
3.75 μ m x 5.78 μ m	3.75 μ m x 11.56 μ m	7.50 μ m x 5.78 μ m	7.50 μ m x 11.56 μ m

Pixel Format

Related Setting Items: [ImageFormatControl](#)



Technical Notes

Pixel Format Alignments for GigE Vision

This camera can capture the image in the visible region and the near infrared region (NIR) simultaneously. There are the following two ways of sending data of the two captured images from the camera.

Note: When using the SW-4000Q model, if your image display application does not display NIR data, you can set **OutputLineSelector** ([ImageFormatControl](#)) to output NIR at the conventional R, G, or B position. For example, when set to Rch=NIR / Gch=Green / Bch=Blue / Nch=Red, NIR is output at the conventional R position.

Single-Stream Output

A single stream (Stream0) outputs the visible and near infrared (NIR) image in the same stream.



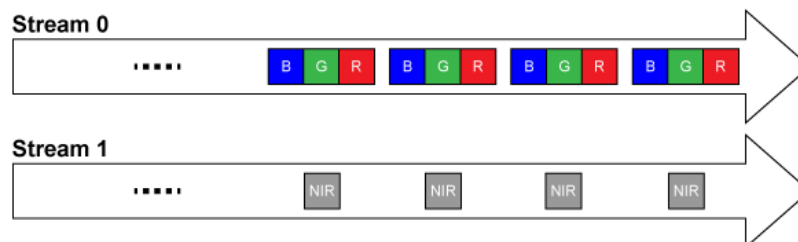
How to Configure

1. Select **RGB** from **ComponentSelector** [\[ImageFormatControl\]](#).
2. Select **RGBa8** from **PixelFormat**.

Dual Stream Output

Two streams (Stream0 and Stream1) separately output the visible and near infrared (NIR) images.

Note: See "[Appendix](#)" for how to configure the dual stream settings.



How to Configure

1. Select **RGB** from **ComponentSelector** [\[ImageFormatControl\]](#).
2. Select the pixel format for Stream0 from **PixelFormat**. See the table below for selectable pixel formats.
3. Select **NIR** from **ComponentSelector**.

Note: When ComponentSelector is set to RGB and PixelFormat is set to RGBa8, the PixelFormat setting for NIR is disabled.

4. Select the pixel format for Stream1 from **PixelFormat**. See the table below for selectable pixel formats.

There are ten combinations of PixelFormat that can be set.

Stream0 (RGB)	Stream1 (NIR)
RGB8	Mono8
RGB8	Mono10Packed
RGB10V1Packed	Mono8
RGB10V1Packed	Mono10Packed
RGB10p32	Mono8
RGB10p32	Mono10Packed
YUV422_8	Mono8
YUV422_8	Mono10Packed
YUV422_8_UYUY	Mono8
YUV422_8_UYUY	Mono10Packed

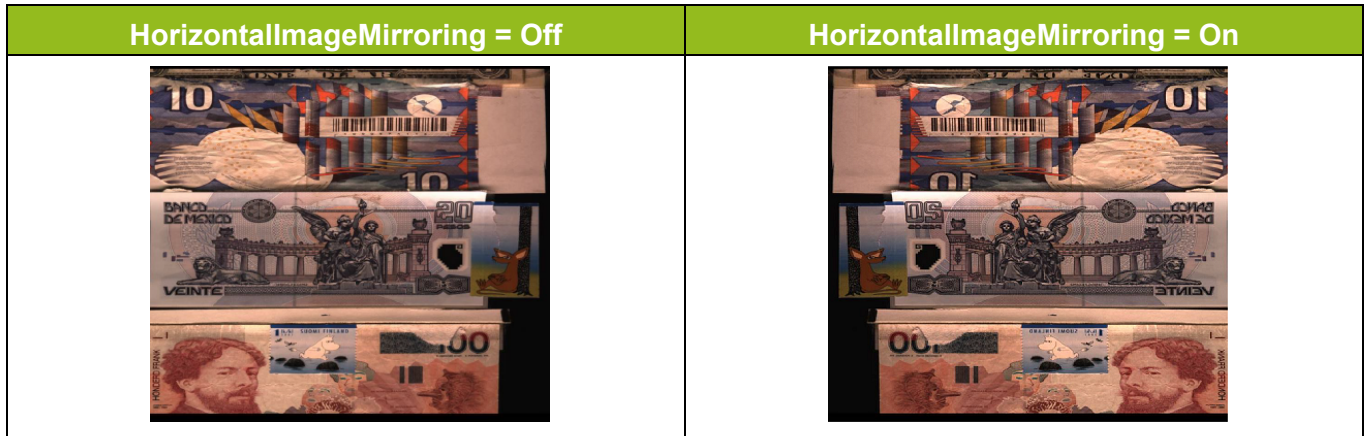
- The fastest line rate can be realized by setting "YUV422_8 and Mono8" or "YUV422_8_UYVY and Mono8" with the smallest number of bits per pixel.
- By setting "RGB10V1Packed and Mono10Packed" or "RGB10p32 and Mono10Packed", which has the largest number of bits per pixel, the highest image quality can be taken.

Note: Stream 0, Stream 1 are two UDP streams, each assigned a different port number. The assigned port number can be confirmed with the following settings. Select the stream whose port number you want to check from **GevStreamChannelSelector** [\[Transport Layer Control\]](#), the port number will be displayed in **GevSCSP**.

Horizontal Image Mirroring

Related Setting Items: [ImageFormatControl](#)

The HorizontalImageMirroring function allows you to flip an image horizontally.

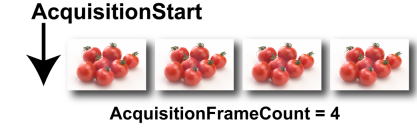


Note: The **Width** and **OffsetX** settings are not affected by this function because the image is flipped after the image acquisition.

Acquisition Control

Related Setting Items: [AcquisitionControl](#)

Use the [AcquisitionControl](#) settings to perform operations and settings for image capture. This camera supports the following Acquisition modes.

AcquisitionMode	Description	
SingleFrame	When the AcquisitionStart command is executed, one frame of image is captured.	
MultiFrame	When the AcquisitionStart command is executed, the number of frames set in AcquisitonFrameCount are acquired as images.	
Continuous	When the AcquisitionStart command is executed, images will continue to be acquired until the AcquisitionStop command is executed.	

Change the Line Rate

Related Setting Items: [AcquisitionControl](#)

When **TriggerMode** is set to **Off**, you can set the line rate using **AcquisitionLineRate**. This function can be used to match the scanning speed of the camera to the feeding speed of the object or to lengthen the accumulation time to increase sensitivity.

The minimum value that can be set is 66 Hz, and the maximum value varies depending on the settings (see "[Maximum Line Rate \(Approximate\)](#)" for more information).

Supported Operation Mode

ExposureMode	TriggerMode	Example
Timed	Off	Control without External Triggers with the Specified Exposure Time
Off	Off	Control without External Triggers without Specifying the Exposure Time

Notes:

- You can also save the setting, and have it applied whenever the power is subsequently turned on, but this requires additional operations. ([Step 7: Save the Settings](#))
- The black level will change depending on the line rate, so be sure to readjust the black level after changing the line rate or trigger period.

Maximum Line Rate (Approximate)

Related Setting Items: [AcquisitionControl](#)

The below table show the maximum line rate in different [ROI \(Regional Scanning Function\)](#) and [Pixel Format](#) settings.

Notes:

- The maximum line rates shown below are when `GevSCPDPacketSize` = 8976byte, `LinkSpeed` = 10Gbps, `ExposureTime` = 3μs, and `Height` = 1.
- When `BinningHorizontal` ([ImageFormatControl](#)) = 2 (ON), the Width value after Binning applies.
- The frame rate can be calculated using the following formula: $\text{Frame Rate} = \text{Line Rate} / \text{Height}$

4000Q Models

Width	Max Line Rate						
	RGBa8	RGB8 + Mono8	RGB8 + Mono10p	RGB10p* + Mono8	RGB10p* + Mono10p	YUV422** + Mono8	YUV422** + Mono10p
4096 (Full)	73kHz	72kHz	64kHz	58kHz	53kHz	74kHz	74kHz
3072 (3/4)	97kHz	94kHz	84kHz	76kHz	70kHz	98kHz	98kHz
2048 (1/2)	145kHz	138kHz	124kHz	113kHz	103kHz	148kHz	148kHz
1024 (1/4)	183kHz	183kHz	183kHz	183kHz	183kHz	183kHz	183kHz
*RGB10p: RGB10V1Packed, RGB10p32							
**YUV422: YUV422_8, YUV422_8_UYUY							

8000Q Models

Width	Max Line Rate						
	RGBa8	RGB8 + Mono8	RGB8 + Mono10p	RGB10p* + Mono8	RGB10p* + Mono10p	YUV422** + Mono8	YUV422** + Mono10p
8192 (Full)	37kHz	36kHz	32kHz	29kHz	26kHz	37kHz	37kHz
6144 (3/4)	49kHz	48kHz	43kHz	39kHz	35kHz	49kHz	49kHz
4096 (1/2)	74kHz	72kHz	64kHz	58kHz	53kHz	74kHz	74kHz
2048 (1/4)	100kHz	100kHz	100kHz	100kHz	100kHz	100kHz	100kHz
*RGB10p: RGB10V1Packed, RGB10p32							
**YUV422: YUV422_8, YUV422_8_UYUY							

Trigger Control

Related Setting Items: [AcquisitionControl](#)

The camera allows the following controls to be performed via external trigger signals.

TriggerSelector	Description
AcquisitionStart	Start image acquisition in response to the external trigger signal input.
AcquisitionEnd	Stop image acquisition in response to the external trigger signal input.
LineStart	Acquire one line in response to the external trigger input. Select this option when Exposure control is performed by an external trigger.
FrameStart	Acquire one frame in response to the external trigger signal input. Select this to perform exposure control using external triggers. Note: For more information, see "Frame Start Trigger" and "FrameStart Trigger and FrameTransferStart Trigger".
AcquisitionTransferStart	Output acquired images at a specified timing in response to an external trigger signal input. Note: There is a limit to the number of image frames that can be stored internally. The limits for each image format are as follows. Acquired images must be output to avoid exceeding these limits. • 4000Q Models: When Width = 4096, Height = 4096, and PixelFormat = RGBa8, "3" frames can be stored in the camera. • 8000Q Models: When Width = 8192, Height = 4096, and PixelFormat = RGBa8, "1.5" frames can be stored in the camera.

Notes:

- When TriggerMode is On, the camera first receives the AcquisitionStart command ([AcquisitionControl](#)), the Acquisition trigger signal, and then outputs images.
- The settings for exposure control and triggers are related to each other. Refer to "[Step 5: Configure Trigger, Exposure, and Line Rate Settings](#)" when configure the settings.

Frame Start Trigger

In this camera, Data Leader and Data Trailer are added to every frame. The number of lines per frame is set by Offset Y and Height of [ImageFormatControl](#).

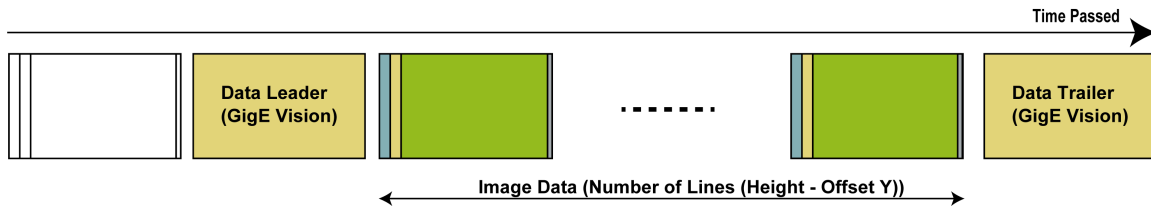
Offset Y's setting range is 0 to 4096. The Height setting range is 1 to 4096.

One Frame of Image Data (Offset Y = 0)

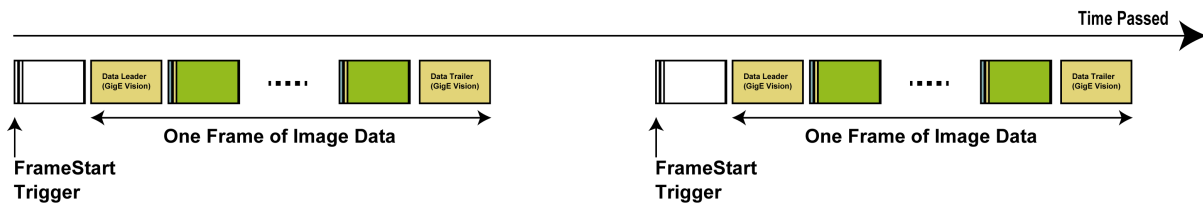


One Frame of Image Data (Offset Y > 0)

Image Data for the number of lines specified by OffsetY will not be sent (empty block below).



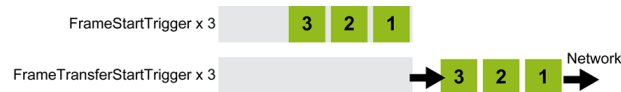
When using Frame Start Trigger, after receiving Frame Start Trigger, skip the image data of the number of lines of Offset Y and send the data of Data Leader, image data, and Data Trailer. (Upon completion of data transmission for one frame, no data will be sent until the next Frame Start Trigger is received.)



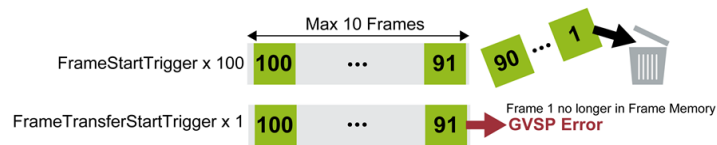
Caution: Chunk Data (first line of every frame only) is sent after Data Trailer.

FrameStart Trigger and FrameTransferStart Trigger

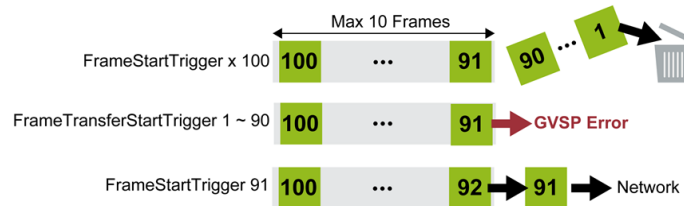
On this camera, when **FrameTransferStart** is **On**, the camera expects that the number of **FrameTransferStart** trigger inputs is the same as the number of **FrameStart** trigger inputs. Otherwise, a GVSP error may occur.



For example, if the FrameStart trigger is issued 100 times but the FrameTransferStart trigger is issued only once, the camera attempts to send the first frame, but a GVSP Error will be sent instead because the first frame is already discarded. The below shows an example of when the camera can hold up to 10 frames in the frame memory.



To output an image, the FrameTransferStart trigger must be issued continuously until it reaches the number of frames in the frame memory. For example, if 10 frames remain in the frame memory, the FrameTransferStart trigger must be issued 90 more times to output the image.



Note: This feature, also called Delayed Readout, is useful when triggering multiple cameras simultaneously. In this case, images from multiple cameras are read out simultaneously, which places a high load on the network bandwidth. The number of images that can be delayed depends on the PixelFormat. See **FrameStartTrigger** in "[Trigger Control](#)" for more information.

Exposure Mode

Related Setting Items: [AcquisitionControl](#)

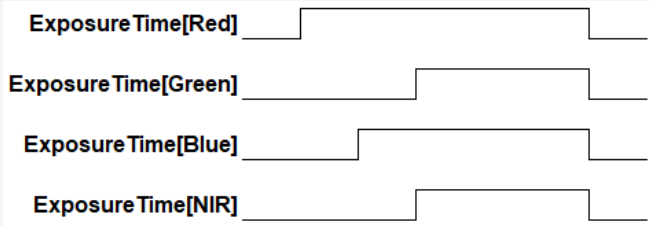
This camera supports the following exposure modes:

Exposure Mode	Description	Setting Example
Off	Exposure control is not performed (free-running operation).	Control via External Triggers without Specifying the ExposureTime
		Control without External Triggers without Specifying the Exposure Time
Timed	Mode in which control is performed using ExposureTime. Acquire images using an exposure time configured beforehand on an external trigger.	Control via External Triggers with the Specified Exposure Time
		Control without External Triggers with the Specified Exposure Time
TriggerWidth	Mode in which control of the exposure time is performed using the pulse width of the trigger input signal. The exposure time will be the same as the pulse width of the trigger input signal.	Control via External Triggers with Exposure Time Set to TriggerWidth

Note: When **ExposureMode** is set to **Timed** or **TriggerWidth**, the actual exposure time will consist of the image sensor's offset duration subtracted from the ExposureTime setting configured on the camera or the Width of the trigger signal to the camera. For more information, see "[Actual Exposure Time](#)".

ExposureTimeMode

When **ExposureMode** is set to **Timed**, you can select the following Exposure Time Mode.

Exposure Mode	Description
Common (Default)	Set the common exposure time for Red, Green, Blue, and NIR (the R/G/B/NIR channels will have the same exposure time).
Individual	Set the exposure times for Red, Green, Blue, and NIR individually. To set the exposure time individually for Red, set ExposureTimeSelector to Red, and configure the exposure time for Red in ExposureTime. Similarly, configure the exposure times individually for Green, Blue, and NIR. Note: The actual exposure time starts with the channel with the longest exposure time and ends with the channel with the shortest exposure time, so that the exposures end at the same time (see image below). 

Notes:

- When ExposureMode is set other than Timed, ExposureTimeMode is fixed to Common.
- The **RBExposureInterlocked** function is available when the Individual setting is selected. This function changes the exposure time while maintaining the Red / Blue exposure time ratio (G:R and G:B ratio before the change) with respect to Green.

For example, if R: 20μs / G: 10μs / B: 15μs and G is changed to 30μs, R will automatically change to 60μs (= 20 * 30 / 10) and B will automatically change to 45μs (= 15 * 30 / 10).

Actual Exposure Time

The actual exposure time will consist of the image sensor's offset duration ($0.85\mu\text{s}$) subtracted from the ExposureTime setting configured on the camera or the Width of the trigger signal to the camera.

- Exposure Offset Time: $-0.85\mu\text{s}$

The minimum ExposureTime setting is $3\mu\text{s}$ (step 0.01), and the maximum Exposure setting depends on other settings (see Exposure Mode on "[Specifications](#)").

■ ExposureMode = Timed

When ExposureTime is set to $3\mu\text{s}$, the actual exposure time will be $2.15\mu\text{s}$ ($= 3\mu\text{s} - 0.85\mu\text{s}$).

■ ExposureMode = TriggerWidth

The actual exposure time will consist of the image sensor's offset duration added to the Width of the trigger signal to the camera. If the needed ExposureTime is $2.15\mu\text{s}$, the width of the Trigger Signal to the camera will be $3\mu\text{s}$ ($= 2.15\mu\text{s} + 0.85\mu\text{s}$).

Timing Chart

This section shows the timing charts under the following conditions on each model.

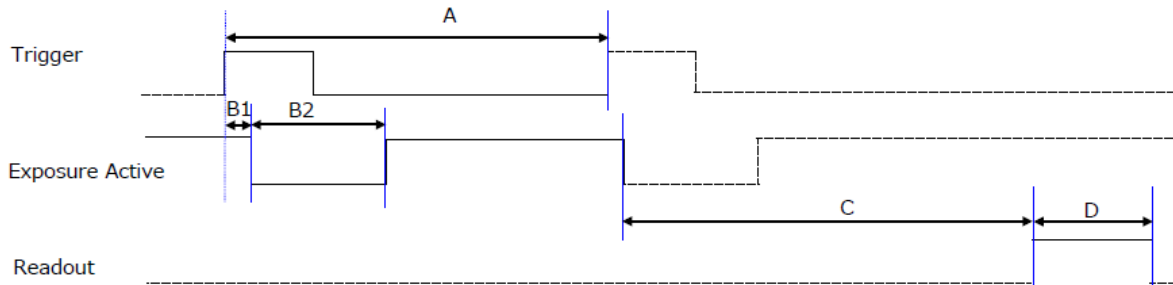
■ 4000Q Model

- [ExposureMode: Off \(4000Q\)](#)
- [ExposureMode: Timed \(4000Q\)](#)
- [ExposureMode: TriggerWidth \(4000Q\)](#)

■ 8000Q Model

- [ExposureMode: Off \(8000Q\)](#)
- [ExposureMode: Timed \(8000Q\)](#)
- [ExposureMode: TriggerWidth \(8000Q\)](#)

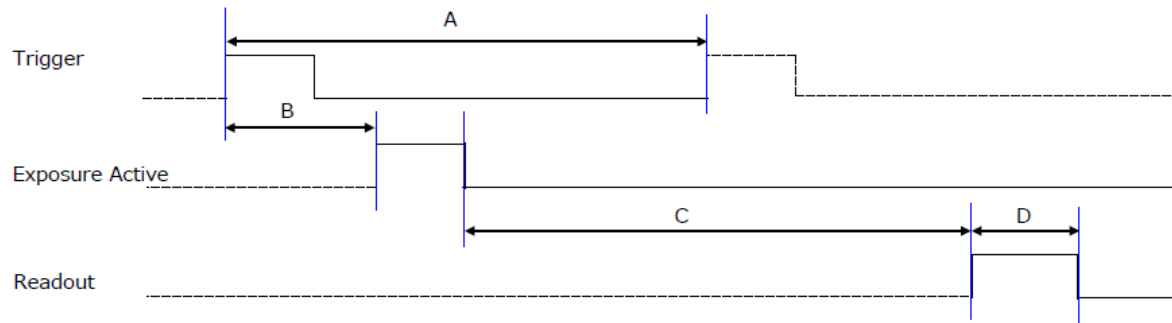
ExposureMode: Off (4000Q)



Pixel Format	Width	Trigger Period [A] (μs)*	Delay Time from Trigger to Exposure Active [B1]	Exposure Active Non Active[B2] (μs)	Period from Exposure Active Falling to Readout Start [C] (μs)	Readout Period [D] (μs)
RGB8	4096	14.70	0.4	3.6	37.0	6.56
	2048	7.69	0.4	3.6	30.4	3.28
	16	5.45	0.4	3.6	23.9	0.03
RGBa8	4096	14.49	0.4	3.6	37.0	6.56
	2048	7.37	0.4	3.6	30.4	3.28
	16	5.45	0.4	3.6	23.9	0.03
RGB10V1 Pack ed	4096	18.27	0.4	3.6	37.0	6.56
	2048	9.42	0.4	3.6	30.4	3.28
	16	5.45	0.4	3.6	23.9	0.03
RGB10p32	4096	18.27	0.4	3.6	37.0	6.56
	2048	9.42	0.4	3.6	30.4	3.28
	16	5.45	0.4	3.6	23.9	0.03
YUV422_8	4096	13.52	0.4	3.6	37.0	6.56
	2048	6.76	0.4	3.6	30.4	3.28
	16	5.45	0.4	3.6	23.9	0.03
YUV422_8_UY VY	4096	13.53	0.4	3.6	37.0	6.56
	2048	6.76	0.4	3.6	30.4	3.28
	16	5.45	0.4	3.6	23.9	0.03

Note: *H Binning = Off, GevGVSPExtendedIDMode = Off, GevSCPDPacketSize = 8976

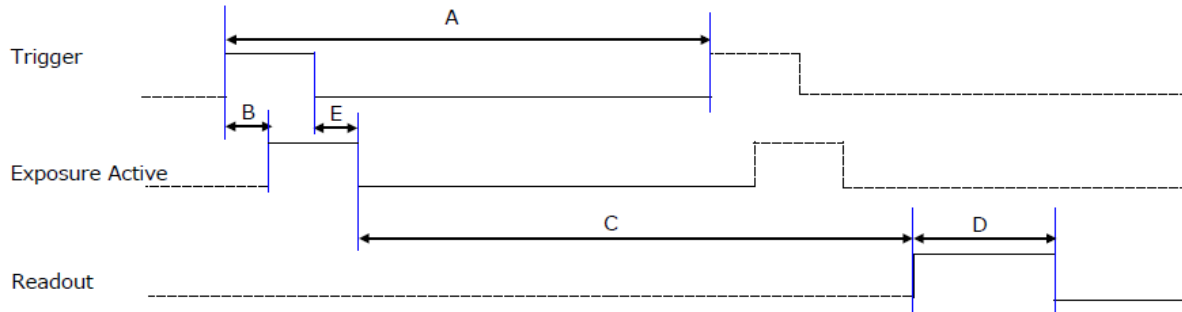
ExposureMode: Timed (4000Q)



Pixel Format	Width	Trigger Period[A] (μ s)*	Delay Time from Trigger Rising to Exposure Active Rising[B] (μ s)	Period from Exposure Active Falling to Readout rising[C] (μ s)	Readout period[D] (μ s)
RGB8	4096	14.70	0.27	37.0	6.56
	2048	7.69	0.27	30.4	3.28
	16	5.45	0.27	23.9	0.03
RGBa8	4096	14.49	0.27	37.0	6.56
	2048	7.37	0.27	30.4	3.28
	16	5.45	0.27	23.9	0.03
RGB10V1Packed	4096	18.27	0.27	37.0	6.56
	2048	9.42	0.27	30.4	3.28
	16	5.45	0.27	23.9	0.03
RGB10p32	4096	18.27	0.27	37.0	6.56
	2048	9.42	0.27	30.4	3.28
	16	5.45	0.27	23.9	0.03
YUV422_8	4096	13.52	0.27	37.0	6.56
	2048	6.76	0.27	30.4	3.28
	16	5.45	0.27	23.9	0.03
YUV422_8_UYVY	4096	13.53	0.27	37.0	6.56
	2048	6.76	0.27	30.4	3.28
	16	5.45	0.27	23.9	0.03

Note: *H Binning = Off, GevGVSPExtendedIDMode = Off, GevSCPDPacketSize = 8976

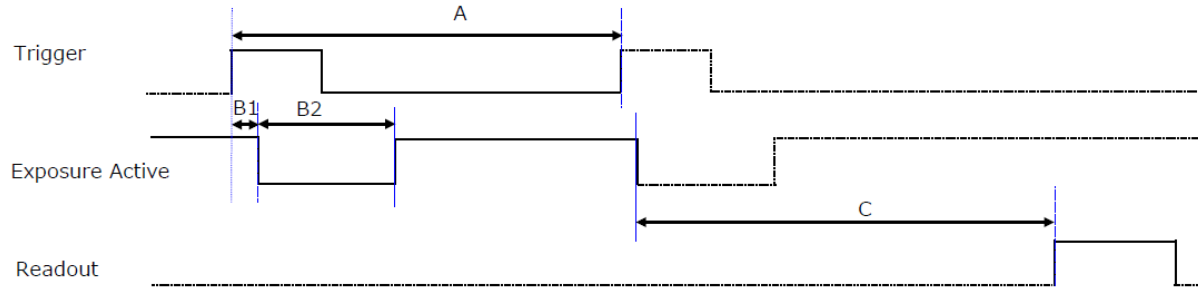
ExposureMode: TriggerWidth (4000Q)



Pixel Format	Width	Trigger Period [A] (μs)	Delay Time from Trigger Rising to Exposure Active Rising[B] (μs)	Period from Exposure Active Falling to Readout Start [C] (μs)	Readout period [D] (μs)	Delay Time from Trigger Falling to Exposure Active Falling[E] (μs)
RGB8	4096	14.70	0.26	37.0	6.56	0.3
	2048	7.69	0.26	30.4	3.28	0.3
	16	5.45	0.26	23.9	0.03	0.3
RGBa8	4096	14.49	0.26	37.0	6.56	0.3
	2048	7.37	0.26	30.4	3.28	0.3
	16	5.45	0.26	23.9	0.03	0.3
RGB10V1Packed	4096	18.27	0.26	37.0	6.56	0.3
	2048	9.42	0.26	30.4	3.28	0.3
	16	5.45	0.26	23.9	0.03	0.3
RGB10p32	4096	18.27	0.26	37.0	6.56	0.3
	2048	9.42	0.26	30.4	3.28	0.3
	16	5.45	0.26	23.9	0.03	0.3
YUV422_8	4096	13.52	0.26	37.0	6.56	0.3
	2048	6.76	0.26	30.4	3.28	0.3
	16	5.45	0.26	23.9	0.03	0.3
YUV422_8_UYVY	4096	13.53	0.26	37.0	6.56	0.3
	2048	6.76	0.26	30.4	3.28	0.3
	16	5.45	0.26	23.9	0.03	0.3

Note: *H Binning = Off, GevGVSPExtendedIDMode = Off, GevSCPDPacketSize = 8976

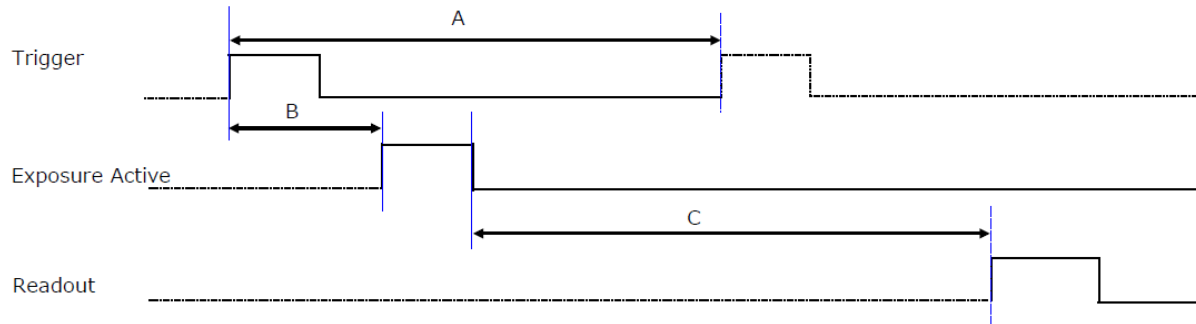
ExposureMode: Off (8000Q)



PixelFormat	Width	Trigger Period[A] (usec)*	Delay Time from Trigger to Exposure Active [B1] (usec)	Exposure Active non active [B2] (usec)	Period from Exposure Active Falling to LVAL rising [C] (usec)
RGB8	8192	27.9	0.3	4.3	65.1
	4096	14.2	0.3	4.3	52
	16	10	0.3	4.3	38.9
RGBa8	8192	27.3	0.3	4.3	65.1
	4096	13.8	0.3	4.3	52
	16	10	0.3	4.3	38.9
RGB10V1Packed	8192	34.7	0.3	4.3	65.1
	4096	17.6	0.3	4.3	52
	16	10	0.3	4.3	38.9
RGB10p32	8192	34.7	0.3	4.3	65.1
	4096	17.6	0.3	4.3	52
	16	10	0.3	4.3	38.9
YUV422_8	8192	27	0.3	4.3	65.1
	4096	13.5	0.3	4.3	52
	16	10	0.3	4.3	38.9
YUV422_8_UYVY	8192	27	0.3	4.3	65.1
	4096	13.5	0.3	4.3	52
	16	10	0.3	4.3	38.9

Note: *H Binning = Off, GevGVSPExtendedIDMode = Off, GevSCPDPacketSize = 8976

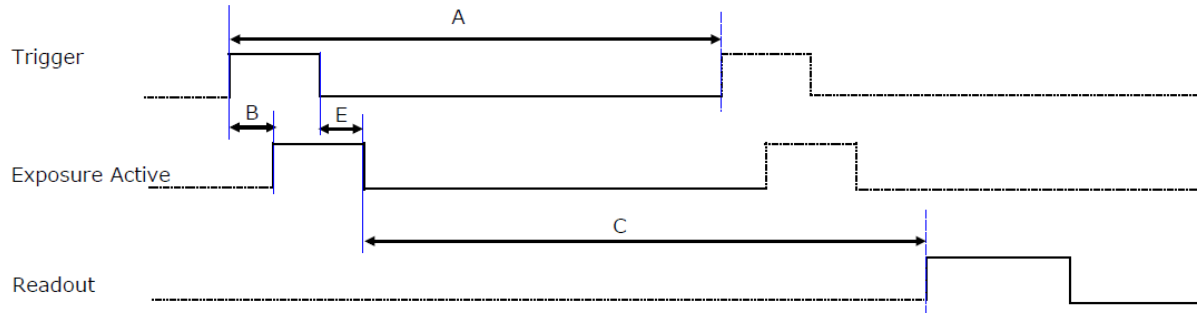
ExposureMode: Timed (8000Q)



PixelFormat	Width	Trigger Period[A] (usec)*	Delay Time from Trigger Rising to Exposure Active Rising [B] (usec)	Period from Exposure Active to LVAL rising [C] (usec)
RGB8	8192	27.9	0.3	65.1
	4096	14.2	0.3	52
	16	10	0.3	38.9
RGBa8	8192	27.3	0.3	65.1
	4096	13.8	0.3	52
	16	10	0.3	38.9
RGB10V1Packed	8192	34.7	0.3	65.1
	4096	17.6	0.3	52
	16	10	0.3	38.9
RGB10p32	8192	34.7	0.3	65.1
	4096	17.6	0.3	52
	16	10	0.3	38.9
YUV422_8	8192	27	0.3	65.1
	4096	13.5	0.3	52
	16	10	0.3	38.9
YUV422_8_UYVY	8192	27	0.3	65.1
	4096	13.5	0.3	52
	16	10	0.3	38.9

Note: *H Binning = Off, GevGVSPExtendedIDMode = Off, GevSCPDPacketSize = 8976

ExposureMode: TriggerWidth (8000Q)



PixelFormat	Width	Trigger Period [A] (usec)*	Delay Time from Trigger Rising to Exposure Active Rising [B] (usec)	Period from Exposure Active Falling to LVAL Rising [C] (usec)	Delay Time from Trigger Falling to Exposure Active Falling [E]
RGB8	8192	28.1	0.3	65.1	0.3
	4096	14.4	0.3	52	0.3
	16	10	0.3	38.9	0.3
RGBa8	8192	27.4	0.3	65.1	0.3
	4096	13.9	0.3	52	0.3
	16	10	0.3	38.9	0.3
RGB10V1Packed	8192	34.8	0.3	65.1	0.3
	4096	17.7	0.3	52	0.3
	16	10	0.3	38.9	0.3
RGB10p32	8192	34.8	0.3	65.1	0.3
	4096	17.7	0.3	52	0.3
	16	10	0.3	38.9	0.3
YUV422_8	8192	27	0.3	65.1	0.3
	4096	13.5	0.3	52	0.3
	16	10	0.3	38.9	0.3
YUV422_8_UYVY	8192	27	0.3	65.1	0.3
	4096	13.5	0.3	52	0.3
	16	10	0.3	38.9	0.3

Note: *H Binning = Off, GevGVSPExtendedIDMode = Off, GevSCPDPacketSize = 8976

Gain Control

Related Setting Items: [AnalogControl](#)

Gain can be controlled manually or automatically on this camera.

Manual Adjustment

- **Digital Gain:** Configure Gain in Master Mode or Individual Gain Mode. For more information, see "[Individual Gain Mode](#)".
- **Analog Gain (4000Q models Only):** This setting is applied to the analog video signal output from the sensor. The gain steps can be configured to one of three levels (0 dB, 6 dB, 12 dB).

Note: 4000Q models Only: The following two gain values are added together for the total gain value:
 Total Gain = AnalogGain (dB) + DigitalGain (dB)

Individual Gain Mode

Configure DigitalGain using this mode. The available options are as follows:

Note: The Gain setting is configured in multipliers. For more information, see "[Comparison of the Decibel Display and Multiplier Display](#)".

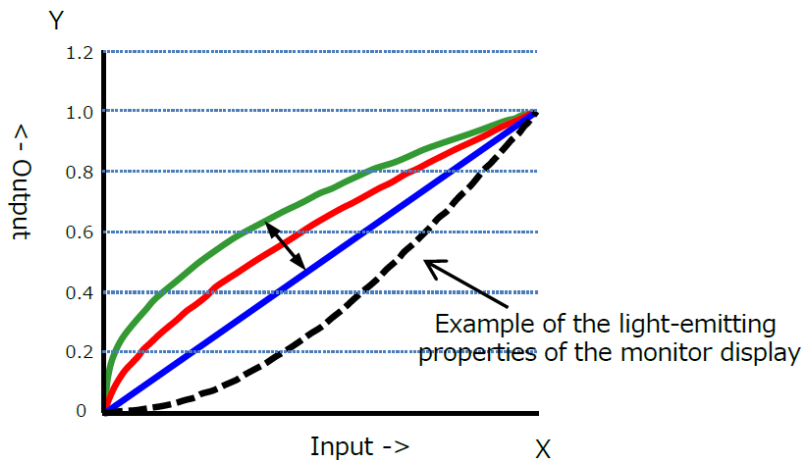
Master Mode (Individual Gain Mode = Off)	Individual Gain Mode
Adjust the DigitalAll (master gain) setting first, and then adjust the DigitalRed , DigitalBlue , and DigitalNIR setting values to perform fine adjustment.	Adjust the DigitalGreen , DigitalRed , DigitalBlue , and DigitalNIR setting values to adjust the gain. This mode allows a wider range of adjustment by the user when compared to Master Mode.

Gamma Function

Related Setting Items: [AnalogControl](#),

The Gamma function corrects the output signals from the camera beforehand (reverse correction), taking into consideration the light-emitting properties of the monitor display. As the light-emitting properties of the monitor are not linear, the entire image may be darker or the gradation in the dark areas may be less noticeable when camera outputs are displayed without processing.

The Gamma function can be used to correct the camera signals with an opposite-direction curve and produce a display that is close to linear.



To Use the Gamma Function

1. Select the correction value from **Gamma**. The selectable values are as follows:
 - **4000Q models:** 0.45, 0.5, 0.55, 0.6, 0.65, 0.75, 0.8, 0.9, 1.0
 - **8000Q models:** 0.45, 0.5, 0.55, 0.6, 0.65, 0.75, 0.8, 0.9, 1.0, 1.1, 1.2, 1.4, 1.6, 1.8, 2.1, 2.4, 2.7, 3.1, 3.5, 4.0
2. Select **Gamma** from **LUTMode**.

Note: You can use the LUT function to configure a curve with more detailed points. For details, see [LUT \(Lookup Table\)](#).

LUT (Lookup Table)

Related Setting Items: [LUTControl](#)

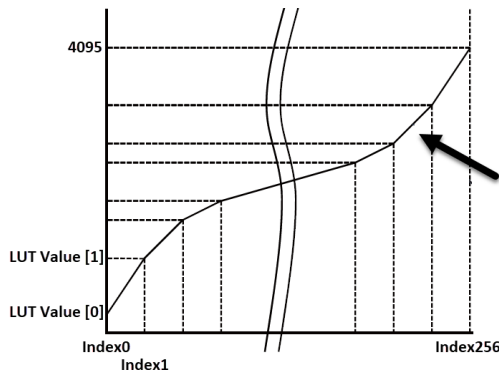
The LUT function is used to generate a non-linear mapping between signal values captured on the sensor and those that are output from the camera. On this camera, you can specify the output curve using 257 setting points (indexes).

How to Configure

1. Select **LUT** from LUTControl [[AnalogControl](#)].
2. Select the LUT channel you want to control from **LUTSelector** [[LUTControl](#)]. (Red, Green, or Blue)
3. Select the LUT Index from **LUTIndex** (0 ~ 256). Indexes represent the possible pixel values captured on the sensor, from the lowest value (Index 0) to the highest (Index 256). For example, Index 0 represents a full black pixel and Index 256 represents a full white pixel.
4. Set the LUT output value for the selected index in **LUTValue** (0 ~ 4095).

LUT Values

LUT values range from 0 at the lowest to 4095 at the highest. Linear interpolation is used to calculate LUT values between the index points.

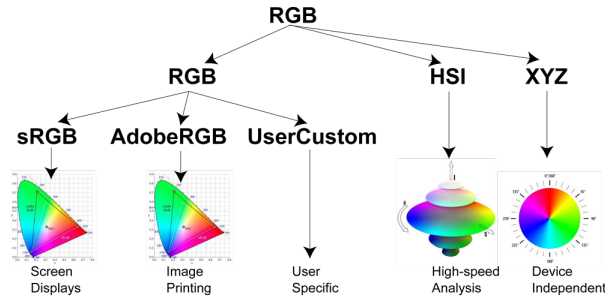


Interpolation using the average values of data to the left and right is used to determine values between points.

Color Space Conversion (Color Transformation Control)

Related Setting Items: [ColorTransformationControl](#)

This camera allows you to convert the standard color space (RGB) that is used to produce colors into other color spaces.

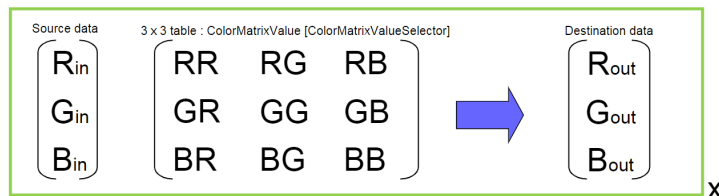


How to Configure

1. Select the color space (**RGB**, **HSI**, or **XYZ**) you want to use from **ColorTransformationMode** ([ColorTransformationControl](#)).
2. When **RGB** is selected, select the details (sRGB, AdobeRGB, UserCustom) from **ColorTransformationRGBMode**.

Note: If you select other than RGB, ColorTransformationRGBMode is fixed to Off.

3. When UserCustom is selected,
 - a. Select the item you want to configure in **ColorMatrixValueSelector**.
 - b. Configure the value (-2 to +2) in **ColorMatrixValue**.



Caution: If you set the color space to XYZ or HSI, Control Tool will not display the images captured by the camera properly. To display them properly, XYZ- or HSI-compatible image processing must be performed on the computer side.

About Color Space HSI

- Hue Value: 0° to 360° can be specified as follows.

Output	Description
8bit	Can be specified in 2° increments - 0°(00000000) ~ 360°(10110100)
10bit	Can be specified in 0.5°increments- 0°(0000000000) ~ 360°(1011010000)
12bit	Can be specified in 0.125°increments- 0°(000000000000) ~ 360°(101101000000)

- Saturation value, Intensity value: 0 ~ 100% can be specified as follows.

Output	Description
8bit	0% (00000000) ~ 100% (11111111)
10bit	0% (00000000) ~ 100% (1111111111)
12bit	0% (00000000) ~ 100% (111111111111)

GPIO (Digital Input/Output Settings)

Related Setting Items: [DigitalIOControl](#)

The camera is equipped with GPIO (general-purpose input/output) functions for generating and using combinations of triggers and other necessary signals within the camera and of signals output from the camera to the system such as those used for lighting equipment control.

These signals can be used as triggers and other necessary signals within the camera or as signals output from the camera to the system, such as those used for lighting equipment control.

Note: See "[① DC IN/TRIG Connector \(12-Pin Round\)](#)" for recommended external circuit examples.

You can check the status of each digital I/O as shown in the table below with LineStatusAll.

Line Selector	Line Mode	Line Format	Line Inverter	Line Status All	Line Source
Line1 TTL Out 1	Output	TTL	False / True	bit0	User-specified
Line4 TTL In 1	Input	TTL	False (Fixed)	bit3	-
Line5 Opt In 1	Input	OptoCoupled	False (Fixed)	bit4	-
Line8 TTL Out 2	Output	TTL	False / True	bit7	User-specified
Line9 TTL Out 3	Output	TTL	False / True	bit8	User-specified
Line10 TTL In 2	Input	TTL	False (Fixed)	bit9	-
Line12 TTL Out 4	Output	TTL	False / True	bit11	User-specified
Line13 TTL In 3	Input	TTL	False (Fixed)	bit12	-

Notes:

- Line Status: "Low" signal level is indicated by **False**, and "High" signal level is indicated by **True**.
- Line Status All: The current status of the Line signal is indicated by the above bit field.
- Line Source: Selectable items are listed in "[LineSource Items](#)".

LineSource Items

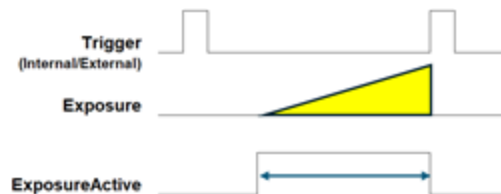
This section describes each item that can be selected in **LineSource**.

LineSource	Description
AcquisitionActive	From AcquisitionStart to AcquisitionStop. See " Acquisition Control " for reference.
FrameActive	From Frame's Exposure to FVAL End.
ExposureActive	Camera is doing the exposure. See " ExposureActive Signal " for reference.
LVAL	Image data (line) from the sensor is being read.
PulseGenerator0 ~ 3	PulseGenerator output. For more information, see the following technical note: https://www.jai.com/uploads/documents/Technical-notes/English/TNE-0005-2015XII11-000-TechNote-PulseGenerator-tips.pdf
UserOutput0 ~ 3	Allows you to toggle UserOutput's On / Off on the software. Select the User Output 0 ~ 3 you want to use from UserOutputSelector , and then set the UserOutputValue (High or Low).
Line4 TTL In1	TTL In1
Line5 Opt In1	Opt In1
Line10 TTL In2	TTL In2
Line13 TTL In3	TTL In3
Logic Block0 ~ 1	Logic Block output. See " Logic Block Control " for reference.
EncoderTrigger	Encoder output. See " Connecting Rotary Encoders " for reference.
Encoder Direction	Direction of encoder rotation. See " Rotation Direction " for reference.

ExposureActive Signal

Perform external output for the timing at which video is accumulated to the sensor. The signal is output to the DC IN / TRIG IN connector (12-pin round) or AUX connector.

Note: ExposureActive includes the exposure offset time. For more information see "[Actual Exposure Time](#)".



Counter and Timer Control

Related Setting Items: [CounterAndTimerControl](#)

Note: This camera supports the Counter function only.

The Counter function counts up change points in the camera's internal signals using the camera's internal counter, and reads that information from the host side. This function is useful for verifying error conditions via the count value using internal camera operations.

When a problem occurs in a system that includes this camera, comparing the values from multiple counters allows you to verify the extent of normal operability and can be useful when investigating the cause of the problem.

The following counters are available on this camera, and the functions that can be counted are fixed for each counter.

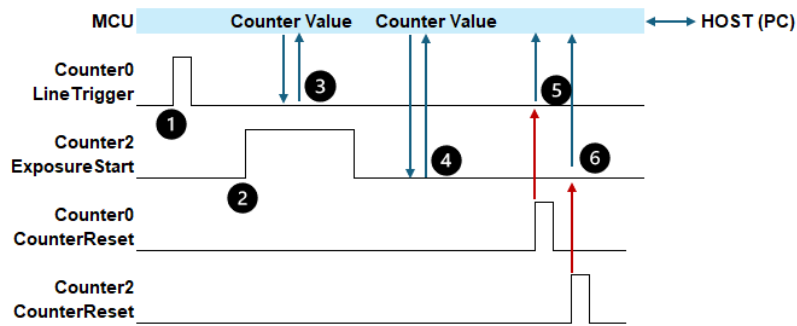
Counter Selector	Counter Event Source (Fixed)	Counter Event Activation
Counter0	Counts the number of Line Trigger instances.	Rising Edge (Fixed)
Counter1	Counts the number of Line Start instances.	Rising Edge (Fixed)
Counter2	Counts the number of Exposure Start instances.	Rising Edge (Fixed)
Counter3	Count the number of Frame Trigger instances.	Rising Edge (Fixed)
Counter4	Count the number of Frame Start instances.	Rising Edge (Fixed)
Counter5	Count the number of Frame Transfer End instances.	Falling Edge (Fixed)

How to Configure

1. Select the counter you want to use from **CounterSelector**.
2. Enable the counter by selecting the event source in **ConterEventSource** (Default = Off).
3. **CounterEventActivation** displays the timing for counting for the selected counter.
4. You can reset and refresh the selected counter's counter value by executing **CounterReset** and **CounterRefresh**, respectively. The selected counter's value and status are displayed in **CounterValue** and **CounterStatus**, respectively.

Note: After a power cycle, **CounterValue** is reset to 0.

Counter Occurrence Diagram (Example)



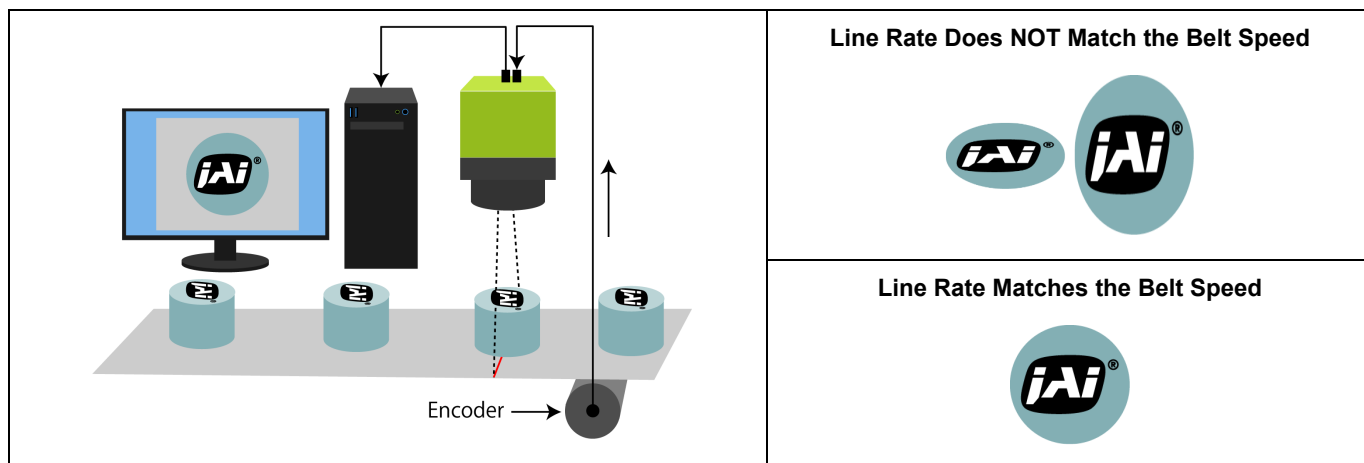
1. A LineTrigger Event occurs. Counter0 counts up.
2. An Exposure Start Event occurs. Counter 2 counts up.
3. The camera's internal MCU requests and reads the Counter0's counter value.
4. The camera's internal MCU requests and reads the Counter2's counter value.
5. Reset the Counter0's counter value to 0 by a CounterReset command or a CounterResetSource signal.
6. Reset the Counter2's counter value to 0 by a CounterReset command or a CounterResetSource signal.

Connecting Rotary Encoders

Related Setting Items: [EncoderControl](#)

Encoders are useful in line scan applications where line triggers need to be tied to motion, such as applications using conveyors with varying belt speeds.

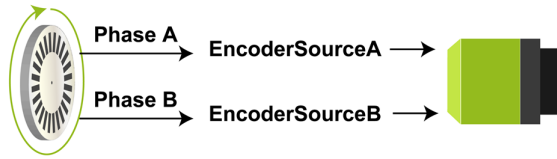
If the object is moving at a constant speed, a fixed line rate can be set. In most cases, however, the speed of the belt speed is not always constant and must be triggered by an encoder to ensure that the speed of the object and the image acquisition are always synchronized. If the line rate and the belt speed do not match, the image of the object will appear stretched or shrunk (see images below).



Note: JAI tests the encoder-related functions with a 2-Phase (Phase A and Phase B) incremental encoder.

How to Configure

1. Connect the two signals (Phase A and Phase B) from the rotary encoder to the camera's inputs (**EncoderSourceA** and **EncoderSourceB**).

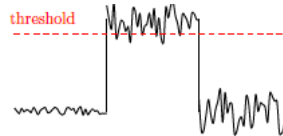


Note: On this camera, PhaseB is used only to detect the rotation direction.

2. Specify the number of triggers to generate as a ratio ($65536 / \text{EncodeDivider}$ value). For more information, see "[EncoderDivider](#)".

Note: On this camera, input pulses are generated on the rising edge of the Phase A signal.

3. If necessary, configure the following settings.
 - **EncoderFilter:** Enable the low-pass filter for the signal to prevent unintended operations due to signal noise from the rotary encoder. Specify the number of cycles from a range of 0 to 150 ns.



- **EncoderStrobe:** Specify the strobe length of the generated signal (10 ~ 2550 ns).
- **EncoderAveragingInterval:** When **EncoderDivider** is not set to an integer multiple of 65536, use this setting if the reliability of the interval of the signal output from the rotary encoder is low (some signal interval is extremely long or short; the encoder's jitter is large). When this function is enabled, internal processing is performed by averaging the interval of several previous signals.
- **EncoderMaxIntervalForNonDecimationMode (8000Q only):** When **EncoderDivider** is not set to an integer multiple of 65536, set the maximum interval period of the output signal. When set to 0 (Default), the trigger output period is calculated using only the encoder input period. When set to anything other than 0, the trigger output period is calculated using the encoder input period and this setting.

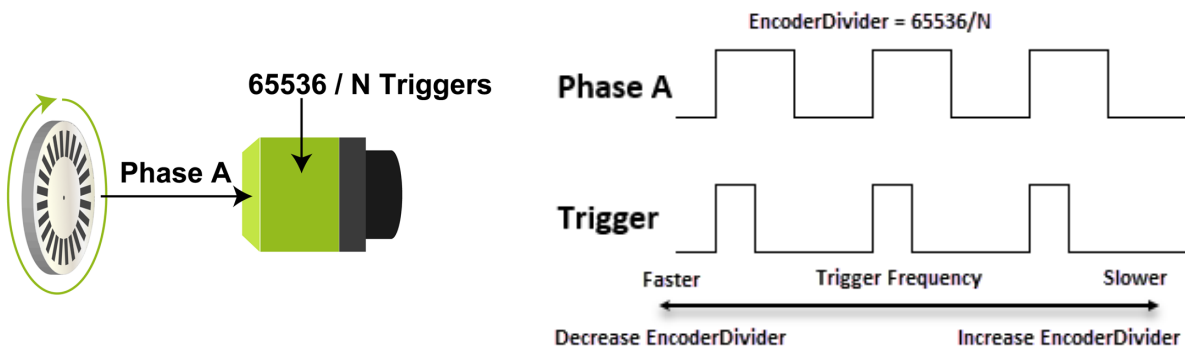
Note: If the time interval of the output of the rotary encoder fluctuates greatly, the output of the camera's internal trigger generated may also fluctuate greatly.

For example, if the belt is stopped for a long time and no signal is received from the encoder, **EncoderDivider** tries to generate a trigger signal calculated from the time the belt was stopped. This will result in no trigger signal being output even after the belt starts moving again.

In this case, by setting the upper limit of the Phase A interval measurement time in **EncoderAveragingInterval**, even if the encoder stops for a long time, the trigger signal can be generated with the setting configured in **EncoderMaxIntervalForNonDecimationMode**.

EncoderDivider

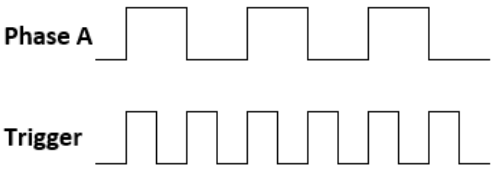
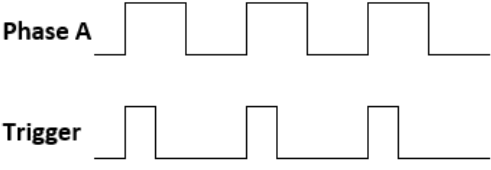
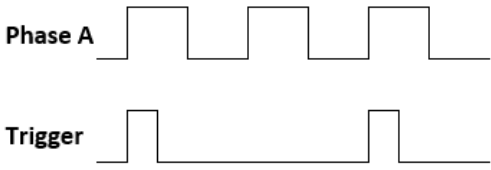
The **EncoderDivider** trigger option allows you to specify the number of triggers to generate as a ratio ($65536 / N$).



Notes:

- With this setting, input pulses are generated on the rising edge of PhaseA.
- **When N is an integer multiple of 65536:** The camera's internal trigger is generated by the decimation of the output trigger of a rotary encoder.
- **When N is not an integer multiple of 65536:** Using the time interval of the output trigger of the rotary encoder, the camera's internal trigger is generated so that the set division ratio is obtained. For example, if the encoder frequency is 10khz, but you need a line rate of 12khz to get a proper image, then the EncoderDivider option can be used to set this 1:1.2 ratio, which will be maintained even if the encoder frequency changes.
- If the time interval of the output of the rotary encoder fluctuates greatly, the output of the camera's internal trigger generated may also fluctuate greatly. In this case, by setting **EncoderAveragingInterval**, it is possible to perform internal processing with the value obtained by averaging the time intervals of the specified number of signals.

EncoderDivider Examples

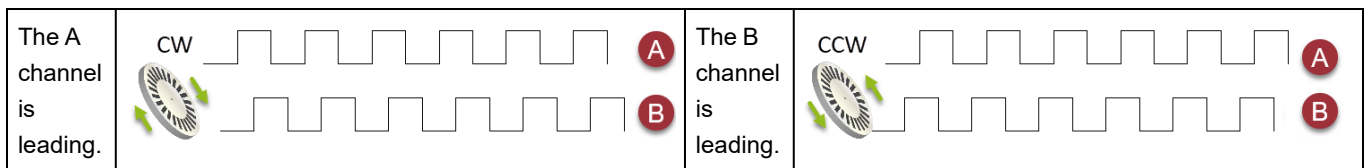
EncoderDivider Setting	Encoder Input : Encoder Trigger Ratio	Number of Triggers (Output Pulse No.)	Timing Chart
32768	1 : 2	2 (= 65536/32768) The camera generates "two" triggers per a PhaseA input pulse signal.	
65536 (Default)	1 : 1	1 (= 65536/65536) The camera generates "one" trigger per a PhaseA input pulse signal.	
131072	2 : 1	0.5 (= 65536/131072) The camera generates "one" trigger per "two" PhaseA input pulse signals.	

Rotation Direction

Incremental encoders typically have two channels (A and B), and the channels operate in a square logical pattern. In one cycle, an encoder outputs a number of pulses on each channel which is called the resolution.

Because the A and B channels are phase shifted, it is possible to determine which direction the rotation is based on which channel is leading (see below).

Note: On this camera, PhaseB is used only to detect the rotation direction.



Logic Block Control

Related Topic: [Logic Block Control](#)

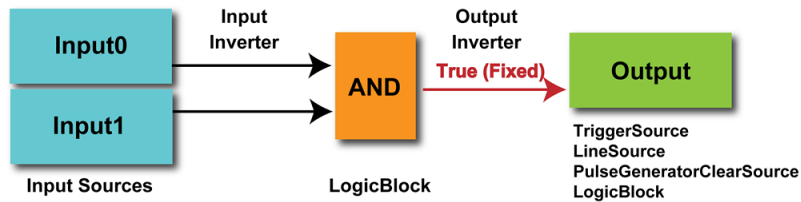
This camera supports the Logic Block Control function. A Logic Block is a combinational logic element that conditions various input signal sources by determining true/false and generates output signals accordingly.

This camera supports up to 2 Logic Blocks, and each block has two input sources.

Caution: On this camera, the LogicBlock function is fixed to AND, and the LogicBlock output signal is always inverted; so it acts as an NAND. For example, in the following table, the Logic Block output signal is generated when NAND is 1. If both Input signals are 1, no Logic Block output signal is generated (NAND = 0).

Input0	Input1	AND	NAND
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

How to Configure



1. Set **LogicBlockSelector** to **LogicBlock0**.
2. Configure LogicBlockInput0. Set **LogicBlockInputSelector** to **0**, and select the Input Source from **LogicBlockInputSource**. If the input source is inverted, set **LogicBlockInputInverter** to **1 (True)**.
3. Configure LogicBlockInput1. Set **LogicBlockInputSelector** to **1**, and select the Input Source from **LogicBlockInputSource**. If the input source is inverted, set **LogicBlockInputInverter** to **1 (True)**.
4. Finally, configure LogicBlock0 as the output signal.

On this camera, the Logic Block can be used as the following signal source: TriggerSource [[AcquisitionControl](#)], LineSource [[DigitalIOControl](#)], PulseGeneratorClearSource [[PulseGenerator](#)], LogicBlock [[Logic Block Control](#)]

Action Control Function

Related Setting Items: [ActionControl](#)



Technical Notes

How to use GigE Vision Action Commands

The Action Control Function is a function that executes the pre-configured action when the camera receives action commands. Action commands can send both unicast and broadcast messages and give instructions for actions to multiple cameras simultaneously by broadcasting them. A camera that has this function can even give instructions for actions to different types of multiple cameras. Although this function includes jitter and delays, it is useful for controlling multiple cameras simultaneously.

Note: When the [PTP \(Precision Time Protocol\)](#) function is turned on, **Scheduled Action Command** (Action Control function) becomes available, which allows you to send Action Commands to multiple cameras synchronized with PTP at the same time. For more information, see the How to use GigE Vision Action Commands technical note.

Actions are performed when the following three conditions are met.

1. ActionDeviceKey set to the camera and ActionDeviceKey in the action command match.
2. ActionGroupKey set to the camera and ActionGroupKey in the action command match.
3. ActionGroupMask set to the camera and GroupMask in the action command perform AND operation, and the result is not 0.

How to Configure

1. Specify ActionDeviceKey.
2. Then, specify two actions that can be configured on the camera.

Action 1	1. Select 1 in ActionSelector. 2. Specify ActionGroupMask [ActionSelector]. 3. Specify ActionGroupKey [ActionSelector].
Action2	1. Select 2 in ActionSelector. 2. Specify ActionGroupMask [ActionSelector]. 3. Specify ActionGroupKey [ActionSelector].

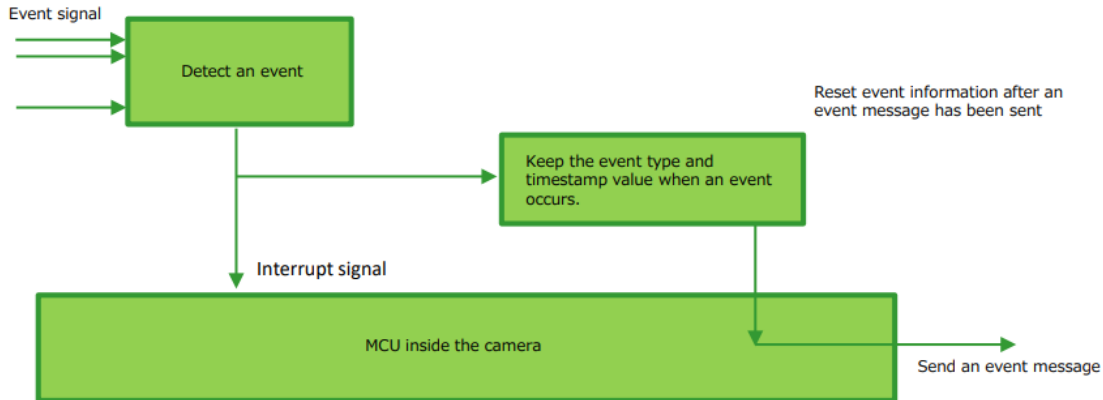
3. Set triggers (AcquisitionStart, AcquisitionEnd, FrameStart, AcquisitionTransferStart) to Action1 and Action2.

Event Control Function

Related Setting Items: [EventControl](#)

The Event Control function is a function that outputs a signal change point inside the camera as information indicative of an event occurrence (event message).

Flow from Detecting an Event to Sending an Event Message



How to Configure

1. Select the even you want to configure from **EventSelector**.
2. Set **EventNotification** to **On** or **Once**.
 - **On**: The Event data is output for each event
 - **Once**: The Event data is output once and then automatically returns to **Off**
3. When an enabled Event occurs, the following Event data will be sent: **EventID**, **EventTimeStamp**, **EventFrameID**.

For example, when **AcquisitionStart** is selected from **EventSelector** and **EventNotification** is set to **On**, the following message will be sent when an Acquisition Start trigger occurs.

EventAcquisitionStartData	Display the following data when the enabled Event occurs.
EventAcquisitionStart	Display the EventID 0x9011.
EventAcquisitionStartTimestamp	Display the time stamp value when the enabled Event occurs.
EventAcquisitionStartFrameID	Display the FrameID value when the enabled Event occurs.

Chunk Data Function

Related Setting Items: [ChunkDataControl](#)

The Chunk Data function adds camera configuration information to the image data that is output from the camera.

How to Configure Chunk Data Function

1. Set **ChunkModeActive** to **True**.
2. Select the items of information you want to add to image data with **Chunk Selector**, and set **Chunk Enable** from **False** to **True**.

Caution: The Chuck Data function settings cannot be changed during image output. To change the settings, stop Acquisition.

PTP (Precision Time Protocol)

Related Setting Items: [Transport Layer Control](#)

The camera can work as the slave for Precision Time Protocol defined in IEEE 1588. When the IEEE 1588 master clock exists in the network where the camera is connected, this function synchronizes the camera to the time of the master clock.

- Transport to be used: Multicast UDP datagram (224.0.1.129); however, Delay Resp is a unicast UDP datagram.
- Destination port number:
 - 319 : Sync, Delay Req, Pdelay Req, Pdelay Resp
 - 320 : Announce, Follow Up, Delay Resp, Pdelay Resp, Management, Signaling
- Items for synchronization: Time synchronization is performed. Frequency tuning is not performed.
- PTP time data: 80 bit (elapsed time in 1 ns, with 00:00:00, January 1 1970 set as the origin)
- Timestamp (this camera): 64 bit* (PTP synchronization: LSB64bit* of PTP time data)
- Supported PTP messages: Announce message (receive only), Sync message (receive only), Follow Up message (receive only), Delay Req message (send only), Delay Resp message (receive only)

Cautions:

- The Timestamp Tick Frequency register value is fixed at 1,000,000,000 (1 GHz).
- When PTP synchronization is being performed, the Timestamp Reset function is disabled.
- Because GenICam treats the timestamp (64 bit) as a 64 bit signed integer, 63 bit is actually timestamp data without the sign bit.

How To Configure

1. Set **GevIEEE1588** ([Transport Layer Control](#)) to **True**.
2. After several statuses from Disable, when a Sync Message is received from the PTP server, **Slave** is Displayed in **GevIEEE1588 Status**.

Note: When the PTP function is **On**, you can use Scheduled Action Command ([ActionControl](#)), which allows you to send action commands to multiple cameras synchronized with PTP at the same time.

Pulse Generator

Related Setting Items: [PulseGenerator](#)



Technical Notes

Tips for using the Pulse Generator

By using this function, any signal can be generated inside the camera.

The following is an example of signal generation.

Settings

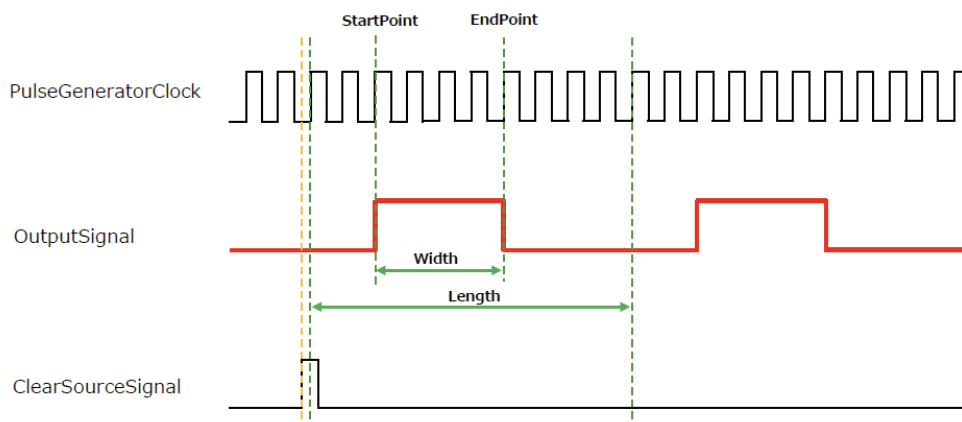
PulseGeneratorStartPoint = 2

PulseGeneratorEndPoint = 6

PulseGeneratorLength = 10

PulseGeneratorPulseWidth = 4

PulseGeneratorClearSyncMode = AsyncMode



The table below shows the PulseGeneratorClearSource signals that can be set.

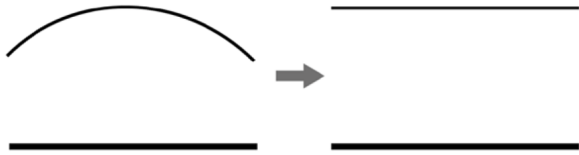
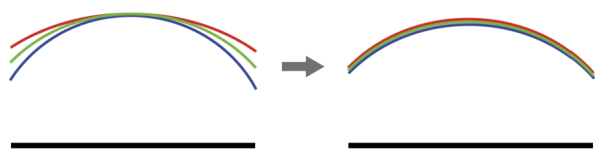
- ExposureActive, LVAL, PulseGenerator0-3*, UserOutput0-3, Line4 TTL In1, Line5 Opt In1, Line10 TTL In2, Line13 TTL In3, Logic Block0-2, EncoderTrigger

Note: *PulseGenerator0-3: You cannot select the same Pulse Generator that is currently selected. For example, if Pulse Generator 0 is selected, you cannot select Pulse Generator 0 as the Clear source.

Shading Correction

Related Setting Items: [Shading](#)

The Shading Correction function corrects non-uniformity (i.e., shading) in the amount of light generated by the lens and lighting equipment. This camera supports the following shading correction modes.

FlatShading	ColorShading
	
The highest brightness level is used as a reference, and other areas are corrected to match that brightness level.	R-, B,- and NIR-channel properties are adjusted by using the G-channel shading properties as a reference.

Shading Correction Blocks

The camera makes adjustments in blocks (4 pixels/block for the 4000Q models; 8 pixels/block for the 8000Q models). The block Index number (ShadingDataIndex) can be used to view and change the settings per block (ShadingData). For more information, see "[How to Configure the Shading Correction Function](#)".

How to Configure the Shading Correction Function

This section explains how to configure the Shading Correction function.

1. If you want to specify the area to calculate the correction value, configure the area with the **Width** and **OffsetX** settings [[ImageFormatControl](#)]. For more information, see "[ROI \(Regional Scanning Function\)](#)".
2. Select the Shading Correction Mode from **ShadingCorrectionMode**. (Flat Shading (Default) or Color Shading)
3. Select the user area (User1 ~ 3) where you save the shading correction data from **ShadingMode**.
4. Display a white chart under a uniform light and execute **CalibrateShadingCorrection**.
5. Once the shading correction is successfully completed, the shading correction values are automatically saved to the area specified in ShadingMode. Also, the calibration result "**Succeeded**" is displayed in **ShadingDetectResult**.
6. Optionally, you can view or change the setting of each correction block.

1. Select a color channel (Red, Green, or Blue) from **ShadingDataSelector** and an Index number (block number) from **ShadingDataIndex**.
2. The setting selected by **ShadingDataSelector** and **ShadingDataIndex** is displayed in **ShadingData**. To change the setting, overwrite the value (0x4000 = 1x).

Note: The set **ShadingData** value is rounded down to multiples of 4.

3. Execute **ShadingDataSave**. The currently set **ShadingData** will be overwritten and save to the area specified in **ShadingMode**.

Note: The setting is immediately reflected in the image, but is not saved until **ShadingDataSave** is executed. If **ShadingMode** is changed without executing **ShadingDataSave**, the setting will be discarded.

Cautions:

- The maximum amount of corrected gain is limited to 8 times the amount of gain before correction for all pixels. (The amount of gain will not be increased beyond 8 times the amount of gain before correction.)
- If the highest brightness level in the image is less than 175 LSB (at 10-bit video output), it cannot be corrected correctly.

ShadingDetectResult

A list of correction results is shown below.

Result	Description
Idle	Correction is not being performed.
Succeeded	Correction was completed successfully. The correction data was applied to the image area and saved in the user area specified by ShadingMode .
Error1 - Image was too bright	Correction failed. The image was too bright.
Error2 - Image was too dark	Correction failed. The image was too dark.
Error3 - Could not calibrated	Could not perform the adjustment due to one of the following reasons: • The image is not being output. • TestPattern[ImageFormatControl] is set to anything other than Off. • ShadingMode is set to Off.

Pixel Sensitivity Correction

Related Topic: [Correction](#)

Correct variations between the sensor's pixels.

Calibration must be performed within the camera and correction data must be created beforehand. DSNU (PixelBlackCorrect) / PRNU (PixelGainCorrect) can be reduced using that correction data.

We recommend performing calibration and creating correction data whenever the line rate setting or Analog base gain setting or vertical binning setting are changed significantly.

Refer to the following topics on how to perform the calibration.

- [DSNU Correction \(Pixel Black Correct\)](#)
- [PRNU Correction \(Pixel Gain Correct\)](#)

Notes:

- Correction data is saved for DSNU (PixelBlackCorrect) / PRNU (PixelGainCorrect) according to the conditions adjusted at the factory.
- We recommend performing DSNU and PRNU calibration again whenever the ExposureTime setting and Analog Gain setting (4000Q only) are changed significantly.
- A single correction data entry can be saved on the camera for each user. When calibration is performed, the correction data is saved to the non-volatile ROM at the same time.

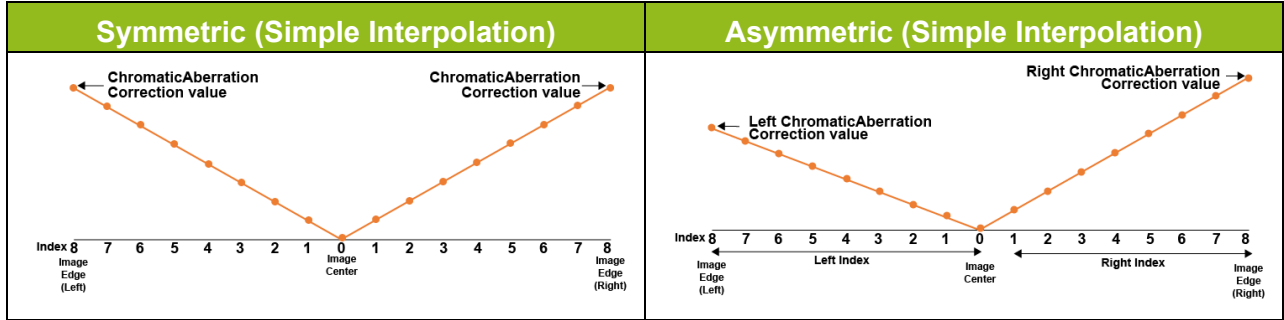
Chromatic Aberration Correction

Related Setting Items: [Correction](#)

This function corrects the magnification differences between the color channels which is caused by the chromatic aberration of the lens. In simpler terms when the object appears with a slightly different width on the blue, green, red and NIR channels. You can save correction data for three types of lenses. Specify the number of pixels to delay or advance the R, B and NIR channels using the G channel as a reference. With this camera, correction can be applied either symmetrically to the left and right sides or independently (asymmetrically) to each side. In addition, the correction method can be selected from three available options.

How to Configure

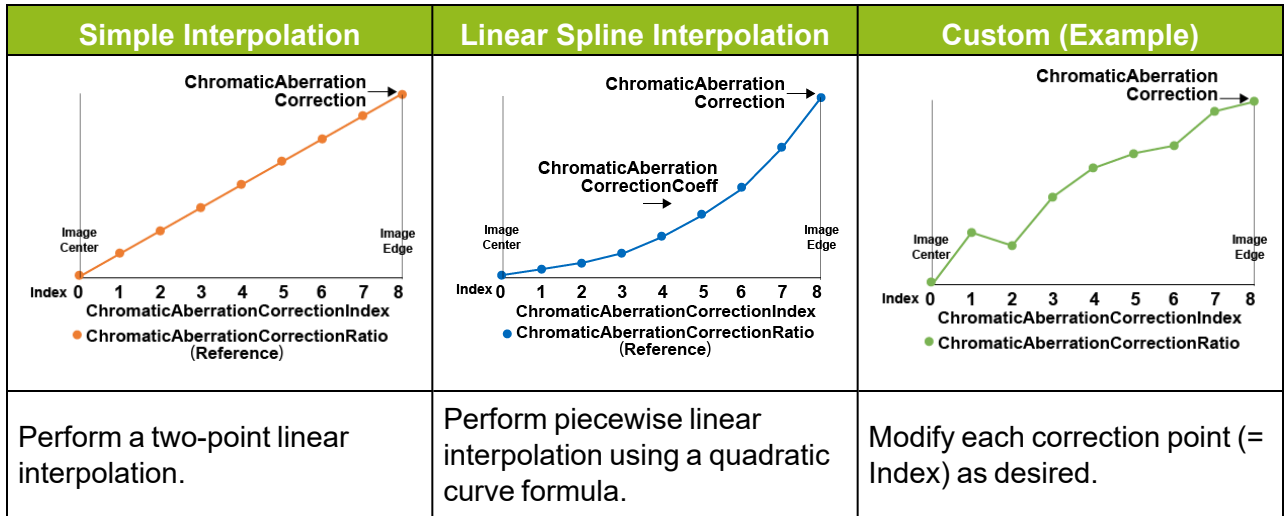
1. In **ChromaticAberrationCorrectionMode**, select **Lens1**, **Lens2**, or **Lens3**.
2. In **ChromaticAberrationCorrectionSymmetricMode**, select whether chromatic aberration correction is applied symmetrically to the left and right sides or independently to each side. Select **Symmetric** to apply symmetric correction, or **Asymmetric** to apply independent correction for the left and right sides.



3. When **ChromaticAberrationCorrectionSymmetricMode** is set to **Asymmetric**, select the side for which the correction values are configured (**Left** or **Right**) in **ChromaticAberrationCorrectionSideSelector**.

Note: When **Symmetric** is selected, this setting is fixed to **Both**.

4. Select how the correction is performed in **ChromaticAberrationCorrectionMethod**. Whichever option is selected, the correction is performed with the image center as the origin and the ChromaticAberrationCorrection value at both ends of the image.



Note: When **Asymmetric** is selected, different correction methods cannot be applied to the left and right sides. The same correction method is used for both sides.

5. In **ChromaticAberrationCorrectionSelector**, select **R Channel** to first configure the correction for the Red channel. The parameters that must be set depend on the selected correction method.
- **ChromaticAberrationCorrection (Simple Interpolation, Linear Spline Interpolation, Custom)**: Set the correction amount at the image edges. The setting range is -8.0 to +8.0 for SW-4000Q, and -16.0 to +16.0 for SW-8000Q.
 - **ChromaticAberrationCorrectionCoeff (Linear Spline Interpolation only)**: Set the correction coefficient. Setting range: 1.0 ~ 10.0, step 0.1
 - **ChromaticAberrationCorrectionRatio (Simple Interpolation, Linear Spline Interpolation)**: Refer to the correction ratio for each point (Chromatic Aberration Correction Index). Setting range: -1.000 ~ + 1.000; step 0.001
 - **ChromaticAberrationCorrectionRatio (Custom)**: Configure the correction ratio for each point (Chromatic Aberration Correction Index). Setting range: -1.000 ~ + 1.000; step 0.001. Configure the ChromaticAberrationCorrection setting first, and then configure this setting item.

Notes:

- When **Symmetric** is selected, **ChromaticAberrationCorrectionIndex** is defined such that the image center corresponds to 0, and both image edges correspond to 8. When **Asymmetric** is selected, the **ChromaticAberrationCorrectionIndex** range is 0 to 8 for the left side and 1 to 8 for the right side (see the images in Step 2).
- If **ChromaticAberrationCorrectionMethod** is set to any option other than **Custom** and the **ChromaticAberrationCorrectionRatio** value is changed manually, the correction method is forcibly switched to **Custom**.
- When the selected correction method is **Linear Spline Interpolation** or **Custom**, the correction value of each index will be calculated using the following formula.
 - **[Linear Spline Interpolation]**: Correction value

$$[\text{ChromaticAberrationCorrectionIndex}] = \text{pow}(\text{ChromaticAberrationCorrectionIndex}/10, \text{ChromaticAberrationCorrectionCoeff}) \times \text{ChromaticAberrationCorrection}$$
 - **[Custom]**: Correction value

$$[\text{ChromaticAberrationCorrectionIndex}] = \text{ChromaticAberrationCorrection} \times \text{ChromaticAberrationCorrectionRatio}[\text{ChromaticAberrationCorrectionIndex}]$$

6. Select **B Channel** from **ChromaticAberrationCorrectionSelector**, and configure the correction settings as R Channel.

When **ChromaticAberrationCorrectionSymmetricMode** is set to **Asymmetric**, select the other side (**Left** or **Right**) for which the correction values are to be configured, and repeat Steps 5 through 6 to set the correction values.

7. Select **NIR Channel** from **ChromaticAberrationCorrectionSelector**, and configure the correction settings as R Channel.

When **ChromaticAberrationCorrectionSymmetricMode** is set to **Asymmetric**, select the other side (**Left** or **Right**) for which the correction values are to be configured, and repeat Steps 5 through 6 to set the correction values.

8. Execute **ChromaticAberrationCorrectionSave** to save the settings. The saved settings are for the area (Lens1 ~ 3) selected in **ChromaticAberrationCorrectionMode**.
9. Optionally, adjust the red/blue pixel position using **SubPixelImageShiftR** / **SubPixelImageShiftB**. The setting range is -1.0 ~ +1.0 pixel (0.01pixel/step).
 - A positive value shifts the pixel to the right of the scan direction. A negative value shifts the pixel to the left of the scan direction.
 - An error will occur if a value greater than +1.0 is set.
 - The set value may not be displayed correctly in 0.01 pixel units on the host side.

Noise Reduction Filter Functions

Related Setting Items: [Correction](#)

The camera has noise reduction functions. The noise reduction methods vary depending on the channel.

Three filters are available:

- **MEDIAN Filter:** Apply 1x3 MEDIAN filter

Select the target to apply the filter from Red, Green, Blue, and set the **Median Filter Mode**. When set to **On**, this function is enabled. (Default = Off)

- **FIR Filter:** Apply the FIR (Finite Impulse Response) filter

Select the target to apply the filter from Red, Green, Blue, and set the **FIR Filter Mode**. When set to **On**, this function is enabled (Default = Off). In FIR Filter, the coefficients of the three signals (left, center, right) can be set in the range of -2 to 2. The correction value through the FIR Filter is:

- Left pixel read value x Left pixel coefficient +
 - Center pixel read value x Center pixel coefficient +
 - Right pixel read value x Right pixel coefficient.
- **Noise Reduction:** Apply the noise filter using JAI's own algorithm.

Set the noise reduction intensity in 4 levels. Level1 = weak, Level4 = strong.

Any of the above filters can improve SNR, but it affects the sense of resolution and sensitivity. An imaging test should be performed before deciding to use this feature.

Setting List (Feature Properties)

This camera complies with GenICam. Each setting item name conforms to GenICam SFNC (Standard Features Naming Convention). (There are some JAI-specific setting items).

Each setting item is an integer type (Integer), a real type (Float), an element enumeration type (Enumeration), a character string (String), a logical type (Boolean), and a category type (Category) or a command type (Command) for executing the function.

Beginner: For beginner users.

Expert: For users with deep knowledge of camera functions.

Guru: For advanced users who make settings, including advanced features that can cause the camera to malfunction if not set correctly.

Note: Depending on the setting item, you may need to change visibility. Please switch visibility (Beginner / Expert / Guru) as necessary.

Selector

A Selector is used to index which instance of the feature is accessed in situations where multiple instances of a feature exist.

Instance Example:

Each Line-related item (LineSource, LineInverter, etc.) has LineSelector-LineX instances, which can be set or referenced as an index.

Selectors are a feature of element enumeration type (Enumeration) or an integer type (Integer). However, unlike normal configuration items, it is only used to select the instance in the following configuration item.

It does not change the behavior of the camera by changing the value of the selector. Also, the selector may have only one selectable value. In this case, use the selector function only for information purposes. In this document, it is described as SelectedFeature[Selector] according to the description method of GenICam.

In the case of Line Selector with a specific I/O line selected, the description could be as follows.

```
LineSource[LineSelector-LineX] = High  
LineInverter[LineSelector-LineX] = False  
LineMode[LineSelector-LineX] = Input  
LineFormat[LineSelector-LineX] = TTL
```

Generally, selectors only apply to a single category of features. (Example: TriggerSelector only applies to trigger related functions.)

DeviceControl

Display/configure information related to the device.

Device Control Item	Setting Range	Default	Description
DeviceVendorName	"JAI Corporation"		Display the manufacturer name.
DeviceModelName	"SW-4000Q-10GE" "SW-4000Q-SFP" "SW-8000Q-10GE" "SW-8000Q-SFP"		Display the model name.
DeviceManufacturerInfo	"See the possibilities"		Display the manufacturer information.
DeviceVersion	-	-	Display the hardware version.
DeviceFirmwareVersion	-	-	Display the firmware version.
DeviceFpgaVersion			Display the FPGA version.
DeviceSerialNumber	-	-	Display the device ID.
DeviceUserID	Any	-	Set the user ID (16bytes) for the camera.
DeviceSFNCVersionMajor	-	2	Display the SFNC Major version.
DeviceSFNCVersionMinor	-	3	Display the SFNC Minor version.
DeviceSFNCVersionSubMinor	-	0	Display the SFNC Sub Minor version
DeviceManifestEntrySelector	-	1	Display information on valid XML file.
DeviceManifestXMLMajorVersion	0 ~ 32bit max	0	Indicates the major version number of the XML file of the selected manifest entry.
DeviceManifestXMLMinorVersion	0 ~ 32bit max	2	Indicates the minor version number of the XML file of the selected manifest entry.
DeviceManifestXMLSubMinorVersion	0 ~ 32bit max	1	Indicates the subminor version number of the XML file of the selected manifest entry.
DeviceManifestSchemaMajorVersion	0 ~ 32bit max	1	Indicates the major version number of the schema file of the selected manifest entry.
DeviceManifestSchemaMinorVersion	0 ~ 32bit max	1	Indicates the minor version number of the schema file of the selected manifest entry.
DeviceManifestPrimaryURL			Display the Primary URL.
DeviceManifestSecondaryURL			Display the Secondary URL.

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SW-4000Q-10GE | SW-4000Q-SFP | SW-8000Q-10GE | SW-8000Q-SFP

Device Control Item	Setting Range	Default	Description
DeviceTLType	-	0: GigEVision	Display type of transport layer.
DeviceTLVersionMajor	-	2	Display the Major version of transport layer.
DeviceTLVersionMinor	-	0	Display the Minor version of transport layer.
DeviceTLVersion SubMinor	-	1	Display the Sub Minor version of transport layer.
DeviceLinkSelector	-	0	Select I/F for control. (0 fixed)
Device Link Speed (Bps)	-	-	Display Link speed.
Device Link Heartbeat Mode	0: Off 1: On	On	Set the mode of Link heartbeat.
Device Link Heartbeat Timeout (us)	500000 ~ 120000000	3000000	Set the time of heartbeat timeout.
Device Stream Channel Count	-	-	Display the number of stream channels.
Device Event Channel Count	-	-	Display the number of event channels.
DeviceReset	-	-	Reset the device. (After the camera receives this command, it returns an ACK response. Then, execute reset.)
DeviceTemperatureSelector	-	0: Mainboard	Select the area of the camera's interior for which to display the temperature sensor's reading. (fixed Mainboard)
DeviceTemperature	-55 ~ 125	-	Display the internal temperature (°C) of the camera.
Timestamp (ns)	0~ 9223372036854775807 (maximum value of unsigned 64-bit)	0	Display the timestamp value. Resets to 0 when the signed maximum 64-bit value is exceeded.
TimestampReset	-	-	Forcibly sets the timestamp's count value to 0.
TimestampLatch	-	-	Sets the timestamp's count value to TimestampLatchValue.
TimestampLatchValue (ns)	0~ 9223372036854775807	-	Max: unsigned 64-bit
DeviceFpga2Version	-	-	Display the FPGA2 version.

ImageFormatControl

Configure image format settings.

Image Format Control Item	Setting Range	Default	Description
WidthMax	SW-4000Q-10GE: 4096 (2048) SW-8000Q-10GE: 8192 (4096) (): BinningHorizontal = 2		Display the maximum image width.
HeightMax	-	4096	
Width	16 (8) ~ (WidthMax - OffsetX) Step: 16 (8) Default: WidthMax (): BinningHorizontal = 2		Set the image width.
Height	1 ~ 4096	1	Set the image height.
OffsetX	0 (Default) ~ (WidthMax - OffsetX) Step: 16 (8) (): BinningHorizontal = 2		Set the horizontal offset.
OffsetY	0 ~ 4096	0	Set the vertical offset.
BinningHorizontal	1: Binning Off (Default) 2: Binning On		Set the number of pixels in the horizontal direction for which to perform binning.
SensorBinningVertical	1: Binning Off (Default) 2: Binning On		Set the number of pixels in the vertical direction for which to perform binning. BinningMode is fixed to Sum.
ComponentSelector	0: RGB (Default) 1: NIR		Select the Stream for which you want to set the PixelFormat.

Image Format Control Item	Setting Range	Default	Description
PixelFormat Related Topic: Pixel Format	ComponentSelector = RGB 0x02180014: RGB8 (Default) 0x0220001C: RGB10V1Packed 0x0220001D: RGB10p32 0x0210001F: YUV422_8_UYVY 0x02100032: YUV422_8 0x02200016: RGBA8 ComponentSelector = NIR 0x01080001: Mono8 (Default) 0x010C0004: Mono10Packed		Set the pixel format. When ComponentSelector = RGB is set to RGBA8, the PixelFormat setting for NIR is disabled.
OutputLineSelector Note: 4000Q Only	0: Rch (Default) 1: Gch 2: Bch 3: Nch		Select the OutputLine for a Color Channel.
OutputLine Note: 4000Q Only	0: Rch (Line0 Default) 1: Gch (Line1 Default) 2: Bch (Line2 Default) 3: Nch (Line3 Default)		Select the Color to output on the selected OutputLine. For example, when set to Rch=NIR / Gch=Green / Bch=Blue / Nch=Red, NIR is output at the conventional R position.
TestPattern	0: Off (Default) 1: White 2: GreyPattern1 (Ramp) 3: GreyPattern2 (Stripe) 4: ColorBar		Select the test image.
Horizontal Image Mirroring Related Topic: Horizontal Image Mirroring	0: Off 1: On	Off	Invert the image left and right.

AcquisitionControl

Configure image capture settings.

Acquisition Control Item	Setting Range	Default	Description
AcquisitionMode Related Topic: Acquisition Control	0: SingleFrame 1: MultiFrame 2: Continuous		Display the image capture mode.
Acquisition Start	-	-	Start image capture.
Acquisition Stop	-	-	Stop image capture.
AcquisitionFrameCount	1 ~ 65535	1	
Acquisition Frame Rate (Hz)	66 ~	66	
AcquisitionLineRate (Hz) Related Topic: Change the Line Rate	66 ~	66	Set the AcquisitionLineRate in Hz (step: 0.1). The maximum value varies depending on the PixelFormat and ROI settings. (Maximum Line Rate (Approximate))
Trigger Selector Related Topic: Trigger Control	0: Acquisition Start (Default) 1: Acquisition End 2: Line Start 3: FrameStart 4: FrameTransferStart		Select the trigger operation.
TriggerMode	0: Off 1: On	Off	Select the trigger mode
TriggerSource	7 ~ 10: PulseGenerator0 ~ 3 11 ~ 14: UserOutput0 ~ 3 15 ~ 18: Action0 ~ 3 23: Line4 TTL In 1 (Default) 24: Line5 Opt In1 29: Line10 TTL In2 32: Line13 TTL In3 36 ~ 37: Logical Block0 ~ 1 38: EncoderTrigger		Select the trigger signal source.
TriggerActivation	1: Rising Edge (Default) 2: Falling Edge 3: Level High 4: Level Low		Select the polarity of the trigger signal (i.e., location of signal at which trigger is applied). When TriggerSelector = LineStart, • ExposureMode = Off or Timed: RisingEdge, FallingEdge • ExposureMode = TriggerWidth: LevelHigh, LevelLow

Acquisition Control Item	Setting Range	Default	Description
ExposureMode Related Topic: Exposure Mode	0: Off 1: Timed (Default) 2: TriggerWidth		Select the exposure mode.
ExposureTimeMode	0: Common (Default) 1: Individual		Select the exposure time mode. Select "Common" to set the common value for all three sensors, and "Individual" to set the individual value for each channel. Note: This setting is available only when ExposureMode is set to Timed .
ExposureTimeSelector	0: Common (Default) 1: Red 2: Green 3: Blue 4: NIR		Select the sensor to set ExposureTime. To set the common setting values for all four sensors, select Common. Note: This setting is available only when ExposureMode is set to Timed .
ExposureTime (μs) Related Topic: Actual Exposure Time	3 ~ 15149.07 (step: 0.01)	15149.07	Set the exposure time (in μs) for the setting selected from ExposureTimeSelector . Note: Exposure Offset Time: -0.85μs
RBExposureInterlocked	0: Off 1: On	Off	When set to On, changes the exposure time while maintaining the Red / Blue exposure time ratio (G:R and G:B ratio before the change) with respect to Green.

AnalogControl

Configure analog control settings.

Analog Control Item	Setting Range	Default	Description
IndividualGainMode Related Topic: Gain Control	0: Off 1: On	0: Off	Select how to configure DigitalGain. When Off (=Master Mode), the overall gain is set by DigitalAll (master gain), and then the gain is fine-tuned by changing the DigitalRed, DigitalBlue, and DigitalNIR settings. When On , (= Individual Gain Mode), RGB/NIR can be configured individually for the entire gain adjustment range of the sensor.
GainSelector	0: DigitalAll* 1: DigitalRed 2: DigitalGreen** 3: Digital Blue 4: Digital NIR *IndividualGainMode=OFF Only **IndividualGainMode=ON Only		Select the gain to configure.
Gain	Individual Gain Mode = Off • DigitalAll: x1.0 ~ x32.0 • DigitalRed/Blue/NIR: x0.63 ~ x4.0 Individual Gain Mode = On • DigitalRed/Green/Blue/NIR: x1.0 ~ x64.0		Set the gain value for the gain setting selected in GainSelector.
AnalogGainSelector Note: 4000Q model Only	1: Analog Red (Default) 2: Analog Green 3: Analog Blue 4: Analog NIR		Select the analog gain to configure.
AnalogGain Note: 4000Q model Only	0: 0dB (Default) 1: 6dB 2: 12dB		Set the gain value for the analog gain setting selected in Analog Gain Selector .
BlackLevelSelector Related Topic: Adjust the Black Level	1: All (Default) 2: Red 3: Blue 4: NIR		Select the black level to configure.

Analog Control Item	Setting Range	Default	Description
BlackLevel	All: -133 ~ 255 Red/Blue/NIR: -64 ~ +64 Default: 0		Set the black level value.
BalanceWhiteAuto	0: Off (Default) 1: Once 2: ExposureOnce 3: Preset 5000K 4: Preset 6500K 5: Preset 7500K		Enable/disable auto white balance. Once automatically changes to Off when the signal level converges once.
Balance White Auto Width	128 (64) ~ (WidthMax - OffsetX), Step: 16 (8) Default: WidthMax (): BinningHorizontal = 2		Set the area for adjusting white balance.
BalanceWhiteAutoOffsetX	0 (Default) ~ (WidthMax - OffsetX), Step: 16 (8) (): BinningHorizontal = 2		Set the area for adjusting white balance.
BalanceWhiteAutoResult	0: Idle 1: Succeeded 2: Error1- G image was too bright 3: Error2 - G image was too dark 4: Error3 - Timeout error occurred		Display the result for adjusting white balance.
Gamma	4000Q: 0.45 (Default) , 0.50, 0.55, 0.60, 0.65, 0.75, 0.80, 0.90, 1.00 8000Q: 0.45 (Default) , 0.50, 0.55, 0.60, 0.65, 0.75, 0.80, 0.90, 1.00, 1.1, 1.2, 1.4, 1.6, 1.8, 2.1, 2.4, 2.7, 3.1, 3.5, 4.0		Set the gamma value.
LUTMode	0: Off (Default) 1: Gamma 2: LUT		Select the LUT mode.
SensorType	0: Type A (Default) 1: Type B		Select the size of pixel. TypeA : 7.5um x 7.5um TypeB : 7.5um x 10.5um

LUTControl

Configure LUT settings.

Related Topic: [LUT \(Lookup Table\)](#)

Image Format Control Item	Setting Range	Default	Description
LUTSelector	0: Red (Default) 1: Green 2: Blue 3: NIR		Select the LUT channel to control.
LUTIndex	0 ~ 256	0	Set the LUT index table number.
LUTValue	0 ~ 4095	Gamma= 1.0	Set the LUT value.

ColorTransformationControl

Configure color transformation settings.

Related Topic: [Color Space Conversion \(Color Transformation Control\)](#)

Color Transformation Control Item	Setting Range	Default	Description
ColorTransformationMode	0: RGB (Default) 1: HSI 2: XYZ		Set the output image format.
ColorTransformationRGBMode	0: OFF (Default) 1: sRGB 2: AdobeRGB 3: UserCustom		Set the detailed mode when RGB is selected for the color space.
ColorMatrixValueSelector	0: R-R (Default) 1: R-G 2: R-B 3: G-R 4: G-G 5: G-B 6: B-R 7: B-G 8: B-B		Select the ColorMatrix setting component.
ColorMatrixValue	-2.0 ~ 2.0	-	Set the Color Matrix value. (step = 0.1) Default: R-R, G-G, B-B: 1.0 Other than above: 0.0

DigitalIOControl

Configure settings for digital input/output.

Related Topic: [GPIO \(Digital Input/Output Settings\)](#)

Digital IO Control Item	Setting Range	Default	Description
LineSelector	20: Line1: TTL Out1 (Default) 23: Line4: TTL In1 24: Line5: Opt In1 27: Line8: TTL Out2 28: Line9: TTL Out3 29: Line10: TTL In2 31: Line12: TTL Out4 32: Line13: TTL In3		Select the input/output to configure.
LineMode	0: Input 1: Output	-	Display the input/output status (whether it is input or output).
LineInverter	0: False (Default) 1: True		Enable/disable polarity inversion for the selected input signal or output signal.
LineStatus	0: False (Low) (Default) 1: True (High)		Display the status of the input signal or output signal (True: High, False: Low).
LineStatusAll	bit0: Line1 bit1 ~ 2: Unused bit3: Line4 bit4: Line5 bit5 ~ 6: Unused bit7: Line8 bit8: Line9 bit9: Line10 bit10: Unused bit11: Line12 bit12: Line13 bit13 ~ 15: Unused		Display the input/output signal status. The state is shown with 16 bits. Note: Unused is fixed to 0.

Digital IO Control Item	Setting Range	Default	Description
LineSource Related Topic: LineSource Items	1: Acquisition Active 2: Frame Active 4: ExposureActive 6: LVAL 7 ~ 10: PulseGenerator0 ~ 3 11 ~ 14: UserOutput0 ~ 3 23: Line4: TTL In1 (Default) 24: Line5: Opt In1 29: Line10: TTL In2 32: Line13: TTL In3 36 ~ 37: LogicBlock0 ~ 1 38: EncoderTriger 39: EncoderDirection		Select the line source signal for the item selected in Line Selector .
LineFormat	2: TTL 5: Opto Coupled		Display the signal format.
OptInFilterSelector (ns)	0 ~ 1000000, step 100	0	Remove noise from the OptIn input signal of Digital I/O.
UserOutputSelector	0: User Output 0 (Default) 1: User Output 1 2: User Output 2 3: User Output 3		Set the UserOutput signal.
UserOutputValue	0: False (Default) 1: True		Set the value for the UserOutput selected in UserOutputSelector .

CounterAndTimerControl

Configure counter settings.

Note: This camera only supports counter functions

Related Topic: [Counter and Timer Control](#)

Counter and Timer Control Item	Setting Range	Default	Description
CounterSelector	0 ~ 5: Counter0 ~ 5	Counter0	Select the counter.
CounterEventSource	0: Off (Default) 1: LineTrigger (Counter0) 2: Line Start (Counter1) 3: Exposure Start (Counter2) 4: Frame Trigger (Counter3) 5: Frame Start (Counter4) 6: FrameTransferEnd (Counter5)		Assign the counter event signal for which you want to read the count value to a dedicated counter, and read the value
CounterEventActivation	1: Rising Edge 2: Falling Edge		Set the count timing. The setting value is fixed with the following data
CounterReset	-	-	Reset the counter.
CounterValue	0 ~ 32bit max	0	Display the count value.
CounterStatus	0: CounterIdle (Default) 1: CounterTriggerWait 2: CounterActive 3: CounterCompleted 4: CounterOverflow		Display the counter status.

EncoderControl

Related Topic: [Connecting Rotary Encoders](#)

Configure settings for encoder control.

Encoder Control Item	Setting Range	Default	Description
EncoderSourceA EncoderSourceB	0: Off (Default) 23: Line4 TTL In1 24: Line5 Opt In1 29: Line10 TTL In2 32: Line13 TTL In3		Select where to input the signal from the rotary encoder.
EncoderDivider Related Topic: EncoderDivider	1 ~ 32bit max	65536	When EncodeDivider is selected for EncoderTriggerOption , set the number of triggers to be generated as a ratio 65536 / (set value).
EncoderAveraging Interval	0: none (Default) 1: 2 pulses 2: 4 pulses 3: 8 pulses 4: 16 pulses 5: 32 pulses		When EncoderOutputMode is set to EncoderDivider and EncoderDivider is not set to an integer multiple of 65536, use this setting if the reliability of the interval of the signal output from the rotary encoder is low (some signal interval is extremely long or short; the encoder's jitter is large). When this function is enabled, internal processing is performed by averaging the interval of several previous signals.
EncoderFilter (ns)	0 ~ 150, step: 10	0	Apply a low-pass filter to prevent noise on the signal from the rotary encoder and stabilize the signal for the specified number of cycles.
EncoderStrobe (ns)	10 ~ 2550, step: 10	10	Set the strobe length of the Trigger signal generated from the rotary encoder by the number of cycles.
EncoderMaxIntervalFor NonDecimationMode (s) Note: 8000Q only	0 ~ 60	0	When EncoderOutputMode is set to EncoderDivider and EncoderDivider is not set to an integer multiple of 65536, set the maximum interval period of the output signal. This setting item is disabled when EncoderDivider is set to an integer multiple of 65536. 0: The trigger output period is calculated using the encoder input period only. 1 ~ 60: The trigger output period is calculated using the encoder input period and this setting.

Logic Block Control

Related Topic: [Logic Block Control](#)

Configure Logic Block settings.

Logic Block Control Item	Setting Range	Default	Description
Logic Block Selector	0: Logic Block 0 (Default) 1: Logic Block 1		Specifies the Logic Block to configure.
Logic Block Function	AND (Fixed)		Selects the combinational logic Function of the Logic Block to configure.
Logic Block Input Selector	0 ~ 1	0	Selects the Logic Block's input to configure.
Logic Block Input Source	4: ExposureActive 6: LVAL 7 ~ 9: PulseGenerator0 ~ 3 11 ~ 14: UserOutput0 ~ 3 23: Line4 TTL In1 (Default) 24: Line5 Opt In1 29: Line10 TTL In2 32: Line13 TTL In3 36 ~ 37: Logic Block0 ~ 1 38: Encoder Trigger		Selects the source signal for the input into the Logic Block.
Logic Block Input Inverter	0: False 1: True	0: False	Selects if the selected Logic Block Input source signal is inverted.
Logic Block Output Inverter	True (Fixed)		Selects if the selected Logic Block Output signal is inverted.

ActionControl

Related Topic: [Action Control Function](#)

Configure action control settings.

Action Control Item	Setting Range	Default	Description
Action Device Key	0x0 ~ 0xFFFFFFFF	0x00	Set the action device key.
Action Queue Size	0 ~ 32bit max	256	Set the size of action queue.
Action Selector	0 ~ 3	0	Select the action.
Action Group Mask	0x0 ~ 0xFFFFFFFF	0x00	Set the mask value that creates the action 0 group,
Action Group Key	0x0 ~ 0xFFFFFFFF	0x00	Set the key that executes action 1.

EventControl

Related Topic: [Event Control Function](#)

Configure event control settings.

Event Control Item	Setting Range	Default	Description
EventSelector	Select the event for which to send notifications. 0: AcquisitionStart (Default) 1: AcquisitionEnd 2: FrameStart 3: FrameEnd 4: LineStart 5: LineEnd 6: ExposureRedStart 7: ExposureRedEnd 8: ExposureGreenStart 9: ExposureGreenEnd 10: ExposureBlueStart 11: ExposureBlueEnd 12: Line1 RisingEdge 13: Line1 FallingEdge 14: Line4 RisingEdge 15: Line4 FallingEdge 16: Line5 RisingEdge 17: Line5 FallingEdge 18: Line8 RisingEdge 19: Line8 FallingEdge 20: Line9 RisingEdge 21: Line9 FallingEdge 22: Line10 RisingEdge 23: Line10 FallingEdge 24: Line12 RisingEdge 25: Line12 FallingEdge 26: Line13 RisingEdge 27: Line13 FallingEdge 28: LVALStart 29: LVALEnd 30: ExposureNIRStart 31: ExposureNIREnd		
EventNotification	0: Off (Default) 1: On 2: Once		Select whether to output the Event message selected by EventSelector . On: TheEvent data will be displayed each time the specified Event occurs. Once: The Event data will be displayed when the specified Event occurs and the EventNotification setting is reset to Off .
EventAcquisitionStartData			Display the following data when the Event occurs.
EventAcquisitionStart	-	0x9011	Display the EventID.
EventAcquisitionStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when an Event occurred.
EventAcquisitionStartFrameID			Displays the FrameID value when an event occurs.
EventAcquisitionEndData			Display the following data when the Event occurs.
EventAcquisitionEnd	-	0x9012	Display the EventID.
EventAcquisitionEndTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.

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Event Control Item	Setting Range	Default	Description
EventAcquisitionEndFrameID			Displays the FrameID value when an event occurs.
EventFrameStartData			Display the following data when the Event occurs.
EventFrameStart	-	0x9300	Display the EventID.
EventFrameStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when an Event occurred.
EventFrameStartFrameID			Displays the FrameID value when an event occurs.
EventFrameEndData			Display the following data when the Event occurs.
EventFrameEnd	-	0x9301	Display the EventID.
EventFrameEndTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventFrameEndFrameID			Displays the FrameID value when an event occurs.
EventLineStartData			Display the following data when the Event occurs.
EventLineStart	-	0x9032	Display the EventID.
EventLineStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLineStartFrameID			Displays the FrameID value when an event occurs.
EventLineEndData			Display the following data when the Event occurs.
EventLineEnd	-	0x09033	Display the EventID.
EventLineEndTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLineEndFrameID			Displays the FrameID value when an event occurs.
EventExposureRedStartData			Display the following data when the Event occurs.
EventExposureRedStart		0x09302	Display the EventID.
EventExposureRedStartTime Stamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureRedStartFrameID			Displays the FrameID value when an event occurs.
EventExposureRedEndData			Display the following data when the Event occurs.
EventExposureRedEnd		0x09303	Display the EventID.
EventExposureRedEndTime Stamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureRedEndFrameID			Displays the FrameID value when an event occurs.
EventExposureGreenStartData			Display the following data when the Event occurs.
EventExposureGreenStart	-	0x9304	Display the EventID.

User Manual (2.4) - Setting List (Feature Properties)
SW-4000Q-10GE | SW-4000Q-SFP | SW-8000Q-10GE | SW-8000Q-SFP

Event Control Item	Setting Range	Default	Description
EventExposureGreenStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureGreenStartFrameID			Displays the FrameID value when an event occurs.
EventExposureGreenEndData			Display the following data when the Event occurs.
EventExposureGreenEnd	-	0x9305	Display the EventID.
EventExposureGreenEndTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureGreenEndFrameID			Displays the FrameID value when an event occurs.
EventExposureBlueStartData			Display the following data when the Event occurs.
EventExposureBlueStart	-	0x9306	Display the EventID.
EventExposureBlueStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureBlueStartFrameID			Displays the FrameID value when an event occurs.
EventExposureBlueEndData			Display the following data when the Event occurs.
EventExposureBlueEnd	-	0x9307	Display the EventID.
EventExposureBlueTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureBlueEndtFrameID			Displays the FrameID value when an event occurs.
EventLine1RisingEdgeData			Display the following data when the Event occurs.
EventLine1RisingEdge	-	0x9310	Display the EventID.
EventLine1RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine1RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine1FallingEdgeData			Display the following data when the Event occurs.
EventLine1FallingEdge	-	0x9318	Display the EventID.
EventLine1FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine1FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine4RisingEdgeData			Display the following data when the Event occurs.
EventLine4RisingEdge	-	0x9313	Display the EventID.
EventLine4RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine4RisingEdgeFrameID			Displays the FrameID value when an event occurs.

User Manual (2.4) - Setting List (Feature Properties)
SW-4000Q-10GE | SW-4000Q-SFP | SW-8000Q-10GE | SW-8000Q-SFP

Event Control Item	Setting Range	Default	Description
EventLine4FallingEdgeData			Display the following data when the Event occurs.
EventLine4FallingEdge	-	0x931B	Display the EventID.
EventLine4FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine4FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine5RisingEdgeData			Display the following data when the Event occurs.
EventLine5RisingEdge	-	0x9314	Display the EventID.
EventLine5RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine5RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine5FallingEdgeData			Display the following data when the Event occurs.
EventLine5FallingEdge	-	0x931C	Display the EventID.
EventLine5FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine5FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine8RisingEdgeData			Display the following data when the Event occurs.
EventLine8RisingEdge	-	0x9507	Display the EventID.
EventLine8RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine8RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine8FallingEdgeData			Display the following data when the Event occurs.
EventLine8FallingEdge	-	0x931F	Display the EventID.
EventLine8FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine8FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine9RisingEdgeData			Display the following data when the Event occurs.
EventLine9RisingEdge	-	x9340	Display the EventID.
EventLine9RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine9RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine9FallingEdgeData			Display the following data when the Event occurs.
EventLine9FallingEdge	-	0x9360	Display the EventID.

User Manual (2.4) - Setting List (Feature Properties)
SW-4000Q-10GE | SW-4000Q-SFP | SW-8000Q-10GE | SW-8000Q-SFP

Event Control Item	Setting Range	Default	Description
EventLine9FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine9FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine10RisingEdgeData			Display the following data when the Event occurs.
EventLine10RisingEdge	-	0x9341	Display the EventID.
EventLine10RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine10RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine10FallingEdgeData			Display the following data when the Event occurs.
EventLine10FallingEdge	-	0x9361	Display the EventID.
EventLine10FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine10FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine12RisingEdgeData			Display the following data when the Event occurs.
EventLine12RisingEdge	-	0x9343	Display the EventID.
EventLine12RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine12RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine12FallingEdgeData			Display the following data when the Event occurs.
EventLine12FallingEdge	-	0x9363	Display the EventID.
EventLine12FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine12FallingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine13RisingEdgeData			Display the following data when the Event occurs.
EventLine13RisingEdge	-	0x9344	Display the EventID.
EventLine13RisingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine13RisingEdgeFrameID			Displays the FrameID value when an event occurs.
EventLine13FallingEdgeData			Display the following data when the Event occurs.
EventLine13FallingEdge	-	0x9364	Display the EventID.
EventLine13FallingEdgeTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLine13FallingEdgeFrameID			Displays the FrameID value when an event occurs.

User Manual (2.4) - Setting List (Feature Properties)
SW-4000Q-10GE | SW-4000Q-SFP | SW-8000Q-10GE | SW-8000Q-SFP

Event Control Item	Setting Range	Default	Description
EventLVALStartData			Display the following data when the Event occurs.
EventLVALStart	-	0x9330	Display the EventID.
EventLVALStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLVALStartFrameID			Displays the FrameID value when an event occurs.
EventLVALEndData			Display the following data when the Event occurs.
EventLVALEnd	-	0x9331	Display the EventID.
EventLVALTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventLVALEndFrameID			Displays the FrameID value when an event occurs.
EventExposureNIRStartData			Display the following data when the Event occurs.
EventExposureNIRStart	-	0x9308	Display the EventID.
EventExposureNIRStartTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureNIRStartFrameID			Displays the FrameID value when an event occurs.
EventExposureNIREndData			Display the following data when the Event occurs.
EventExposureNIREnd	-	0x9309	Display the EventID.
EventExposureNIRTimestamp	0 ~ 64bit max	0	Display the Timestamp value when the Event occurred.
EventExposureNIREndtFrameID			Displays the FrameID value when an event occurs.

UserSetControl

Configure user settings.

Related Topic: [Step 7: Save the Settings](#)

User Set Control Item	Setting Range	Default	Description
UserSetSelector	0: Default (Default) 1: User1 2: User2 3: User3		Select the user settings. Note: Default - Invalid when executing UserSetSave
UserSetLoad	-	-	Read the user settings specified in UserSetSelector. When selecting Default for UserSetSelector, the factory settings are loaded.
UserSetSave	-	-	Overwrite the current setting values with the user settings specified in UserSetSelector. Invalid when UserSetSelector is set to Default.

ChunkDataControl

Configure Chunk control settings.

Related Topic: [Chunk Data Function](#)

Chunk Data Control Item	Setting Range	Default	Description
ChunkModeActive	0: False 1: True	0: False	Set whether to enable ChunkData.
Chunk Selector	1: OffsetX (Default) 2: OffsetY 3: Width 4: Height 5: BinningHorizontal 6: SensorBinningVertical 7: PixelFormat 8: Timestamp 9: LineStatusAllOn ExposureStart 10: LineStatusAllOn LVALStart 11: LineStatusAllOn LVALEnd 12: CounterValue 13: ExposureTime 14: Gain 15: BlackLevel 16: DeviceSerial Number 17: DeviceUserID 18: DeviceTemperature		Select the Chunk data to add.
ChunkEnable	0: False 1: True	False*	Select whether to output ChunkData. *True for ChunkImage.
ChunkComponentSelector	0: RGB 1: NIR	0: RGB	Select the PixelFormat to display.
ChunkImage			ChunkID: 0x00001000
ChunkOffsetX	-	-	Display the OffsetX value (ImageFormatControl) ChunkID: 0x00002000
ChunkOffsetY	-	-	Display the OffsetY value (ImageFormatControl) ChunkID: 0x00002001

Chunk Data Control Item	Setting Range	Default	Description
ChunkWidth	-	-	Display the Width value (ImageFormatControl) ChunkID: 0x00002002
ChunkHeight	-	-	Display the Height value (ImageFormatControl) ChunkID: 0x00002003
ChunkBinningHorizontal	-	-	Display the BinningHorizontal value (ImageFormatControl) ChunkID: 0x00002022
ChunkSensorBinningVertical	-	-	Display the SensorBinningVertical value (ImageFormatControl) ChunkID: 0x00002025
ChunkPixelFormat	-	-	Display the PixelFormat value (ImageFormatControl) ChunkID: 0x00002012
ChunkTimeStamp	-	-	Display the Timestamp of the image included in the payload at the time of the FrameStart internal event. ChunkID: 0x00002014
ChunkLineStatusAllOn ExposureStart	-	-	Display the LineStatusAll value at ExposureStart. Data acquisition timing is at ExposureStart of the first line. ChunkID: 0x00002015
ChunkLineStatusAllOn LVALStart	-	-	Display the LineStatusAll value at LVALStart. Data acquisition timing is at ExposureStart of the first line. ChunkID: 0x00002027
ChunkLineStatusAllOn LVALEnd	-	-	Display the LineStatusAll value at LVALEnd. Data acquisition timing is at ExposureStart of the first line. ChunkID: 0x00002028
ChunkCounterSelector	Counter0 ~ 5	Counter0	Select the counter to display the ChunkCounterValue.
ChunkCounterValue	-	-	Display the CounterValue specified by ChunkCounterSelector. Counter0: Line Trigger (ChunkID: 0x00002029) Counter1: Line Start (ChunkID: 0x0000202A) Counter2: Exposure Start (ChunkID: 0x0000200F) Counter3: Frame Trigger (ChunkID: 0x0000200E) Counter4: Frame Start (ChunkID: 0x0000202B) Counter5: Frame Transfer End (ChunkID: 0x00002011)
ChunkExposureTime Selector	0: Common 1: Red 2: Green 3: Blue 4: NIR	Common	Select ExposureTime to display the ChunkExposureTime.

Chunk Data Control Item	Setting Range	Default	Description
ChunkExposureTime	ExposureTime (Red): (ChunkID: 0x0000201C) ExposureTime Green/Common: (ChunkID: 0x00002004) ExposureTime Blue: (ChunkID: 0x0000201D) ExposureTime NIR: (ChunkID: 0x0000202C)		Display the ExposureTime specified by ChunkExposureTimeSelector.
ChunkIndividualGainMode	-	-	Display the IndividualGainMode value. ChunkID: 0x0000201E
ChunkGainSelector	0: Digital All 1: Digital Green 2: Digital Red 3: Digital Blue 4: DigitalNIR	-	Select the Gain to configure.
ChunkGain	-	-	Display the Gain (AnalogControl) value. Digital All / Digital Green (ChunkID: 0x00002005) Digital Red (ChunkID: 0x00002006) Digital Blue (ChunkID: 0x00002007) Digital NIR (ChunkID: 0x0000202D)
ChunkBlackLevelSelector	0: All 1: Red 2: Blue 3: NIR	-	Select the Black Level to configure.
ChunkBlackLevel	-	-	Display the BlackLevel specified by ChunkBlackLevelSelector. All: ChunkID: 0x00002008 Red: ChunkID: 0x00002009 Blue: ChunkID: 0x0000200A NIR: ChunkID: 0x0000202E
ChunkDeviceSerialNumber	-	-	Display the DeviceSerialNumber value. ChunkID: 0x00002017
ChunkDeviceUserID	-	-	Display the DeviceUserID value. ChunkID: 0x00002018
ChunkDeviceTemperature Selector	Mainboard (Fixed)	-	Select the device to display the ChunkDeviceTemperature.
ChunkDeviceTemperature	-	-	Display the DeviceTemperature value (°C). ChunkID: 0x00002019

Transport Layer Control

Configure Transport Layer settings.

Transport Layer Control Item	Setting Range	Default	Description
PayloadSize (byte)	48 ~ 67109240	4000Q: 12288 8000Q: 24576	Display the payload size information.
GigEVision			
GevPhysicalLinkConfiguration	-	SingleLink (Fixed)	Display the LinkConfiguration status.
GevSupportedOption Selector	Select the supported options for GigEVision. The selections are as follows:		
	Link Configuration	SingleLink, MultiLink, StaticLAG, DynamicLAG	
	nif Configuration	PAUSEFrameReception, PAUSEFrameGeneration, IPConfigurationLLA, IPConfigurationDHCP, IPConfigurationPersistentIP	
	GVCP	MessageChannelSourceSocket, CommandsConcatenation, WriteMem, PacketResend, Event, EventData, PendingAck, IEEE1588, Action, UnconditionalAction, ScheduledAction, PrimaryApplicationSwitchover, ExtendedStatusCodes, ExtendedStatusCodesVersion2_0, DiscoveryAckDelay, DiscoveryAckDelayWritable, TestData, ManifestTable, CCPApplicationSocket, LinkSpeed, HeartbeatDisable, SerialNumber, UserDefinedName	
	GVSP	StreamChannelSourceSocket, StandardIDMode, StreamChannelBigAndLittleEndian, StreamChannelIPReassembly, StreamChannelMultiZone, StreamChannelPacketResendDestination, StreamChannelAllInTransmission, StreamChannelUnconditionalStreaming, StreamChannelExtendedChunkData	
GevSupportedOption	0: False 1: True	-	Displays whether the function selected by GevSupportOptionSelector is supported or not.
GevInterfaceSelector	-	0 (Fixed)	Selects which logical link to control.
GevMacAddress	-	-	Display the MAC address.
GevPAUSEFrameReception	0: False 1: True	True	Controls whether incoming PAUSE Frames are handled on the given logical link.
GevPAUSEFrameTransmission	0: False 1: True	True	Controls whether PAUSE Frames can be generated on the given logical link.

Transport Layer Control Item	Setting Range	Default	Description
GevCurrentIPConfiguration LLA		True (Fixed)	Display whether the current IP configuration is calibrated by LLA (link-local address).
GevCurrentIPConfiguration DHCP	0: False 1: True	True	Select whether to set the IP configuration to DHCP.
GevCurrentIPConfiguration PersistentIP	0: False 1: True	False	Select whether to set the IP configuration to Persistent IP.
GevCurrentIPAddress	-	-	Display the IP address.
GevCurrentSubnetMask	-	-	Display the subnet.
GevCurrentDefaultGateway	-	-	Display the default gateway.
GevIPConfigurationStatus	0: None 1: PersistentIP 2: DHCP 3: LLA 4: ForceIP	LLA	Display the current IP configuration status.
GevPersistentIPAddress	0.0.0.0. ~ 255.255.255.255		Set the persistent IP address.
GevCurrentSubnetMask			Set the persistent subnet mask.
GevPersistentDefaultGateway			Set the persistent default gateway.
GevIEEE1588	0: False 1: True	False	TRUE : Enables PTP FALSE: Disables PTP
GevIEEE1588ClockAccuracy	0 ~ 20	Unknown	Indicates clock accuracy. 0:Within25ns, 1:Within100ns, 2:Within250ns, 3:Within1us, 4:Within2p5u, 5:Within10us, 6:Within25us, 7:Within100us, 8:Within250us, 9:Within1ms. 10:Within2p5ms, 11:Within10ms, 12:Within25ms, 13:Within100ms, 14:Within250ms, 15:Within1s, 16:Within10s, 17:GreaterThan10s, 18:AlternatePTPProfile, 19:Unknown, 20:Reserved
GevIEEE1588Status	-	Disabled	Display the IEEE 1588 Status. 1: Initializing, 2: Faulty, 3: Disabled, 4: Listening, 5: PreMaster, 6: Master, 7: Passive, 8: Uncalibrated, 9: Slave
GevGVCPEExtendedStatus CodesSelector	0:Version1_1 1:Version2_0	Version1_1	Select the GevGVCPEExtendedStatusCodes.
GevGVCPEExtended StatusCodes	0: False 1: True	False	Enables the generation of extended status codes.

Transport Layer Control Item	Setting Range	Default	Description
GevGVCPPendingAck	0: False 1: True	False	Enables/disables the PENDING_ACK.
GevGVSPExtendedIDMode	0: Off 1: On	On	Enables/disables Extended ID Mode.
GevCCP	0: OpenAccess 1: ExclusiveAccess 2: ControlAccess	0: OpenAccess	Control access rights. 0: OpenAccess - Access rights have not been obtained by the application. 1: ExclusiveAccess - Once the application has made this setting, no other applications can control or reference the camera. 2: ControlAccess - Access rights have been obtained by the application. Other applications cannot control the camera, but can refer to it.
GevPrimaryApplicationSocket	-	-	Returns the UDP source port of the primary application.
GevPrimaryApplicationIPAddress	-	-	Returns the address of the primary application.
GevMCPHostPort	-	-	Controls the port to which the device must send messages. Setting this value to 0 closes the message channel.
GevMCDA	-	-	Controls the destination IP address for the message channel.
GevMCTT	0 ~ 4294967295	400	Display/set the Transmission Timeout for Message Channel.
GevMCRC	0 ~ 4294967295	3	Display/set the Retry Count for Message Channel.
GevMCSP	-	-	This feature indicates the source port for the message channel.
GevStreamChannelSelector	0 ~ 1	0 (Default)	Selects the stream channel to control.
GevSCPHostPort	-	-	Controls the port to which the device must send messages.
GevSCPSFireTestPacket	0: False 1: True	True	Sends a test packet.
GevSCPSDoNotFragment	0: False 1: True	True	The state of this feature is copied into the "do not fragment" bit of IP header of each stream packet. It can be used by the application to prevent IP fragmentation of packets on the stream channel.

Transport Layer Control Item	Setting Range	Default	Description
GevSCPSPacketSize (byte)	1476 ~ 8192	1476	This GigE Vision specific feature corresponds to DeviceStreamChannelPacketSize and should be kept in sync with it. It specifies the stream packet size, in bytes, to send on the selected channel for a GVSP transmitter or specifies the maximum packet size supported by a GVSP receiver.
GevSCPD	0 ~	0	Controls the delay (in GEV timestamp counter unit) to insert between each packet for this stream channel. The maximum value varies depending on the settings.
GevSCDA	-	-	Controls the destination IP address of the selected stream channel to which a GVSP transmitter must send data stream or the destination IP address from which a GVSP receiver may receive data stream.
GevSCSP	-	-	Indicates the source port of the stream channel.

PulseGenerator

Configure pulse generator settings.

Pulse Generator Item	Setting Range	Default	Description
ClockPreScaler	1 ~ 4096	1	Set the division value for the prescaler (12 bit) using PixelClock as the base clock.
PulseGeneratorClock (MHz)	-	100	Set the clock used for the pulse generator. This value is calculated using the [ClockPreScaler] value as a base. PulseGeneratorClock = 100 / ClockPreScaler
PulseGeneratorSelector	0: PulseGenerator0 (Default) 1: PulseGenerator1 2: PulseGenerator2 3: PulseGenerator3		Select the pulse generator.
PulseGeneratorLength Value	1 ~ 1048575	30000	Set the maximum count-up value as a clock count.
PulseGeneratorLength (ms)	-	0.3	Set the maximum count-up value in milliseconds. PulseGeneratorLength = 1/PulseGeneratorClock * PulseGeneratorLengthValue
PulseGeneratorFrequency (Hz)	0 ~ 1048574	3333.3333	Set the maximum count-up value as a frequency. PulseGeneratorFrequency = 1sec / PulseGeneratorLength
PulseGeneratorStartPoint Value	0 ~ 1048575	0	Set the start point of the High interval as a clock count. When the counter reaches this value, the output will be 1.
PulseGeneratorStartPoint (ms)	-	0	Set the start point of the High interval in milliseconds. When the counter reaches this value, the output will be 1. PulseGeneratorStartPoint = 1/PulseGeneratorClock * PulseGeneratorStartPointValue
PulseGeneratorEndPoint Value	1 ~ 1048575	15000	Set the start point of the Low interval as a clock count. When the counter reaches this value, the output will be 0.
PulseGeneratorEndPoint (ms)	-	0.15	Set the start point of the Low interval in milliseconds. When the counter reaches this value, the output will be 0. PulseGeneratorEndPoint = 1/PulseGeneratorClock * PulseGeneratorEndPointValue

Pulse Generator Item	Setting Range	Default	Description
PulseGeneratorPulseWidth (ms)	-	0.15	Display the High interval width of the pulse in milliseconds. The duration between the Start Point and End Point is calculated. PulseGeneratorPulseWidth = 1/PulseGeneratorClock * (PulseGeneratorEndPointValue - PulseGeneratorStartPointValue)
PulseGeneratorRepeat Count	0 ~ 255	0	Set the repeat count for the counter. When this is set to 0, a free counter is enabled with no repeat limit.
PulseGeneratorClear Activation	0: Off (Default) 1: Rising Edge 2: Falling Edge 3: Level High 4: Level Low		Set the clear signal condition for the count clear input of the pulse generator.
PulseGeneratorClear Source	1: ExposureActive 6: LVAL 7 ~ 10: PulseGenerator0 ~ 3* 11 ~ 14: UserOutput0 ~ 3 23: Line4: TTL In1 (Default) 24: Line5: Opt In1 29: Line10: TTL In2 32: Line13 TTL In3 36 ~ 37: Logic Block0 ~ 1 38: EncoderTriger		Select the count clear input signal source. Note: *Disabled if the PulseGenerator is selected in PulseGeneratorSelector.
PulseGeneratorClear SyncMode	0: Async Mode 1: Sync Mode		Select the sync mode for the count clear input signal.

Shading

Configure shading correction settings.

Related Topic: [Shading Correction](#)

Shading Control Item	Setting Range	Default	Description
ShadingCorrectionMode	0: Flat Shading (Default) 1: Color Shading		Select the shading correction method.
ShadingMode	0: Off (Default) 1: User1 2: User2 3: User3		Set the area to which to save shading correction data. When this is set to Off, CalibrateShadingCorrection will not be executed.
CalibrateShadingCorrection	-	-	Execute shading correction. Note: This command cannot be executed under the following conditions: when outputting no image, when outputting TestPattern.Width and/or Height are less than 128, when Shading Mode is Off.
ShadingCalibrationResult	0: Idle (Default) 1: Succeed 2: Error1 - Image was too bright 3: Error2 - Image was too dark 4: Error3 - Could not calibrated		Display the shading correction results.
ShadingDataSelector	0: Red (Default) 1: Green 2: Blue 3: NIR		Read the shading correction data and select the sensor to be changed.
ShadingDataIndex	1 ~ 1024	1	Set the index table number for shading correction.
ShadingData	0 ~ 0x1FFF	0x4000	Display the result of shading correction.
ShadingDataSave	-	-	Save the result of shading correction.

Correction

Correct variations due to sensors and lenses. (PRNU/DSNU)

Correction Control Item	Setting Range	Default	Description
PixelBlackCorrectionMode Related Topic: DSNU Correction (Pixel Black Correct)	0: Off 1: Default (Default) 2: User1 3: User2 4: User3		(DSNU) Select the user area to which to save the black level correction value.
CalibratePixelBlackCorrection	-	-	(DSNU) Generate black level correction data automatically from the captured image. Caution: When Pixel Black Correction Mode is set to Off or Default and a test pattern is being output instead of an image, this command cannot be executed.
PixelBlackCalibrationResult	0: Idle (Default) 1: Succeeded 2: Error1 - Image was too bright 3: Error2 - Image was too dark 4: Error3 - Could not calibrated		(DSNU) Display the results of Calibrate Pixel Black Correction execution.
PixelGainCorrectionMode Related Topic: PRNU Correction (Pixel Gain Correct)	0: Off 1: Default (Default) 2: User1 3: User2 4: User3		Select the user area to which to save the gain correction value.
CalibratePixelGainCorrection	-	-	(PRNU) Generate gain correction data automatically from the captured image. Caution: When Pixel Black Correction Mode is set to Off or Default and a test pattern is being output instead of an image, this command cannot be executed.

Correction Control Item	Setting Range	Default	Description
PixelGainCalibrationResult	0: Idle (Default) 1: Succeeded 2: Error1 - Image too bright 3: Error2 - Image too dark 4: Error3 - Timeout error		(PRNU) Display the results of Calibrate Pixel Gain Correction execution.
ChromaticAberrationCorrectionMode Related Topic: Chromatic Aberration Correction	0: Off (Default) 1: Lens1 2: Lens2 3: Lens3		Correct the color aberration that occurs at the left and right edges due to lens characteristics.
ChromaticAberrationCorrectionSymmetricMode	0: Symmetric (Default) 1: Asymmetric		Select whether chromatic aberration correction is applied symmetrically to both left and right sides, or independently to each side. Select Symmetric to apply symmetric correction, or Asymmetric to apply independent correction to the left and right sides.
ChromaticAberrationCorrectionSideSelector	0: Both (Default) 1: Left 2: Right		When Asymmetric is selected, choose the side to which the correction value is applied (Left or Right). When Symmetric is selected, this setting is fixed to Both .
ChromaticAberrationCorrectionMethod	0: Simple Interpolation (Default) 1: Linear Spline Interpolation 2: Custom		Select the Chromatic Aberration Correction method. Simple Interpolation: Perform a two-point linear interpolation. Linear Spline Interpolation: Performs piecewise linear interpolation using a quadratic curve formula. Custom: Modify each correction point as desired.
ChromaticAberrationCorrectionSelector	0: R Channel (Default) 2: B Channel 3: NIR		Specify the channel for which to perform Chromatic Aberration Correction Lens1,2,3.
ChromaticAberrationCorrectionIndex	-	1	1: Asymmetric Right: 1 ~ 8 Both / Left: 0 ~ 8
ChromaticAberrationCorrectionCorrectionRatio	-1.000 to +1.000 step: 0.001		Select the index value of the Chromatic Aberration Correction Ratio to be referenced. The available setting range varies depending on the ChromaticAberrationCorrectionSideSelector setting. Right: 1 ~ 8 Both / Left: 0 ~ 8

Correction Control Item	Setting Range	Default	Description
ChromaticAberrationCorrection	4000Q R/B/NIR: -8.0 to +8.0 8000Q R/B: -8.0 to +8.0 NIR: -16.0 to +16.0 Default: 0, Step 0.1		Set the amount of correction for Chromatic Aberration Correction Lens1,2,3.
ChromaticAberrationCorrection Coeff	1.0 ~ 10.0 step: 0.1	2	Sets the coefficient value of the Chromatic Aberration Correction for Linear Spline Interpolation.
ChromaticAberrationCorrection Save	-	-	Save the related value of the Chromatic Aberration Correction features.
SubPixelImageShiftR	-1.0 to +10.0 step: 0.1	0	Adjust the red pixel position in subpixels. A positive value shifts the pixel to the right of the scan direction. A negative value shifts the pixel to the left of the scan direction.
SubPixelImageShiftB	-1.0 to +10.0 step: 0.1	0	Adjust the blue pixel position in subpixels. A positive value shifts the pixel to the right of the scan direction. A negative value shifts the pixel to the left of the scan direction.
FIRFilterSelector	0: Red (Default) 1: Green 2: Blue 3: NIR		Select the target to apply FIR Filter from Red, Green, Blue.
Related Topic: Noise Reduction Filter Functions			
FIRFilterMode	0: Off 1: On	Off	Enable / Disable FIR Filter.
FIRFilterLeftRatio	-2 ~ 2	0	Set the coefficient of the left pixel when FIR Filter is applied.
FIRFilterCenterRatio	-2 ~ 2	1	Set the coefficient of the center pixel when FIR Filter is applied.
FIRFilterRightRatio	-2 ~ 2	0	Set the coefficient of the right pixel when FIR Filter is applied.
MEDIANFilterSelector	0: Red (Default) 1: Green 2: Blue 3: NIR		Select the target to apply Median Filter from Red, Green, Blue
MEDIANFilterMode	0: Off 1: On	Off	Enable / Disable MEDIAN Filter.

Correction Control Item	Setting Range	Default	Description
NoiseReduction	0: Off (Default) 1: Level1 2: Level2 3: Level3 4: Level4		Set the noise reduction intensity in 4 levels. Level1 = weak, Level4 = strong

Miscellaneous

Troubleshooting

Check the following before requesting help. If the problem persists, contact your local JAI distributor.

Power Supply and Connections

Issue: The POWER/TRIG LED remains lit amber and does not turn green, even after power is supplied to the camera.

Cause and Solution: Camera initialization may not be complete due to lack of power. Check the 12-pin power cable connection.

Image Display

Issue: Gradation in dark areas is not noticeable.

Cause and Solution: Use the gamma function to correct the display. As the light-emitting properties of the monitor are not linear, the entire image may be darker or the gradation in the dark areas may be less noticeable when camera outputs are displayed without processing. Using the gamma function performs correction to produce a display that is close to linear. For details, see [Gamma Function](#).

Settings and Operations

Issue: Settings cannot be saved to user memory.

Cause and Solution: You cannot save to user memory while images are being acquired by the camera. Stop image acquisition before performing the save operation.

Issue: I want to restore the factory default settings.

Cause and Solution: Load Default under User Set Selector in the Feature Properties tab to restore the factory default settings.

Specifications

Item	Specifications		
Image Sensor	4K / 8K line scan CMOS image sensor × 4		
		SW-4000Q-10GE	SW-8000Q-10GE
	Effective Pixels	4096 × 4 (R, G, B, NIR)	8192 × 4 (R, G, B, NIR)
	Pixel Size	TypeA: 7.5 μm x 7.5 μm	3.75 μm x 5.78 μm
TypeB: 7.5 μm x 10.5 μm			
Synchronization	Internal		
Communication Interface	10GE Models: 10GBase-T, 5GBase-T, 2.5GBase-T, 1000Base-T		
	SFP Models: 10GBase-R		
Line Rate (Full ROI)		SW-4000Q-10GE	SW-8000Q-10GE
	RGBa8	66Hz ~ 73kHz	66Hz ~ 37kHz
	RGB8 + Mono8	66Hz ~ 72kHz	66Hz ~ 36kHz
	RGB10 + Mono10p	66Hz ~ 53kHz	66Hz ~ 26kHz
	YUV422_8 + Mono8	66Hz ~ 74kHz	66Hz ~ 37kHz
	Note: When taking a trigger signal from the outside, there is no limitation on the minimum value		
SN SW-4000Q	455 dB (Gain = 0dB) @10bit		
SN SW-8000Q	G-ch	NIR-ch	
	> 53dB	> 55dB	
	Gain = 0dB, 10bit, ExposureTime = 525μs, IndividualGainMode = Off		
Digital Image Output Format		SW-4000Q-10GE	SW-8000Q-10GE
	Width (pixels)	16 (8) ~ 4096 (2048), 16 (8) pixels/step	16 (8) ~ 8192 (4096), 16 (8) pixels/step
	OffsetX	0 ~ 4080 (2040), 16 (8) pixels/step	0 ~ 8176 (4088), 16 (8) pixels/step
	Height	1 ~ 4096 lines, 1 line / step	
	OffsetY	0 ~ 4096 lines, 1 line / step	
	PixelFormat (1 Stream)	RGBa8	
	PixelFormat (2 Streams)	RGB: RGB8, RGB10V1Packed, RGB10p32, YUV422_8, YUV422_8_UYVY	
		NIR: Mono8, Mono10Packed	
() = Binning On			
Acquisition Mode	SingleFrame, MultiFrame, Continuous		

Item	Specifications		
Exposure Mode	Exposure Mode		ExposureTime (step: 0.01μs)
	Off		Line Period - 3.29 μ s + 0.85 μ s
	Timed (LineStart Trigger Off)		3.0 μ s ~ 15.149ms
	Timed (LineStart Trigger On)		3.0 μ s ~ 15.149ms
	TriggerWidth (LineStart only)		TriggerWidth + 0.85 μ s (1.8 μ s ~ 1s)
Trigger Selector	Acquisition: AcquisitionStart / AcquisitionEnd Exposure: FrameStart / LineStart Transfer: FrameTransferStart		
Trigger Inputs	12pin (DC IN/TRIG): TTL, Opt Input 10pin (AUX): TTL Input Positive / negative logic switchable. Minimum trigger width: 50ns and more		
Trigger Input Signals	Software, Line4 (TTL In1), Line5 (Opt IN1), Line10 (TTL In2), Line13 (TTL In3), PulseGenerator0-3, UserOutput0-3, Action0-3, LogicBlock0-1, EncoderTrigger		
Gain Adjustment	Mode		Gain Range
	Analog Gain (4000Q Only)		0dB / 6dB / 12dB
	Individual Gain Mode		DigitalG/R/B/NIR: 0 ~ 36.0dB
	Master Mode (IndividualGainMode = Off)		DigitalAll: 0 ~ 30.0dB
			Digital R/B/NIR: -4 ~ +12.0dB
Black Level Adjustment	All: -133 ~ +255 (LSB@12bit) Red/Blue/NIR: -64 ~ +64 (LSB@12bit) Default setting: Output black level at 0 (33LSB during 10-bit)		
White Balance	BalanceWhiteAuto: Off, Once, Exposure Once, Preset5000K, Preset6500K, Preset7500K		
Test Pattern	Off, White, GreyPattern1(Ramp), GreyPattern2(Stripe), ColorBar		
Image Processing	Pixel Sensitivity Correction: Pixel Correction (DSNU, PRNU) Shading Correction ColorShading, FlatShading LUT: Off : y = 1.0, ON: 257 points can be set. Gamma (4000Q): 0.45 ~ 1.0 (9 steps available) Gamma (8000Q): 0.45 ~ 4.0 (20 steps available) Noise Reduction Filter (MEDIAN, FIR, NoiseReduction)		
Input Voltage	DC + 10V ~ + 25V (All Models)		
Power Consumption (12-pin) 4000Q Models	Model	Hardware Rev.	Power Consumption *
	SW-4000Q-10GE	Any	19.3W (typ.), 28.0W (max.)
	SW-4000Q-SFP	Any	17.4W (typ.), 24.8W (max)
	*Default / 25°C Environment @ DC+12V		

Item	Specifications		
Power Consumption (12-pin) 8000Q Models	Model	Hardware Rev.	Power Consumption *
	SW-8000Q-10GE-F	A - D	19.3W (typ.), 29.0W (max)
	SW-8000Q-10GE-M52	A - B	
	SW-8000Q-10GE-F	E or later	17.8W (typ.), 29.0W (max)
	SW-8000Q-10GE-M52	C or later	
	SW-8000Q-SFP-F	A	17.4W (typ.), 25.1W (max)
	SW-8000Q-SFP-F	D or later	16.2W (typ.), 25.1W (max)
	SW-8000Q-SFP-M52	D or later	
	*Default / 25°C Environment @ DC+12V		
	Note: For the SW-8000Q models, the power consumption specifications vary depending on the hardware revision number. You can identify the hardware revision number by the last letter of your camera's serial number.		
Connectors / LEDs	RJ45 (10GE Models)	Ethernet standards and the cable type and the maximum cable length. 1000 Base-T : Cat5e, Cat6, Cat6e, Cat6A, Cat7 2.5G Base-T : Cat5e, Cat6, Cat6e, Cat6A, Cat7 5G Base-T : Cat6, Cat6e, Cat6A, Cat7 10G Base-T : Cat6*, Cat6e*, Cat6A, Cat7) The maximum cable length is limited to 55m.	
	SFP+ (SFP Models)	10GBase-R, Power Level I	
	12-pin (DC IN / TRIG)	Model: HR10A-10R-12PB(71) (or equivalent) Function: Power supply input / External trigger / External I/O	
	10-pin (AUX)	Model (Camera side): Equivalent to 3260-10S3 (55) Model (Cable side): Equivalent to 350-10P-C (50) Function: External trigger / External I/O	
	LED	Function: Power on, trigger input indicator	
Lens Mount	M52-mount, F-mount. Lens mount protrusions of 13 mm or less can be attached.		
Back Flange Distance	46.5 mm, tolerance: 0 mm to ~ 0.05 mm (F- and M52-mount)		
Verified Performance Temperature/Humidity	-5°C ~ +45°C (20 to 80%, non-condensing) Note: It may change depending on the installation environment. Please refer to the Caution in this section.		
Storage Temperature/Humidity	-25°C ~ +60°C (20 to 80%, non-condensing)		
Vibration Resistance	3G (20 Hz~ 200 Hz X-Y-Z direction)		

Item	Specifications		
Shock Resistance	50G		
Regulations (SW-4000Q)	Model	Hardware Rev.	Regulations
	SW-4000Q-10GE	A - C	CE (EN 61000-6-3, EN 61000-6-2), RoHS/WEEE, FCC Part15 Class B, KC
	SW-4000Q-SFP	Any	
	SW-4000Q-10GE	D or later	CE (EN 61000-6-3, EN 61000-6-2), RoHS/WEEE, FCC Part15 Class A, KC
	Note: For the SW-4000Q-10GE model, the FCC compliance varies depending on the hardware revision number. You can identify the hardware revision number by the last letter of your camera's serial number.		
Regulations (SW-8000Q)	CE (EN 55032:2015(CISPR32:2015), EN 55035:2017(CISPR35:2016)), RoHS/WEEE, FCC Part15 Class B, KC		
Dimensions	90mm x 90mm x 120mm (WHD; excluding mount and protrusions)		
Weight	980g		

Notes:

- Design and specifications are subject to change without notice.
- Approximately 30 minutes of warm-up are required to achieve these specifications.

Caution: About the verified performance temperature

Make sure the following temperature conditions are met when operating the unit.

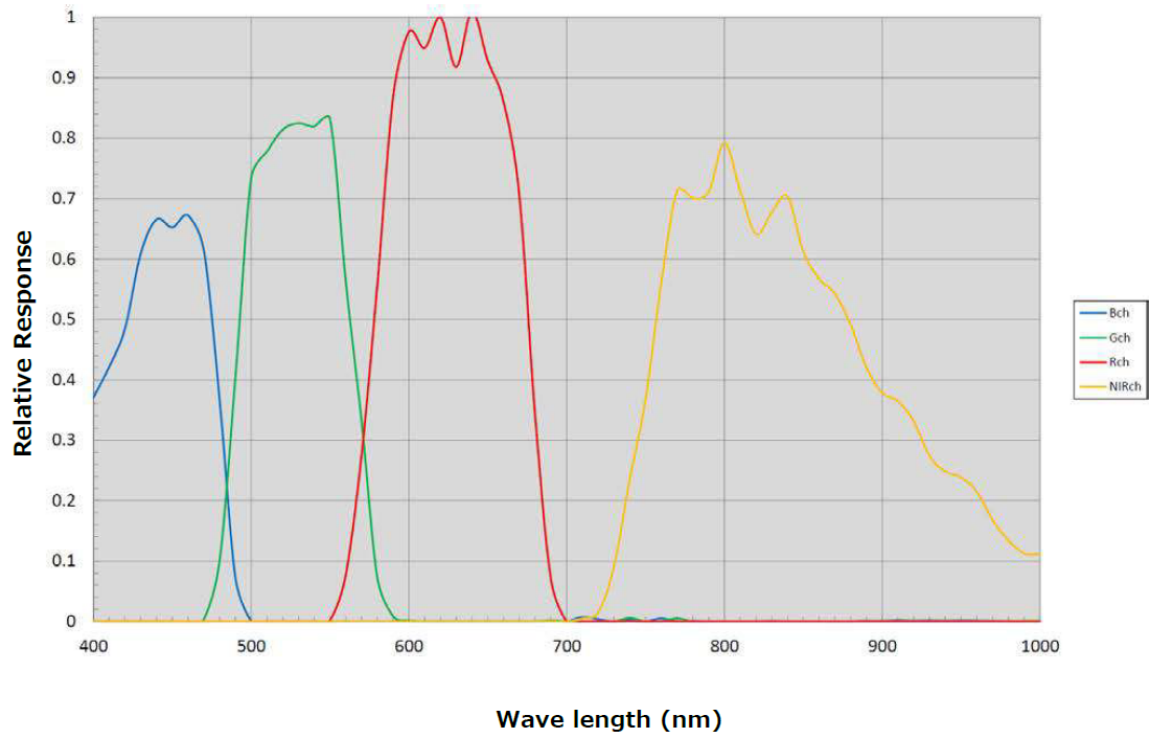
- 10GE model: the camera's internal temperature should not exceed 101 °C during operation.
- SFP model: the camera's internal temperature should not exceed 65 °C during operation.

If the above temperature conditions are exceeded, take measures to dissipate heat according to your installation environment and conditions.

Package Contents

- Camera body (1)
- Sensor protection cap (1)
- Dear Customer (sheet) (1)

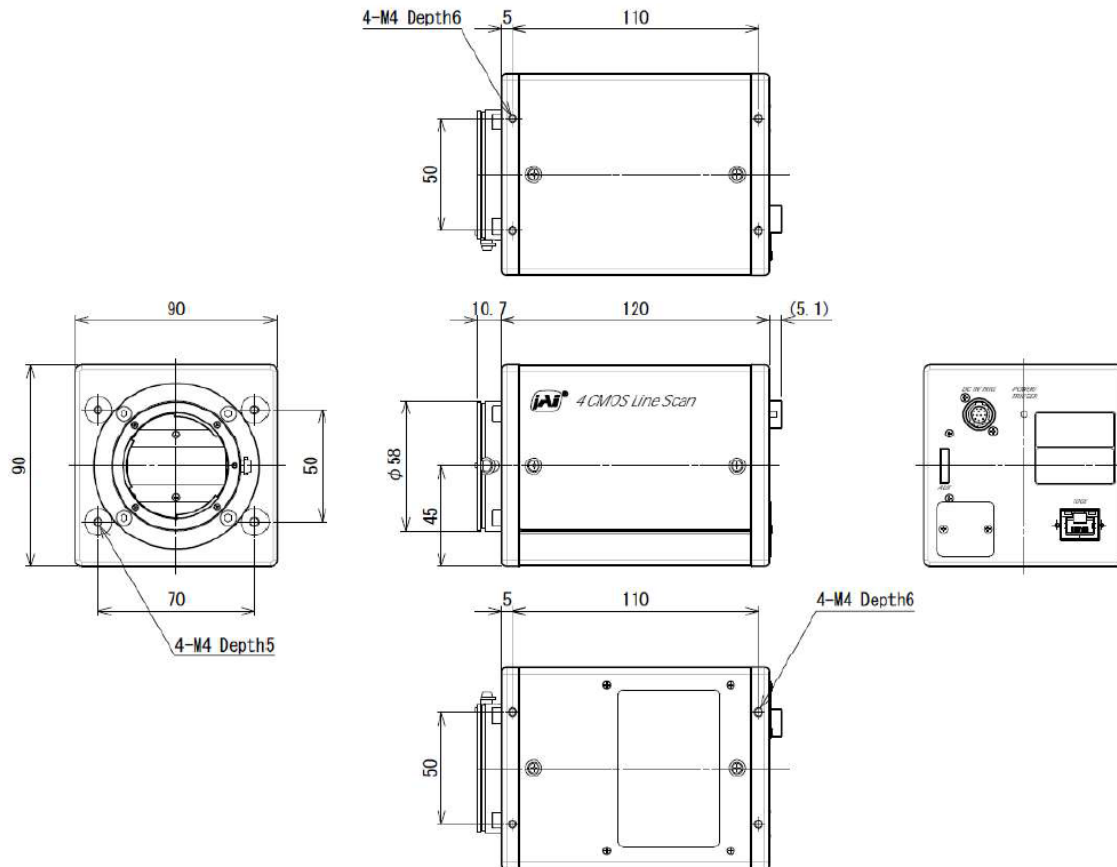
Spectral Response



Dimensions

This section shows the dimensional drawings of each camera model.

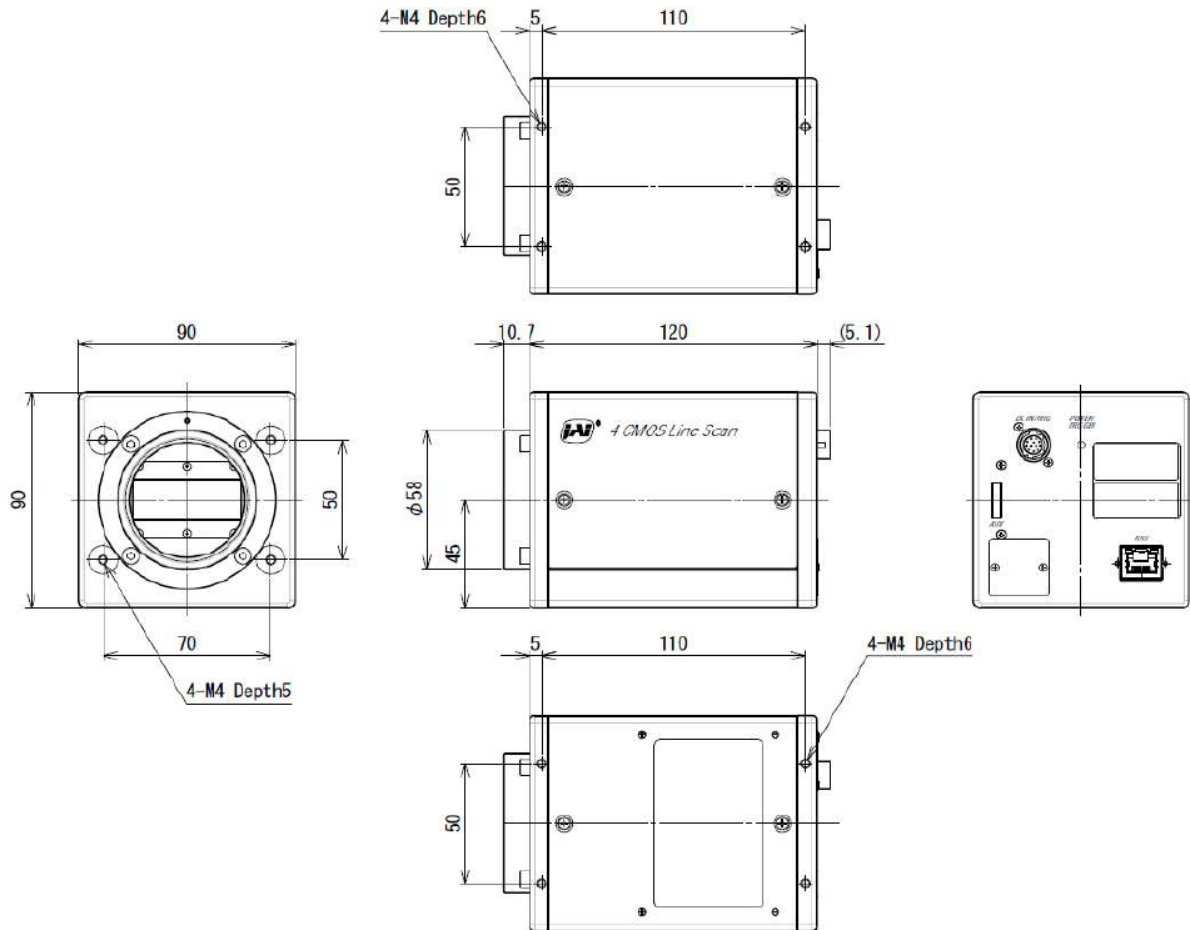
SW-4000Q-10GE-F / SW-8000Q-10GE-F



Notes:

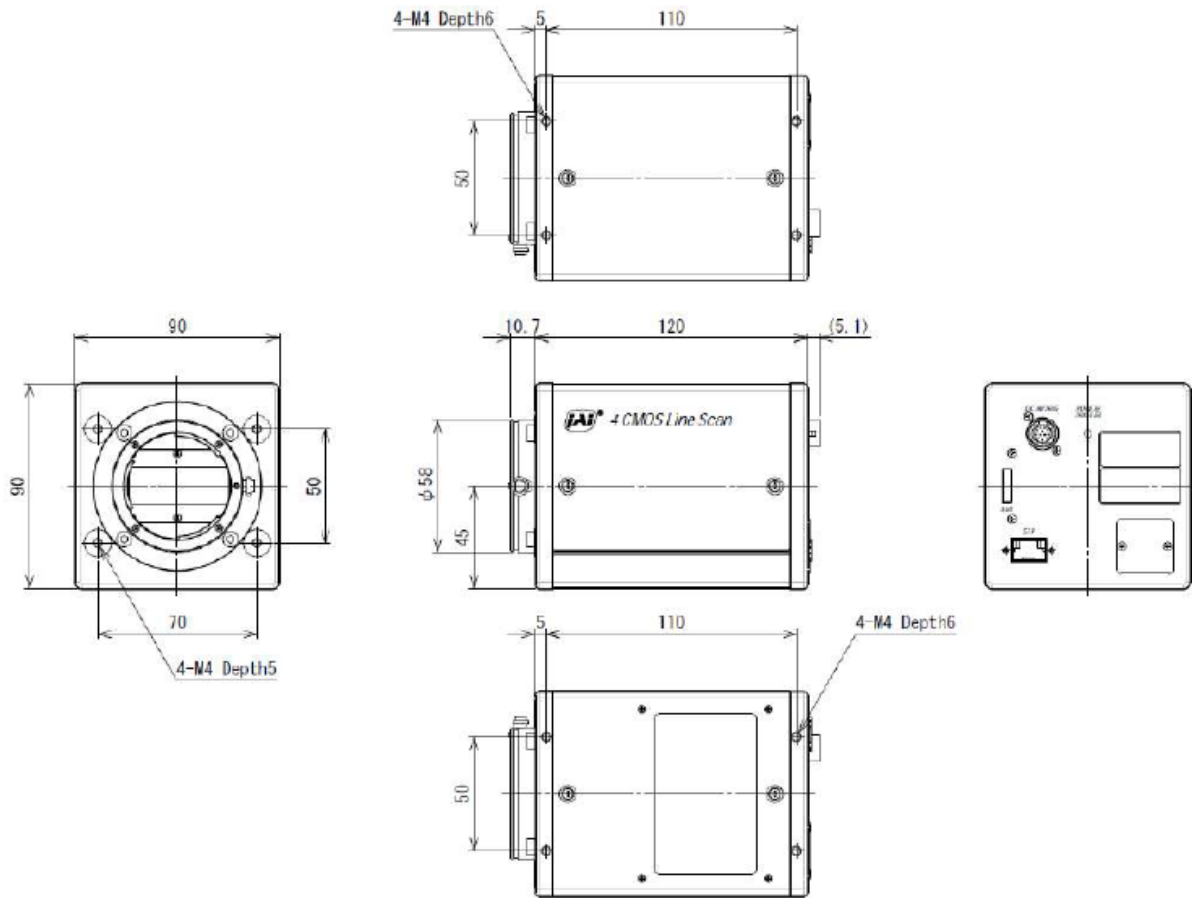
- Dimensional Tolerance: $\pm 0.3\text{mm}$
- Unit: mm

SW-4000Q-10GE-M52 / SW-8000Q-10GE-M52

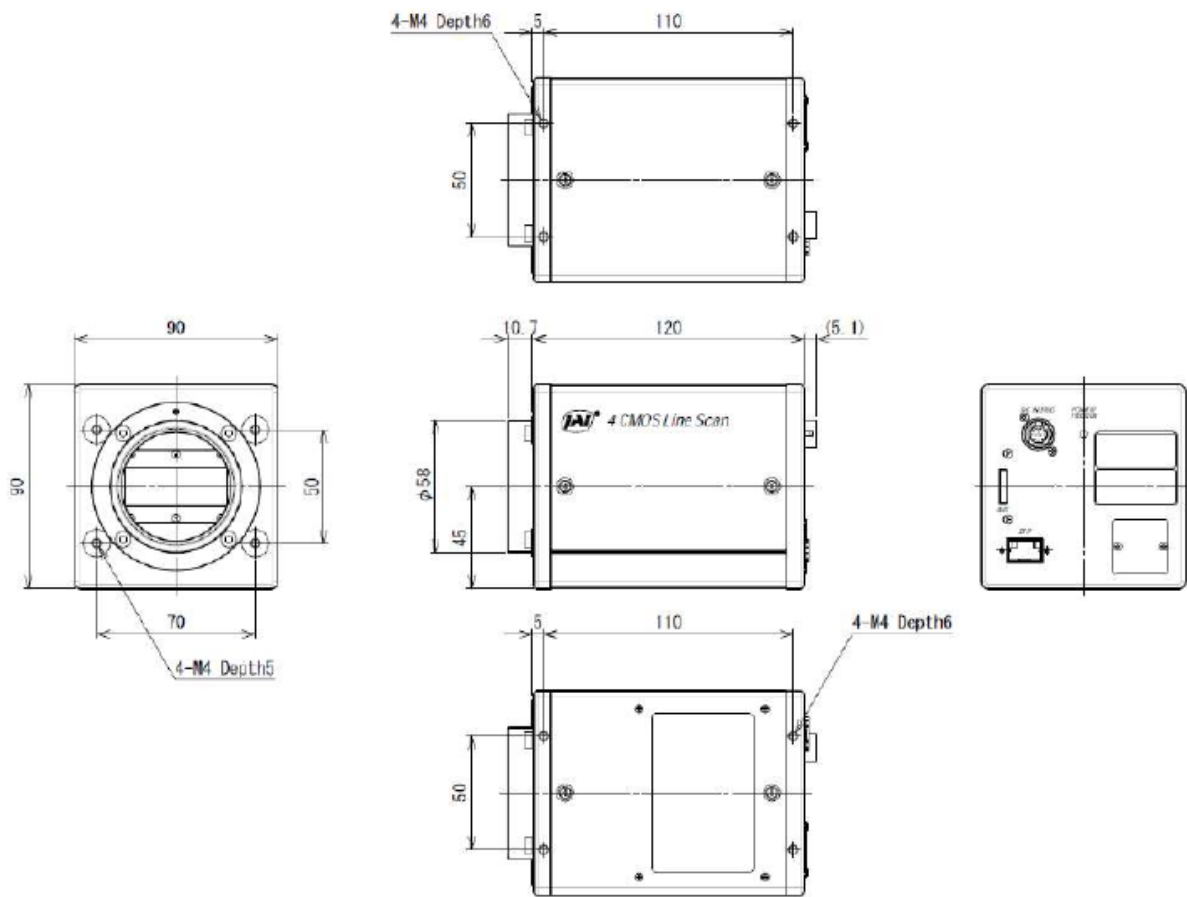


Notes:

- Dimensional Tolerance: $\pm 0.3\text{mm}$
- Unit: mm

SW-4000Q-SFP-F / SW-8000Q-SFP-F**Notes:**

- Dimensional Tolerance: $\pm 0.3\text{mm}$
- Unit: mm

SW-4000Q-SFP-M52 / SW-8000Q-SFP-M52**Notes:**

- Dimensional Tolerance: $\pm 0.3\text{mm}$
- Unit: mm

Comparison of the Decibel Display and Multiplier Display

Decibels [dB]	Multipliers [X]	Remarks
-6	0.501	
-5	0.562	
-4	0.631	
-3	0.708	
-2	0.794	
-1	0.891	
0	1	
1	1.122	
2	1.259	
3	1.413	
4	1.585	
5	1.778	
6	1.995	
7	2.239	
8	2.512	
9	2.818	
10	3.162	
11	3.548	
12	3.981	
13	4.467	
14	5.012	
15	5.623	
16	6.31	
17	7.079	
18	7.943	
19	8.913	
20	10	
21	11.22	
22	12.589	
23	14.125	
24	15.849	
25	17.783	
26	19.953	
27	22.387	
28	25.119	
29	28.184	
30	31.623	
31	35.481	
32	39.811	
33	44.668	

Decibels [dB]	Multipliers [X]	Remarks
34	50.119	
35	56.234	
36	63.096	

User's Record

Model name:

Revision:

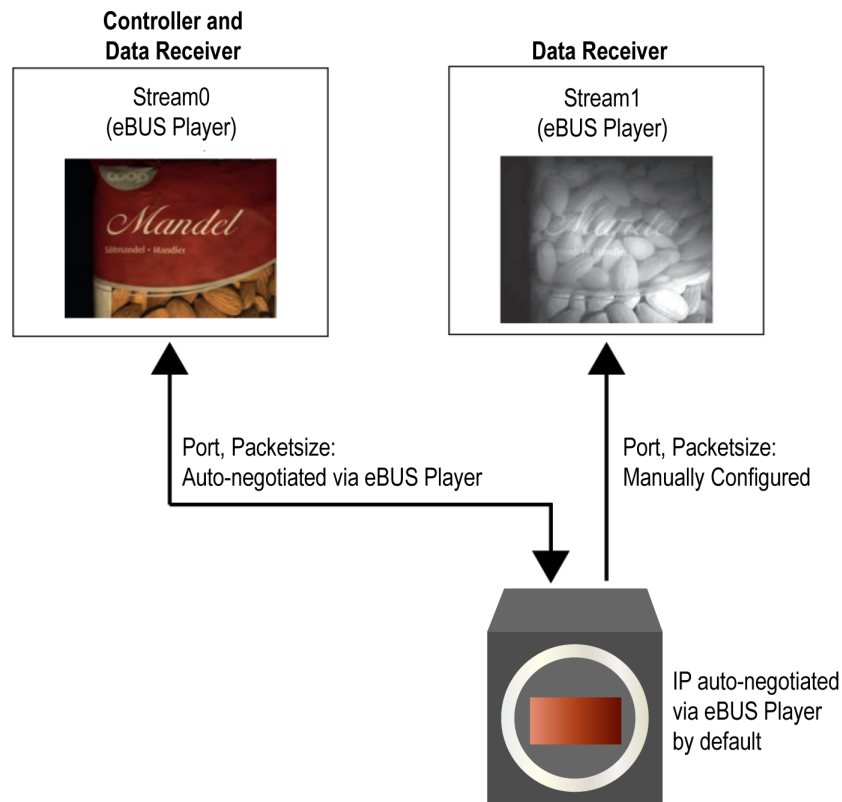
Serial No:

Firmware version:

For camera revision history, please contact your local JAI distributor.

Appendix

This chapter shows how to set up dual streaming using eBUS SDK for JAI.



Notes:

- If you use multiple cameras, please refer to our article on setting the correct Packet Delays: <https://support.jai.com/hc/en-us/articles/360010698019-Multiple-cameras-on-a-single-network>
- To set up a persistent IP address, please refer to our relevant Technical Note: https://www.jai.com/uploads/documents/Technical-notes/English/TNE-0028-20200324-00-TechNote-PersistentIP_eBus.pdf

How to Set Up Dual Streaming

To configure two streams (RGB and NIR), we need to open "two" separate eBUS Player windows.

Configure eBUS Player Role

In the first steps, we will connect to the camera from the Stream0 window and configure Stream1's **eBUS Player Role** as **Data Receiver**.

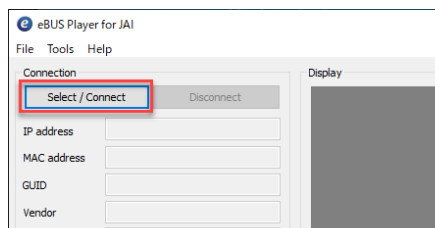
Note: Stream0's **eBUS Player Role** is automatically set to **Controller and Data Receiver** by default.

Stream0

First, go to Stream0's window.

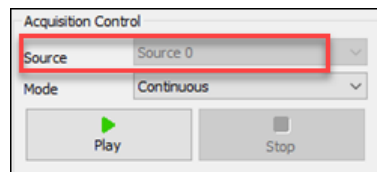
1. Open **eBUS Player for JAI**.

Click **Select / Connect** to open the **Device Selection** dialog.



In the Device Selection dialog, select the camera and click **OK** to connect to the camera.

2. In the eBUS Player window, ensure that **Source** is set to **Source0** (Acquisition Control).



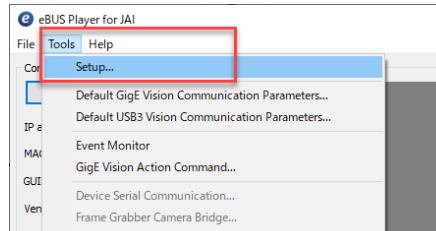
Note: **Source0** indicates that Stream0's **GevStreamChannel** is set to **0**.

Stream1

Now, configure the Stream1 settings.

Caution: Steps 3 through 5 must be completed **before connecting to the camera** in this window.

- Open a second eBUS Player window and select **Tools > Setup**. The **Setup** dialog opens.



- Configure the Setup dialog as follows:

Stream1	
Setup eBUS Player Role ☐ Controller and data receiver ☐ Controller ☒ Data receiver Stream Channel Default channel 1 GigE Vision Stream Destination ☐ Unicast, automatic ☒ Unicast, specific local port ☐ Unicast, other destination Port 10000 ☐ Multicast IP address 239 . 192 . 1 . 1 Port 1042 OK Cancel	
eBUS Player Role	Data receiver
Default channel (Stream Channel)	1
GigE Vision Stream Destination	Unicast, specific local port
Port	User-specified port value (in this example, "10000")

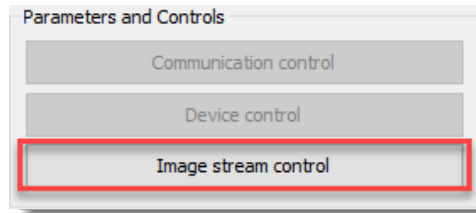
- Click **OK** to close the **Setup** dialog.
- In the eBUS Player window for **Stream1**, click **Select/Connect** to open the **Device Selection** dialog. In the dialog, select the same camera and click **OK**.

Configure the Host Port

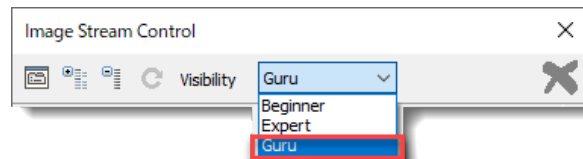
In the following steps, we will align the Host Port between the two streams.

Stream1 (Image Stream Control)

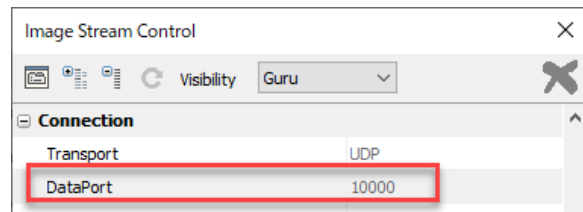
7. In the eBUS Player window for Stream1, click **Image Stream Control** (Parameters and Controls). The **Image Stream Control** dialog opens.



8. In the **Image Stream Control** dialog, do the following:
 - a. Set **Visibility** to **Guru**.

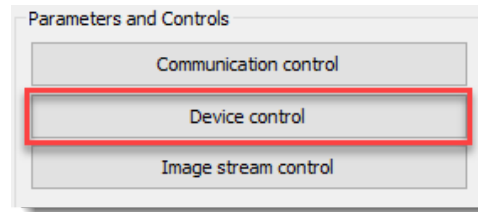


- b. Check the value of **DataPort** (Connection). It should match the **Port** value you have specified in the Setup dialog (in this example: 10000).



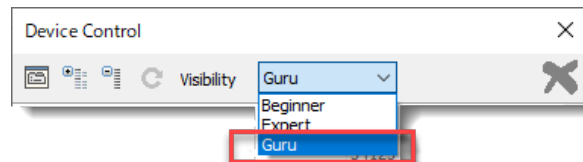
Stream0 (Device Control)

9. In the eBUS Player window for Stream1, click **Device Control** (Parameters and Controls). The **Device Control** dialog opens.



10. In the **Device Control** dialog, configure the following:

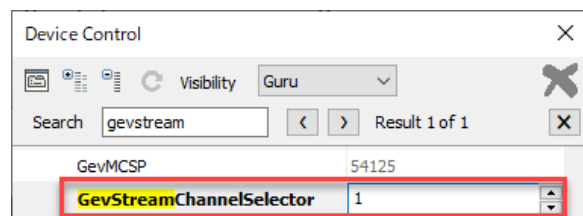
- a. Set **Visibility** to **Guru**.



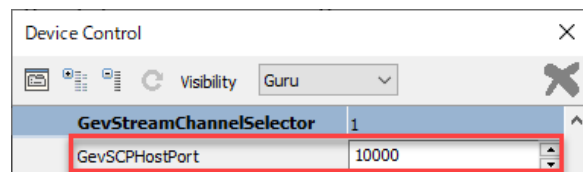
- b. Set **GevStreamChannelSelector** (TransportLayerControl) to **1**.

Notes:

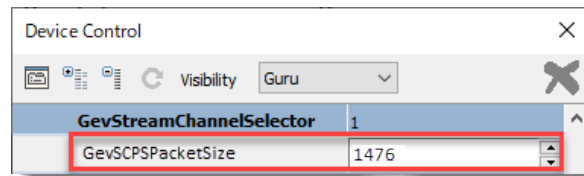
- By setting **GevStreamChannelSelector** to **1**, you are now configuring the **Stream1** settings.
- You can use the search box by pressing **Ctrl + F**.



- c. Enter the **Port** value you have specified in the Setup dialog into **GevSCPHostPort** (in this example: 10000).



- d. Specify the PacketSize value for Stream1 in **GevSCPSPacketSize**.



Notes:

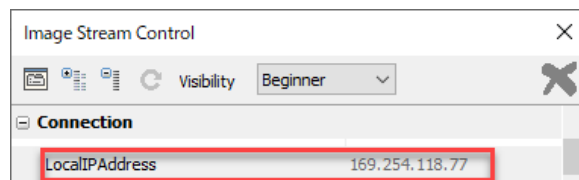
- eBUS Player automatically sets the PacketSize for Stream0 using the AutoNegotiation setting (default = On); however, the PacketSize for other streams (for example, Stream1) must be set manually.
- If the Host receiving multiple data streams is the same device, it is common to set the same packet size for all channels. If the data is sent to multiple Hosts via a switching hub, etc., different values can be set according to the host's upper limit.

Align the IP Addresses

Now we will align the IP addresses between the two streams:

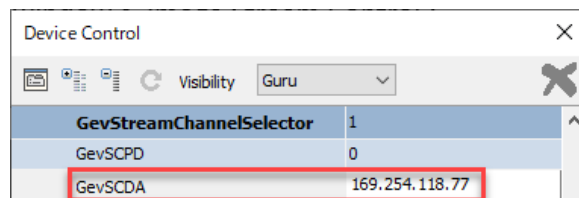
Stream1 (Image Stream Control)

11. In the Image Stream Control dialog for Stream1, copy the **IP address** from **LocalIPAddress** (Connection).

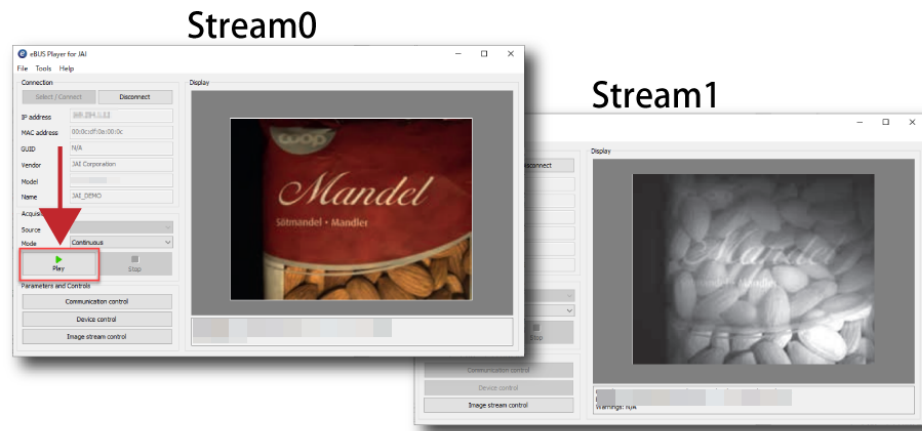


Stream0 (Device Control)

12. In the Device Control dialog for Stream0, paste the IP address into **GevSCDA** (TransportLayerControl).



13. Now when you click **Play** in the Stream0 eBUS Player window, streaming will start in both windows.



Note: All your Acquisition settings are controlled from the **Device Control** dialog for Stream0.

Summary (Dual Streaming Camera)

■ Setup dialogs for Stream1

Configure the following settings in the Setup dialog for Stream1.

	Stream1
eBUS Player Role	Data receiver
Default Channel (Stream Channel)	1
GigE Vision Stream Destination	Unicast, specific local post
Port	User-specified

■ Device Control dialog for Stream0

Configure the following settings in the Device Control dialog for Stream0.

	Stream1
GevStreamChannelSelector	1
GevSCPHostPort	Specified Port value in the Setup dialog for Stream1
GevSCPSPacketSize	User-specified PacketSize
GevStreamCannelSelector	1
GevSCDA*	Stream1's IP address

*GevSCDA: The IP address is displayed in the LocalIPAddress (Connection) in the Image Stream Control dialog.

Revision History

Revision	Date	Device Version		Changes
		4000Q	8000Q	
2.4	2026/08/10	DV0208	DV0204	Updated the FCC compliance and the power consumption specifications (Certifications, Specifications) Expanded the 8000Q model's Chromatic Aberration Correction function ("Chromatic Aberration Correction" and "Correction"). Update the "PRNU Correction (Pixel Gain Correct)" and How to Configure the Shading Correction Function" topics. Updated the description on the 12-pin connector (① DC IN/TRIG Connector (12-Pin Round)).
2.3	2026/06/08	DV0208	DV0202 (10GE) DV0203 (SFP)	Expanded the 4000Q model's Chromatic Aberration Correction function ("Chromatic Aberration Correction" and "Correction"). Update the "PRNU Correction (Pixel Gain Correct)" and How to Configure the Shading Correction Function" topics.
2.2	2026/04/23	DV0202 (10GE) DV0201 (SFP)	DV0202 (10GE) DV0203 (SFP)	Corrected the setting range for GevStreamChannelSelector (Transport Layer Control).
2.1	2025/05/04			Corrected the PixelSize on " Specifications ".
2.0	2025/03/21	DV0202 (10GE) DV0201 (SFP)	DV0202 (10GE) DV0203 (SFP)	Combined the SW-4000Q-10GE, SW-4000Q-SFP, SW-8000Q-10GE, SW-8000Q-SFP user manuals into one book. Added the following topics: "Horizontal Image Mirroring", "Maximum Line Rate (Approximate)", "Actual Exposure Time", "Frame Start Trigger", "LineSource Items", "Logic Block Control", and "Appendix (How to configure dual streaming)". Significant additions and corrections have been made to the following topics: "ROI (Regional Scanning Function)", "Binning Function", "Exposure Mode", "Connecting Rotary Encoders". Corrected "China RoHS".

Previous Revisions

SW-4000Q-10GE

Revision	Date	Changes
1.3	July, 2022	Corrected China RoHS
1.2	Nov. 2020	Corrected China RoHS
1.1	Oct. 2020	Added the Noise Reduction Filter function, etc.
1.0	Apr. 2019	First release.

SW-4000Q-SFP

Revision	Date	Changes
1.3	July, 2022	Corrected China RoHS
1.2	Nov. 2020	Corrected China RoHS
1.1	Oct. 2020	Added the Noise Reduction Filter function, etc.
1.0	June 2019	First release.

SW-8000Q-10GE | SW-8000Q-SFP

Revision	Date	Changes
1.3	Jan 2023	Corrected China RoHS. Corrected the Chromatic Aberration Correction's setting ranges. Modified the Frame Start Trigger topic's images.
1.2	July, 2022	Corrected the Valid Input / Output Combinations table. Corrected the max value for the Counter Value (CounterAndTimerControl).
1.1	Nov. 2020	Corrected China RoHS
1.0	Aug 2020	First release.

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