See the possibilities

Tentative Version

User Manual

Sweep+ Series - CoaXPress Interface

SW-4000T-CXPA
SW-8000T-CXPA

3CMOS Prism Line Scan Camera
Document Version: Tentative
Date: 2025-01-31

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.

Company and product names mentioned in this manual are trademarks or registered trademarks of their respective owners.

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-4000T-CXPA and SW-8000T-CXPA comply with the following provisions applying to their standards.

EMI: EN55032:2015 / A11:2020

EMS: EN55035:2017 (CISPR35:2016)

FCC

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-4000T-CXPA-F
제조자 및 제조국가:	JAI Ltd., Japan / JAPAN

TBD

상 호:	JAI Ltd. Japan
기자재명칭:	Industrial Camera
모 델 명:	SW-4000T-CXPA-M52
제조자 및 제조국가:	JAI Ltd., Japan / JAPAN

TBD

상 호:	JAI Ltd. Japan
기자재명칭:	Industrial Camera
모 델 명:	SW-8000T-CXPA-F
제조자 및 제조국가:	JAI Ltd., Japan / JAPAN

TBD

상 호:	JAI Ltd. Japan
기자재명칭:	Industrial Camera
모 델 명:	SW-8000T-CXPA-M52
제조자 및 제조국가:	JAI Ltd., Japan / JAPAN

TBD

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-4000T-CXPA	×	○	○	○	○	○
SW-8000T-CXPA						

○: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 Attaching the Lens

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 3CMOS line scan camera mounted on a prism, for the R, G and B channels. This camera uses CoaXPress v2.0 as its interface and supports up to 12.5 Gbps output when using CXP-12. Supported output formats are RGB8, RGB10 and YUV422_8.

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

	SW-4000T-CXPA	SW-8000T-CXPA
Active Pixels	3 x 4096 (R, G, B)	3 x 8192 (R, G, B)
Pixel Size	7.5 µm x 7.5 µm, 7.5 µm x 10.5 µm	3.75 µm x 5.78 µm
Max Line Rate (RGB8)	97kHz	49kHz
Max Line Rate (YUV422_8)	145kHz	73kHz

Features Overview

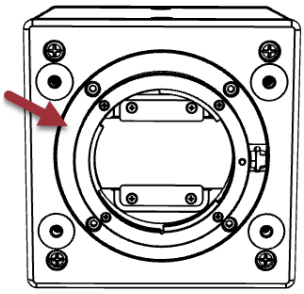
- Prism technology for superior color quality and better color differentiation
- Supports vertical and horizontal binnings.
- Supports Flat Shading and Color Shading.
- HSI, sRGB, Adobe RGB and XYZ color space conversion.
- Supports direct connection to rotary encoders plus large variety of trigger options.
- Accepts power over CoaXPress interface.
- Excellent shock and vibration resistance.
- Lens mount: F or M52

Parts Identification

This section describes the lens mount, connectors, LEDs, and mounting holes of this camera.

Lens Mount (F-Mount or M52-Mount)

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

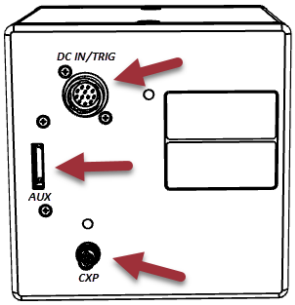


- Back flange distance (both F- and M52-mount): 46.5 mm (tolerance: 0 ~ -0.05mm)
- Thread pitch (M52): 0.75mm

> **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

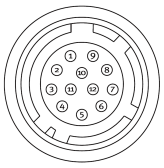
This section displays the pin assignments for each connector.



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: HR10A-10R-12PB (71)
Cable:HR10-10P-12S(73)(Plug)

Pin No.	Input/Output	Signal	Description
1		GND	
2	Power In	DC In (+12V)	DC 10.8 ~ 26.4V
3		GND	
4	In	TTL In 4	Line 14
5	In	Opto In 1 -	Line 5
6	In	Opto In 1 +	
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 10.8 ~ 26.4V
12		GND	

Note: The pin assignment of this camera is different from other Sweep+ cameras.

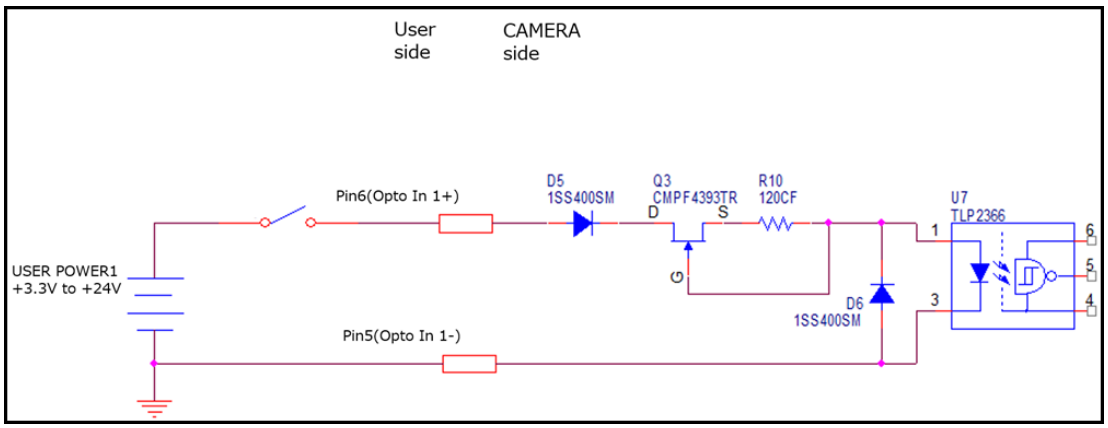
TTL Signal Specification

TTL out signal specification (Typ.)	Output voltage: Low 0.0V, High 5.0V
TTL in signal specification (Typ.)	Input voltage: Low 0.0 ~ 0.7V, High 2.0 ~ 5.5V

Recommended External Input Circuit Diagram

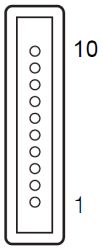
> **Caution:** Check the recommended external input circuit diagram (reference example) and connect correctly.

> **Note:** Parts may be replaced with equivalent products.



AUX Connector (10-pin)

Connect the cable for DC IN / trigger IN here.

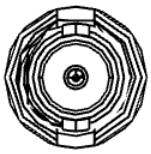


Camera side: 3260-10S3 (55)
Cable side: 3240-10P-C (50)

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	

CXP (CoaXPress) Connector

Coaxial cable for digital video output.

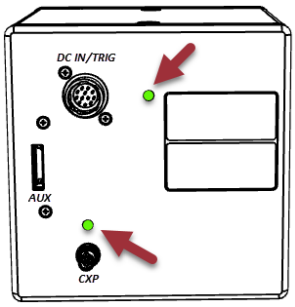


- **Connector**: Micro-BNC
- **CxpLinkConfiguration**: CXP12_X1, CXP6_X1, CXP3_X1

Notes:

- This camera supports the PoCXP function.
- You can check the current CXP version in **CxpVersion Used** [TransportLayerControl]. If CxpVersionUsed is CXP 1.1, you cannot use the CXP12 link configurations. Even if you are using a CoaXPress frame grabber board that supports CXP 2.0, if CxpVersionUsed is CXP 1.1, you may need to make settings on the frame grabber board side. For the specific setting method, refer to the instruction manual of the frame grabber board to be used.

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

Light		Status
	Off	The network link is not established (or is in progress).
	Lit amber	System is powering up.
	Red pulse - slow	No connection. **Note:** Not applicable when using PoCXP.
	Alternating between green and amber - rapid	**When using PoCXP**: Detecting link. **Note:** Blinks for 1 second even when detected immediately.
	Blinking amber - rapid	**When not using PoCXP**: Detecting link. **Note:** Blinks for 1 second even when detected immediately.
	Lit green	Connection between device and host is established, but there is no data being transmitted.
	Blinking amber - slow	Established connection between camera and frame grabber. Waiting for an event (trigger, exposure pulse, etc.)
	Blinking green - rapid	Established connection between camera and frame grabber. Data is being transmitted.
	Alternating between green and amber - slow	Sending connection test packet.

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
Side (Connector Side)	M4, Depth 6mm

Note: Refer to "Dimensions" for the location of the mounting holes.

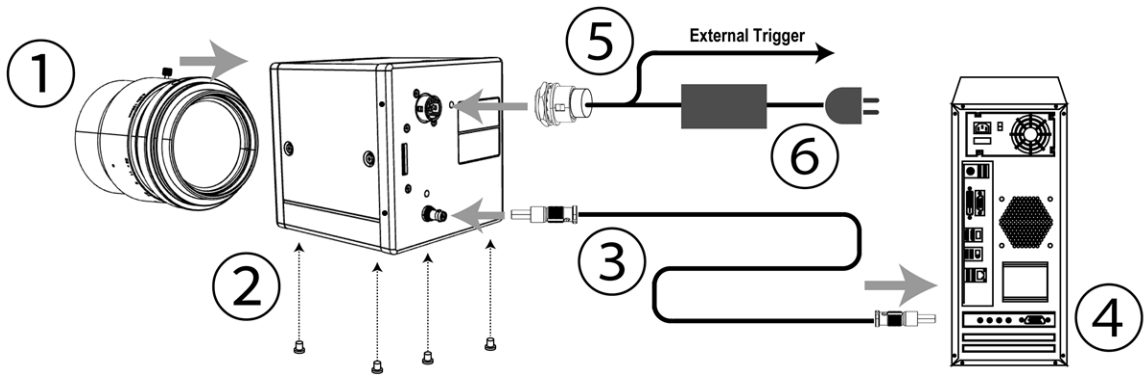
Preparation

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

> **Note:** eBUS Player for JAI does not support this camera.

1	**Step 1: Connect Devices** • Connect the lens, cable, AC adapter, computer, and other devices.
2	**Step 2: Verify Camera Operation** • Verify whether the camera is turned on and ready for use.
3	**Step 3: Verify the Connection between the Camera and PC** • Verify whether the camera is properly recognized via Control Tool.
4	**Step 4: Configure Trigger, Exposure, and Line Rate Settings** • Configure the camera's basic settings.
5	**Step 5: Adjust the Image Quality** • Perform DSNU, PRNU and other basic settings for image quality.
6	**Step 6: Save the Settings** • Save the current setting configurations in user memory.

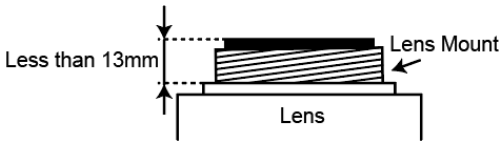
Step 1: Connect Devices



① Lens
② Mounting
③ CoaXPress Cable
④ CoaXPress Frame Grabber Board
⑤ DC IN / Trigger IN Connection Cable
⑥ AC Adapter (Optional)

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 (tolerance: 0 ~ -0.05mm)
- Thread pitch (M52): 0.75mm

> **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.

> **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 CoaXPress Cable

Connect the CXP cables to the CXP connectors on the camera and frame grabber board. Refer to the specifications of the cable for details on its bend radius.

④ CoaXPress Frame Grabber Board

Refer to the operating instructions of the frame grabber board, 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.

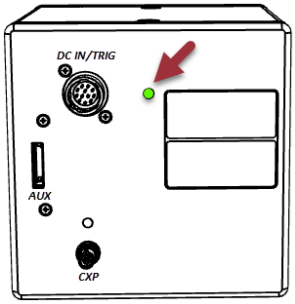
⑥ AC Adapter (Optional)

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

Step 2: 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 3: Verify the Connection between the Camera and PC

Use the appropriate tool for the CoaXPress frame grabber board to be used to set up the camera and display captured images. Refer to the operation manual of the tool to be used for the operation method.

> **Note:** eBUS Player for JAI does not support this camera.

Step 4: Configure Trigger, Exposure, and Line Rate Settings

> **Related Setting Items:** AcquisitionControl

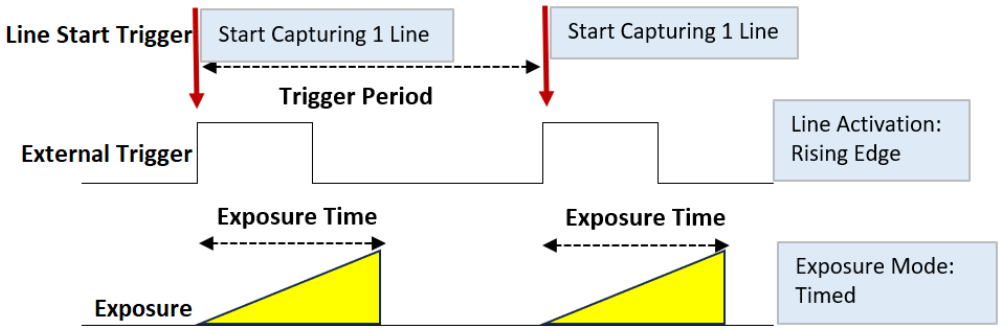
This section describes five scenarios for controlling the trigger, exposure, and line rate.

> **Note:** This section is intended to explain the basic relationship between the trigger, exposure, and line rate.

Trigger	Exposure	Example
ON	On	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	On	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**.



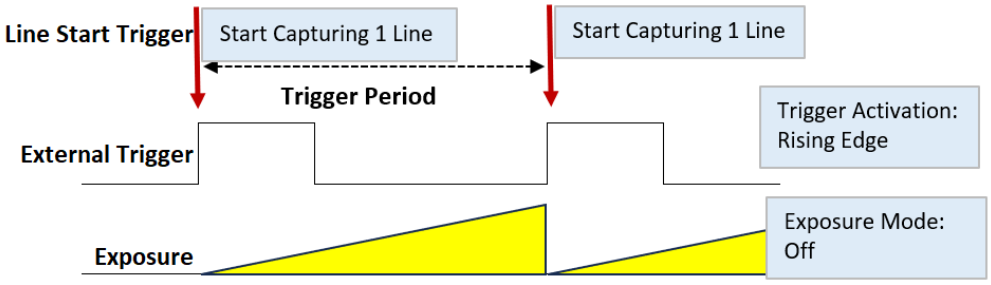
Notes:

- When using external triggers, the line rate is determined by the trigger period.
- The ExposureTime value cannot be longer than the trigger period.

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**.



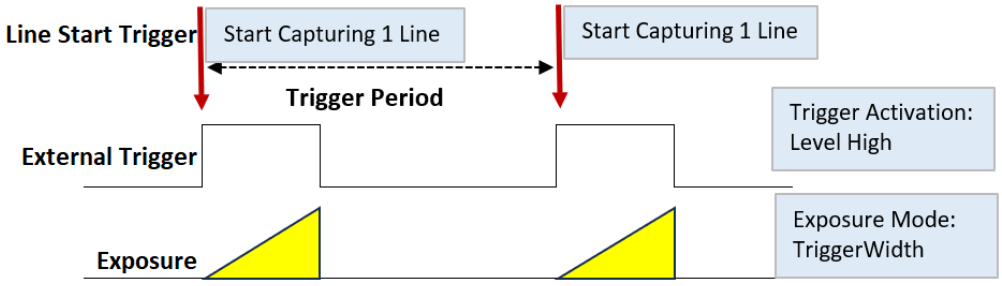
Notes:

- When using external triggers, the line rate is determined by the trigger period.
- The exposure is performed with an exposure time calculated from 1 / (line rate).

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**.



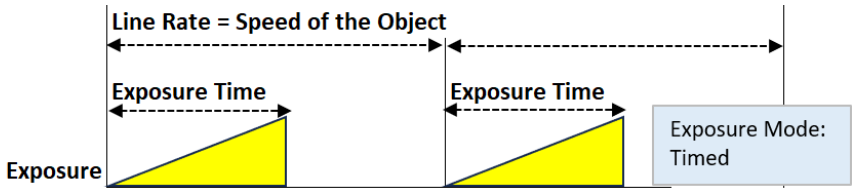
Notes:

- When using external triggers, the line rate is determined by the trigger period.

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.



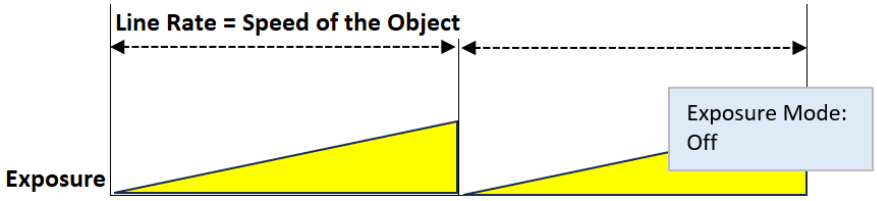
Notes:

- 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 5: Adjust the Image Quality

> **Related Setting Items:** AnalogControl

Display the camera image and adjust the image quality. 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.

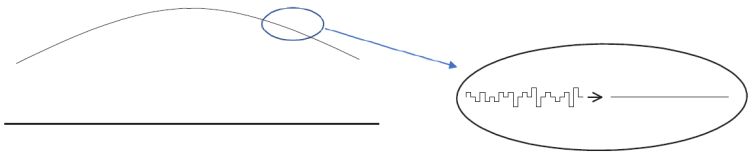
5. You can check the execution result of black level correction by **PixelBlackCalibrationResult**.

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. 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.

2. 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.

3. 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.
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.

1. Select the black level you want to configure in **BlackLevelSelector**. (Red, Green, Blue)
2. Specify the adjustment value in **BlackLevel**. (-133 ~ 255)

Adjust the White Balance

> **Related Setting Items:** AnalogControl

Adjust the white balance using the automatic adjustment function.

Automatic White Balance Adjustment

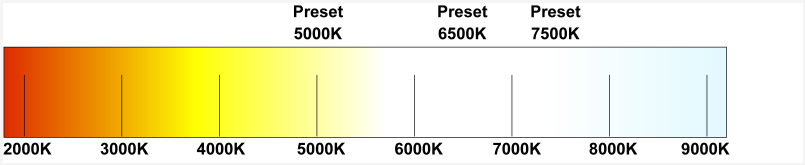
1. Place a white sheet of paper or similar object under the same lighting conditions as the intended subject, and zoom in to capture the white. White objects near the subject, such as a white cloth or wall, can also be used. Be sure to prevent the high-intensity spot lights from entering the screen.
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 DigitalRed / DigitalBlue 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)AcquisitionControlis **On**, the white balance will not be adjusted automatically, however BalanceWhiteAutoResult displays "Succeeded".
4. The white balance is automatically adjusted. After the adjustment, "**Succeeded**" is displayed in **BalanceWhiteAutoResult**. Once the adjustment is completed, BalanceWhiteAuto returns to Off.
5. 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.

Result	Description
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.

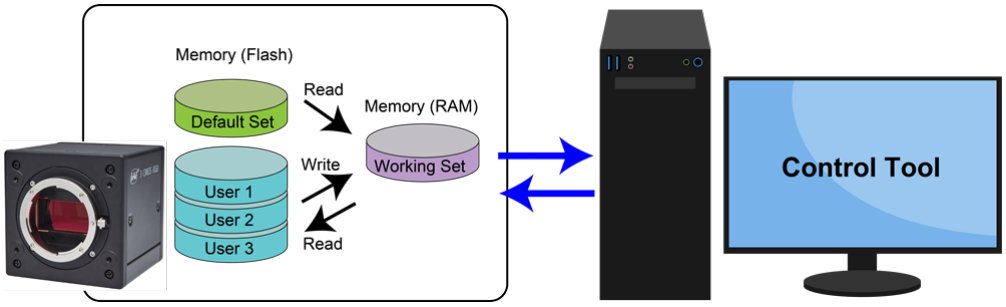
Note: On this camera, the white balance can also be set to "Color Temperature" (**Preset5000K**, **Preset6500K**, **Preset7500K**). When using the Color Temperature option, **IndividualGainMode** [AnalogControl] must be set to **Off**.



Step 6: 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)



Notes:

- Settings will not be saved on the PC.
- 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 Control Tool.

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.

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

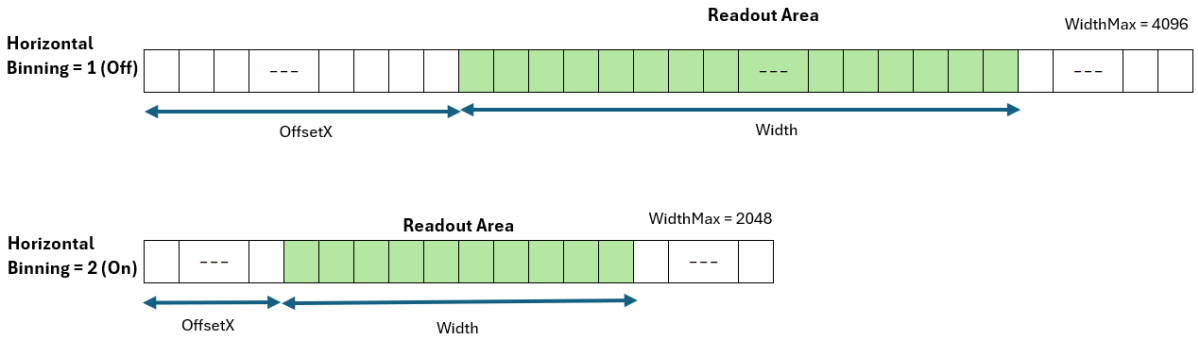
Specify the area to scan by specifying the Width and Horizontal offset value (ImageFormatControl).

Note: On this camera, Height is fixed to 1.

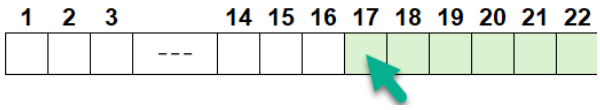
The setting ranges for the ROI function's readable area based on the Binning setting (BinningHorizontal) are as follows.

Model	BinningHorizontal	Width (Pixel)	Offset X (Pixel)
SW-4000T-CXPA	1 (Off)	128 ~ 4096, Step 16	0 ~ 3968, Step 16
	2 (On)	64 ~ 2048, Step 8	0 ~ 1984, Step 8
SW-8000T-CXPA	1 (Off)	128 ~ 8192, Step 16	0 ~ 8064, Step 16
	2 (On)	64 ~ 4096, Step 8	0 ~ 4032, Step 8

Example (SW-4000T-CXPA)



For example, when **OffsetX** is set to 16, the first readout pixel is the 17th pixel.



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 in Sum mode or reduced noise in Average mode.

Binning Off	Binning On (Sum Mode)
	

This camera supports BinningHorizontal and SensorBinningVertical.

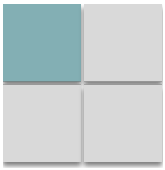
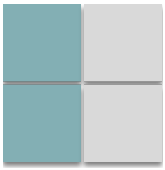
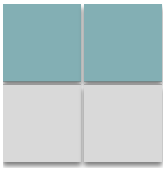
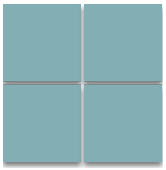
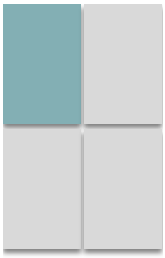
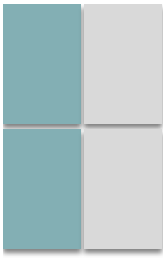
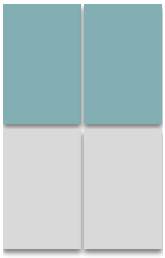
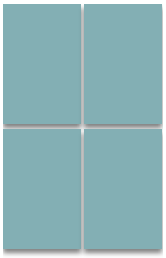
Binning Type	Process Method	Supported Mode
BinningHorizontal	Digital (FPGA)	Sum
		Average
SensorBinningVertical	Analog (Sensor)	Sum
Since **Height** is fixed to **1**, the vertical resolution will not change even if SensorBinningVertical is set to On (= 2).		

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

SW-4000T-CXPA

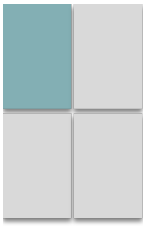
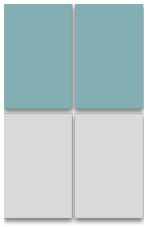
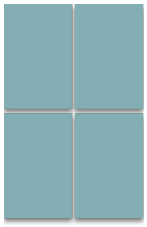
SW-4000T-CXPA supports the following binning types by combining Type A / Type B Sensor Type and horizontal / vertical binning (BinningHorizontal / Binning Vertical).

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

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

SW-8000T-CXPA

SW-8000T-CXPA supports the following binning types.

Binning Off	1 x 2	2 x 1	2 x 2
WidthMax: 8192 pixels		**WidthMax 4096 pixels**	
			
3.75 µm x 5.78 µm	3.75 µm x 11.56 µm	7.50 µm x 5.78 µm	7.50 µm x 11.56 µm

Pixel Format

Related Setting Items: ImageFormatControl

This camera supports the following output formats: RGB8, RGB10, YUV422_8

Horizontal Image Mirroring

Related Setting Items: ImageFormatControl

The HorizontalImageMirroring function allows you to flip an image horizontally.

HorizontalImageMirroring = Off	HorizontalImageMirroring = On
	

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

Acquisition Control

Related Topic: AcquisitionControl

AcquisitionStart / AcquisitionEnd

Start image acquisitions (AcquisitionStart) and end image acquisitions (AcquisitionStop).

Note: When TriggerMode is On, the camera first receives the AcquisitionStart command, the Acquisition trigger signal, and then outputs images. After the AcquisitionEnd command, no image will output when the camera receives an Acquisition trigger signal.

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.

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 6: 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.

Trigger Control

Related Setting Items: AcquisitionControl

In this camera, the following control is performed by the external trigger signal.

Trigger Selector	Description
Acquisition Start	Start image acquisition in response to the external trigger signal input.
Acquisition End	Stop image acquisition in response to the external trigger signal input.
Line Start	Imaging of one line is started by input of external trigger signal.

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 4: Configure Trigger, Exposure, and Line Rate Settings" when configure the settings.

Exposure Mode

> **Related Setting Items:** AcquisitionControl

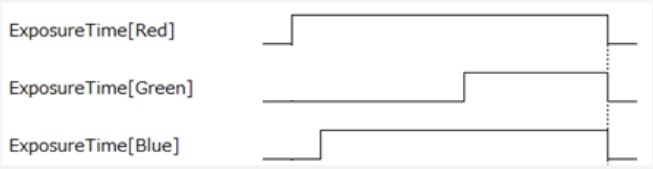
This camera supports the following exposure modes:

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, and Blue (the RGB channels will have the same exposure time).
Individual	Set the exposure times for Red, Green, and Blue 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 and Blue. **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 **Individual** 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 (0.85µs) subtracted from the ExposureTime setting configured on the camera or the Width of the trigger signal to the camera.

- Exposure Offset Time: -0.85µs

The minimum ExposureTime setting is 3 µs (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 µs, the actual exposure time will be 2.15µs (= 3µs - 0.85µs).

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 2.15µs, the width of the Trigger Signal to the camera will be 3 µs (= 2.15µs + 0.85µs).

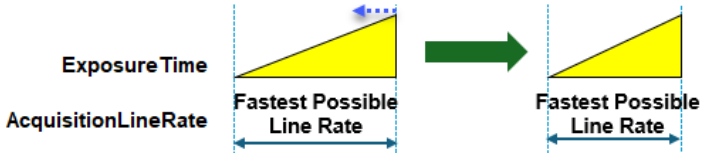
ExposureModeOption

Specifies whether to prioritize exposure time (PrioritizeExposureTime) or line rate (PrioritizeLineRate) when controlling line rate and exposure.

PrioritizeExposureTime (Default) :

This option does not allow you to set a line rate shorter than the configured ExposureTime.

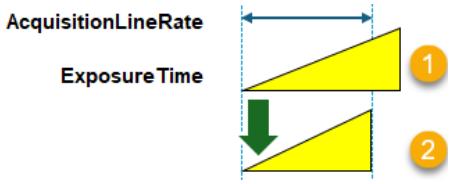
- The maximum AcquisitionLineRate value is limited by the line rate value calculated from the current ExposureTime setting.
- If you want a faster AcquisitionLineRate value, you must first decrease the ExposureTime value.



PrioritizeLineRate:

This option gives the line rate priority over the configured ExposureTime.

- When AcquisitionLineRate becomes faster, if the current ExposureTime value (1) is greater than the ExposureTime value calculated from the faster AcquisitionLineRate setting (2), the ExposureTime value will be overwritten with the value (2).



- If you want to increase the ExposureTime value further, you must first set AcquisitionLineRate to a slower value.

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** (SW-4000T-CXPA 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:** (SW-4000T-CXPA Only) The following two gain values are added together for the total gain value: Total Gain = AnalogGain (dB) + DigitalGain (dB)

Automatic Adjustment

This camera can automatically adjust the gain. It is controlled by the signal level of the area set by **BalanceWhiteAutoWidth** and **BalanceWhiteAutoOffsetX**.

1. Set **IndividualGainMode** to **On**.
2. Configure **AGCReference** to set the convergence level.
3. Set **GainAuto** to **Once**.
4. The Gain value is automatically adjusted. After the adjustment, GainAuto returns to Off.
5. The adjustment status can be checked in **AGCOnceStatus**.

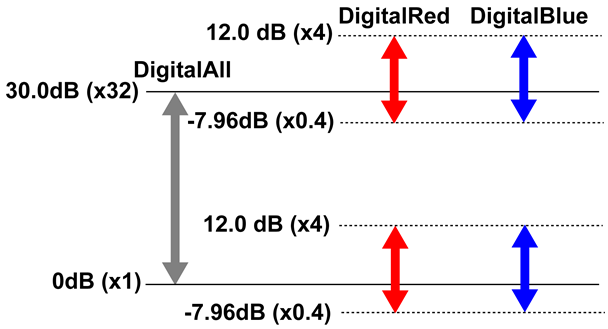
AGCOnceStatus	Description
Idle	Adjustment is not being performed.
Succeeded	Adjustment was completed successfully. After the adjustment, GainAuto returns to Off.
Error1	Adjustment failed. Adjustment was repeated for 10 seconds without success.

Individual Gain Mode

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

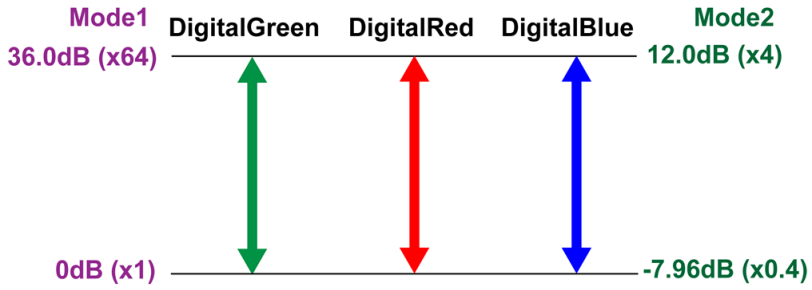
> **Note:** The Gain setting is configured in multipliers. For more information, see "Comparison of the Decibel Display and Multiplier Display."

Individual Gain Mode = Off



Master Mode: Adjust the **DigitalAll** (master gain) setting first, and then adjust the **DigitalRed** and **DigitalBlue** setting values to perform fine adjustment.

Individual Gain Mode = Mode 1 / Mode 2



Individual Mode: Adjust the **DigitalGreen**, **DigitalRed**, and **DigitalBlue** setting values to adjust the gain. This mode allows a wider range of adjustment by the user when compared to Master Mode.

Adjustment range differs between Mode1 and Mode2.

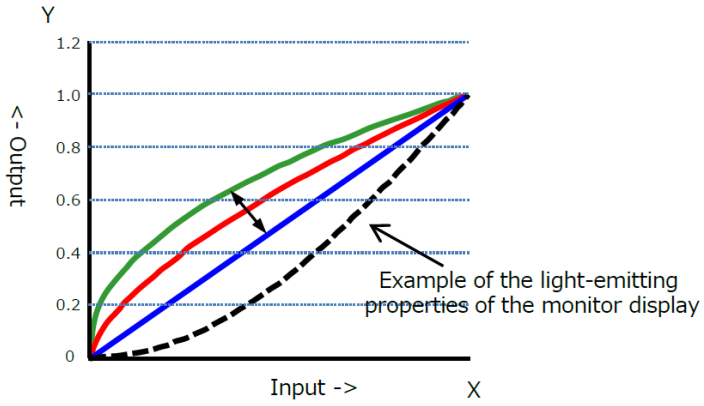
- **Mode 1**: 0dB (x1) ~ 36.0dB (x64)
- **Mode 2**: -7.96dB (x0.4) ~ 12.0dB (x4)

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:
    - **4000T**: 0.45, 0.5, 0.55, 0.6, 0.65, 0.75, 0.8, 0.9, 1.0
    - **8000T**: 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

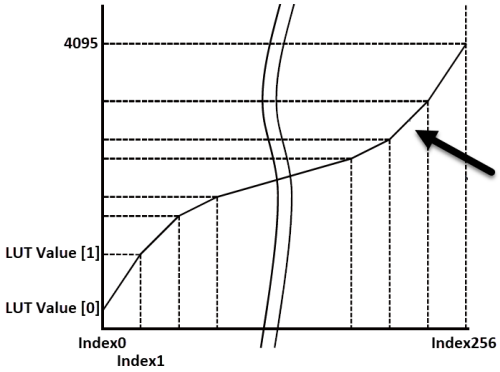
The LUT function is used to generate a non-linear mapping between signal values captured on the sensor and those that are output from the camera. On this camera, you can specify the output curve using 257 setting points (indexes).

How to Configure

1. Select **LUT** from **LUTMode** (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.

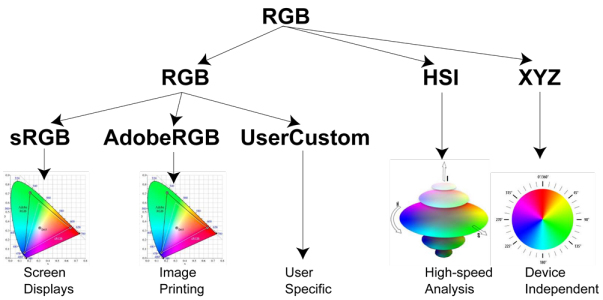


Interpolation using the average values of data to the left and right is used to determine values between points.

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.

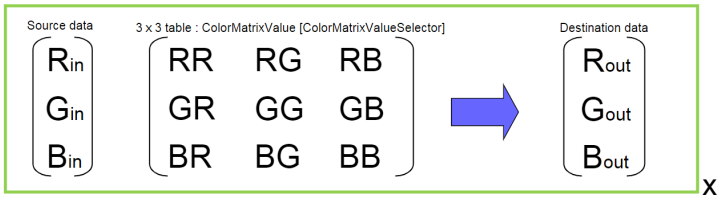


How to Configure

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**.



X

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 "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	-
Line7 CXP In	Input	TTL	False (Fixed)	bit6	-
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	-
Line14 TTL In 4	Input	TTL	False (Fixed)	bit13	-

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

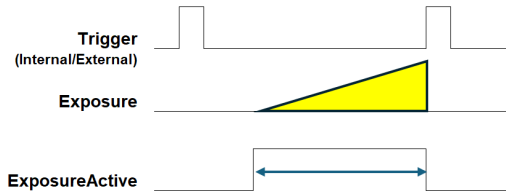
This section describes each item that can be selected in **LineSource**.

LineSource	Description
AcquisitionActive	From AcquisitionStart to AcquisitionStop. See "Acquisition Control" for reference.
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
Line7 Cxp In	CXP In
Line10 TTL In2	TTL In2
Line13 TTL In3	TTL In3
Line14 TTL In4	TTL In4
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.

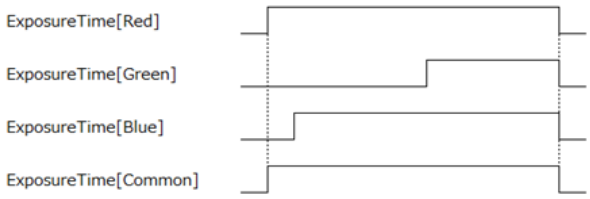
> **Note:** ExposureActive includes the exposure offset time. For more information see "Actual Exposure Time".



ExposureActiveSource

When **ExposureTimeMode** (Exposure Mode) is set to **Individual**, the timing of the ExposureActive signal output will be different for each RGB channel due to the difference in RGB exposure time. Therefore, when setting **ExposureActive** for a **LineSource**, use **ExposureActiveSource** to specify which signal is output as ExposureActive (Common, Red, Green, Blue).

When **ExposureActiveSource** is set to **Common**, the channel with the longest exposure time is output as the ExposureActive signal. In the following example, the timing of the red channel is output as the ExposureActive signal.



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.

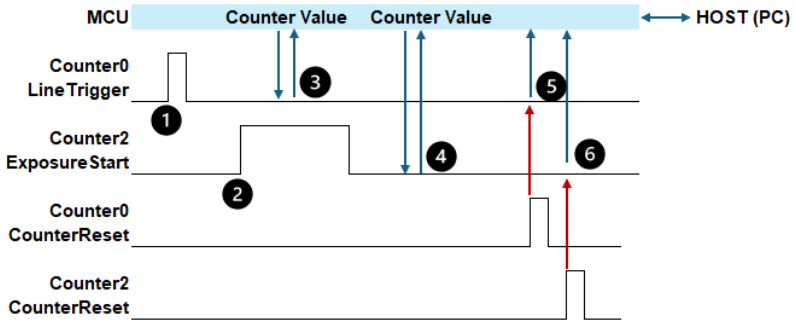
Counter Selector	Counter Event Source (Fixed)	Counter Event Activation
Counter0	Counts the number of **Line Trigger** instances.	Rising Edge (Fixed)
Counter1	Counts the number of **Line Start** instances.	Rising Edge (Fixed)
Counter2	Counts the number of **Exposure Start** instances.	Rising Edge (Fixed)

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)



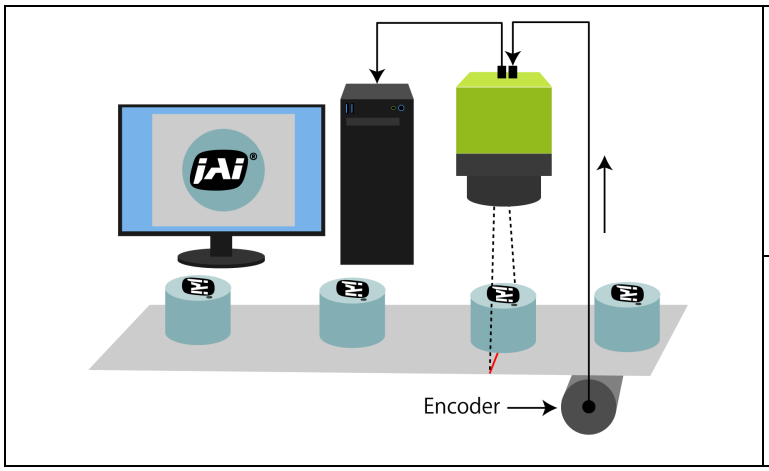
1. A LineTrigger Event occurs. Counter0 counts up.
2. An Exposure Start Event occurs. Counter 2 counts up.
3. The camera's internal MCU requests and reads the Counter0's counter value.
4. The camera's internal MCU requests and reads the Counter2's counter value.
5. Reset the Counter0's counter value 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).



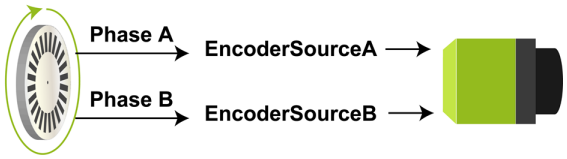
Line Rate Does NOT Match the Belt Speed

Line Rate Matches the Belt Speed

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**).



2. Select the encoder trigger method in **EncoderTriggerOption** and configure the setting.

   - **EncoderDivider** (Default) : Specify the number of triggers to generate as a ratio (65536 / EncodeDivider value). For more information, see "EncoderDivider Trigger Option".

     > **Note:** With this setting, input pulses are generated on the rising edge of the Phase A signal.

   - **EncoderDetection**: Specify the number of edges to pass between each encoder trigger signal. The number of edges to pass is specified by **EncoderEdgeDectionPassCount**. For more information, see "EdgeDetection Trigger Option".

     > **Note:** With this setting, input pulses are generated on the rising edge and falling edge of both the Phase A and B signals.

3. Specify the condition under which the camera outputs images in **EncoderOutputMode**.

   - **PositionUp**: The camera outputs images at all new positions in the positive direction (when **ObjectDirection** is set to **Forward Direction**).
   - **PositionDown**: The camera outputs images at all new positions in the negative direction (when **ObjectDirection** is set to **Reverse Direction**).
   - **Motion** (Default) : The camera outputs images at all motion increments in both directions.

   > **Note:** For more information, see "Resume Scanning (Backward Counter)".

4. Specify the direction of moving objects in **ObjectDirection** (**Forward Direction** or **Reverse Direction**).
5. Select the input to use for obtaining the movement direction information for the object in **ObjectDirectionSource**.

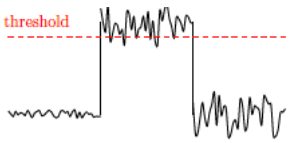
   > **Note**: If you want to reverse the object direction, change the ObjectDirection setting. Alternatively, you can reverse the object direction by changing the High/Low setting of the selected ObjectDirectionSource.

> For example, when ObjectDirectionSource is set to UserOutputValue0 [DigitalIOControl], the object direction can be reversed by changing the False (Low)/True (High) setting of UserOutputValue0.

6. When **EncoderOutputMode** is set to **PositionUp** or **PositionDown**, **EncoderOutputMaskedCount** displays the number of pulses generated during the reverse rotation.
   - EncoderOutputMaskedCount counts up while reversing.
   - EncoderOutputMaskedCount counts down when the reverse rotation is complete and the encoder rotates in the direction set by PositionUp or PositionDown. When the counter reaches 0, the camera resumes image output.

> **Note:** For more information, see "Resume Scanning (Backward Counter)" and "Rotation Direction".

7. 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 **EncoderOutputMode** is set to **EncoderDivider** and EncoderDvidier 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**: When **EncoderOutputMode** is set to **EncoderDivider** and EncoderDvidier 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.

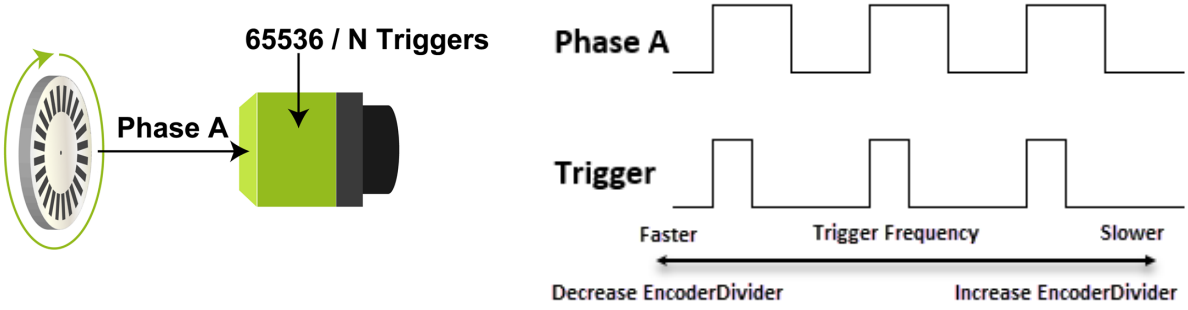
> **Note**: If the time interval of the output of the rotary encoder fluctuates greatly, the output of the camera's internal trigger generated may also fluctuate greatly.

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 Trigger Option

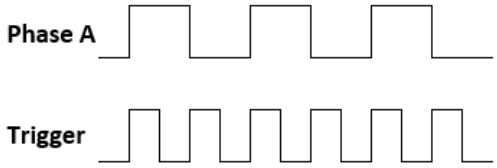
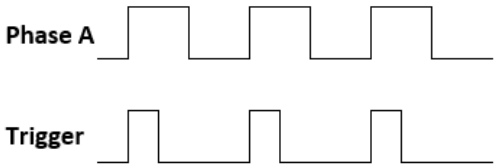
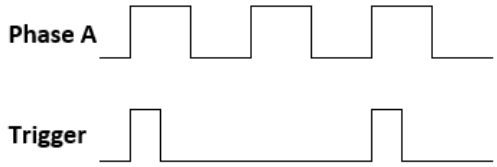
The **EncoderDivider** trigger option allows you to specify the number of triggers to generate as a ratio (65536 / N).



Notes:

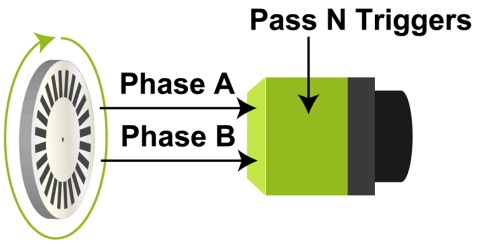
- With this setting, input pulses are generated on the rising edge of PhaseA.
- **When N is an integer multiple of 65536**: The camera's internal trigger is generated by the decimation of the output trigger of a rotary encoder.
- **When N is not an integer multiple of 65536**: Using the time interval 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.

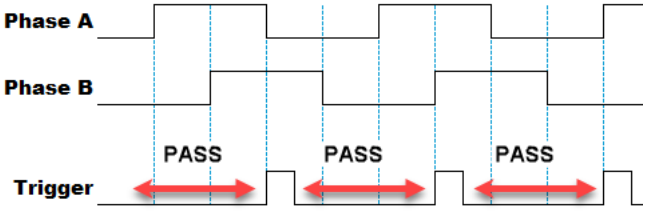
EncoderDivider Examples

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.	

EdgeDetection Trigger Option

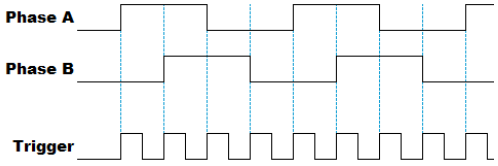
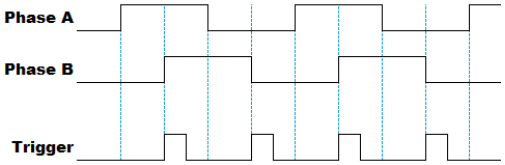
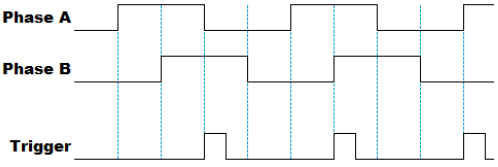
The **EdgeDetection** trigger option allows you to specify the number of edges to pass between encoder trigger signals. The number of edges to pass is specified by **EncoderEdgeDectionPassCount**. This option is useful, for example, if you need to trigger every second or third pulse.





> **Note:** With this setting, input pulses are generated on the rising and falling edge of both PhaseA and B. When Phase A - Phase B are exactly 90 degrees apart, the encoder input cycle is 1/4 of Phase A's rising cycle.

EdgeDetection Examples

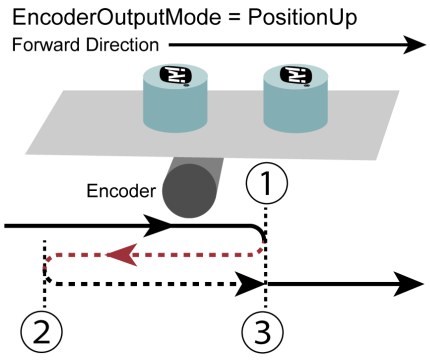
Edge Detection Pass Count Setting	Description	Timing Chart
0 (Default)	The camera generates "one" trigger per an input pulse signal.	
1	The camera generates "one" trigger per "two" input pulse signals.	
2	The camera generates "one" trigger per "three" input pulse signals.	

Resume Scanning (Backward Counter)

This camera can be configured to stop outputting images when the direction of movement of an object moving on a conveyor belt, etc. is reversed, and to resume outputting images when the object returns to the position where the reversal began. In order for the camera to work in this way, configure the following:

- Configure the camera so that the direction of rotation of the encoder can be determined (see "Rotation Direction")
- Set **EncoderOutputMode** to **PositionUp** or **PositionDown**.

Example



1. Reversal has started. The camera stops outputting images and **EncoderOutputMaskedCount** starts counting up.

2. Reversal has ended and the object has started to move forward. **EncoderOutputMaskedCount** starts counting down. However, image output is still paused.

3. The object has returned to the position where the reversal was started. **EncoderOutputMaskedCount** returns to 0 and the camera resumes image output.

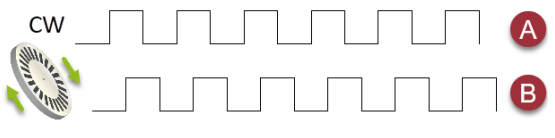
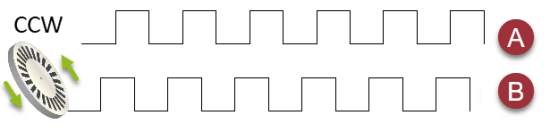
Notes:

- When **AcquisitionStart** [AcquisitionControl] is executed, **EncoderOutputMaskedCount** is reset to 0.
- If you want to output images while the object is moving in a reverse direction, change the **ObjectDirection** (Forward Direction / Reverse Direction)] setting to reverse the detected direction of the object.

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).

The A channel is leading.		The B channel is leading.	

Logic Block Control

> **Related Topic:** Logic Block Control

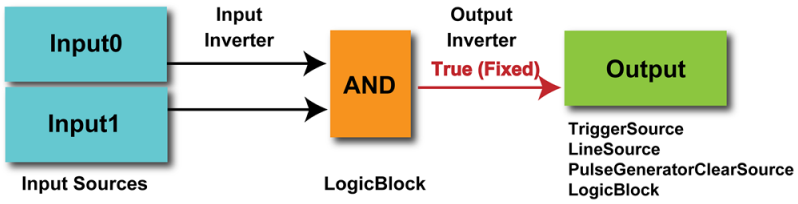
This camera supports the Logic Block Control function. A Logic Block is a combinational logic element that conditions various input signal sources by determining true/false and generates output signals accordingly.

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 a 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 Souce 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]

Pulse Generator

Related Setting Items: PulseGenerator

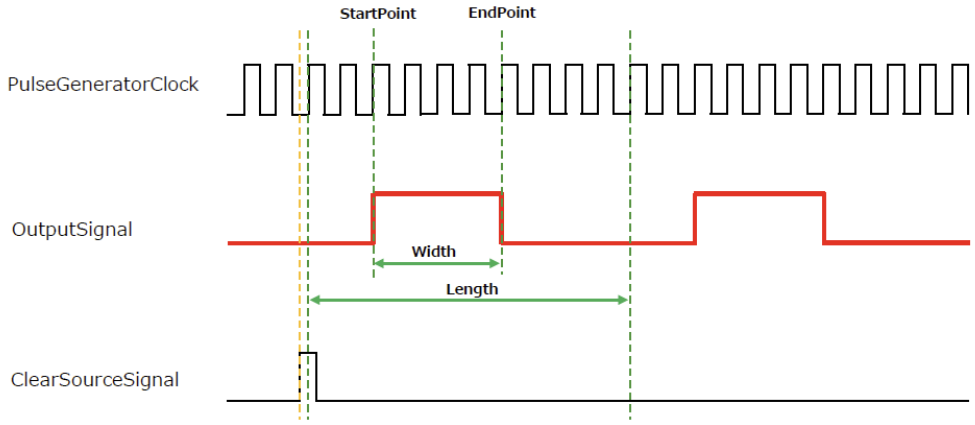
Technical Notes Tips for using the Pulse Generator

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.

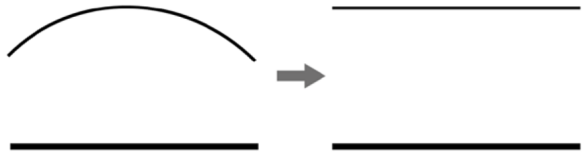
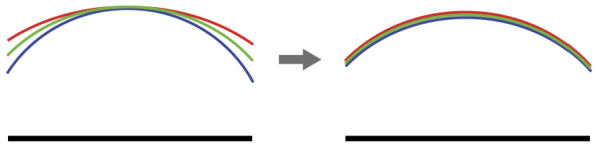
- ExposureActive, LVAL, PulseGenerator0-3*, UserOutput0-3, Line4 TTL In1, Line5 Opt In1, Line7 Cxp In, Line10 TTL In2, Line13 TTL In3, Line14 TTL In4, Logic Block0-1, EncoderTrigger

> **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-channel and B-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 SW-4000T-CXPA; 8 pixels/block for, SW-8000T-CXPA). 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. Select the Shading Correction Mode from **ShadingCorrectionMode**. (Flat Shading (Default) or Color Shading)
2. Select the user area (User1 ~ 3) where you save the shading correction data from **ShadingMode**.
3. Display a white chart under a uniform light and execute **CalibrateShadingCorrection**.
4. 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**.
5. 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 line rate setting is 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

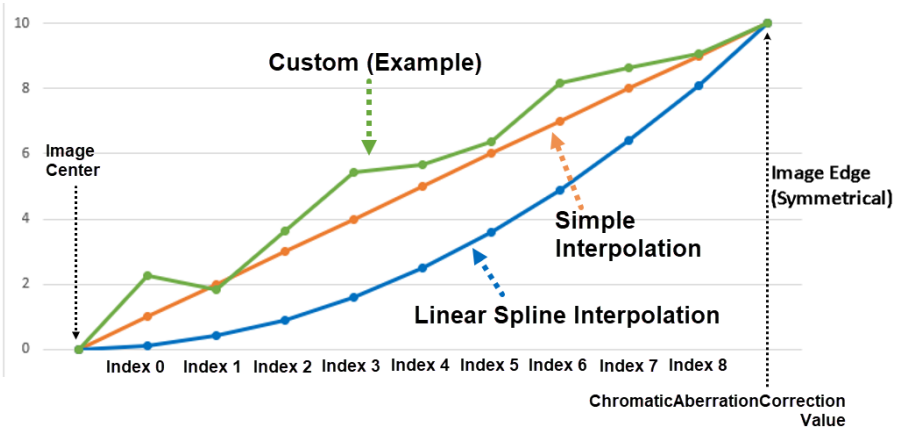
This function corrects the magnification differences between the color channels which is caused by the chromatic aberration of the lens. In simpler terms when the object appears with a slightly different width on the blue, green and red channels. You can save correction data for three types of lenses.

Specify the number of pixels to delay or advance the R channel and B channel using the G channel as a reference.

Note: This function assumes that the amount of deviation between the left and right is identical. If the amount of deviation between the left and right is not identical, correction will not be performed properly.

How to Configure

1. Select the area to apply or save the correction value in **ChromaticAberrationCorrectionMode** (Lens1 ~ 3).
2. 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.
   - **Simple Interpolation** (Default): 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.



3. Configure the correction settings, which vary depending on the selected correction method.

- **Simple Interpolation**: Select **R Channel** from **ChromaticAberrationCorrectionSelecter** and set the correction value in **ChromaticAberrationCorrection**. The setting range for SW-4000T-CXPA is -4.0 ~ +4.0; the setting range for SW-8000T-CXPA is -8.0 ~ +8.0 (step: 0.1 pixel).
- **Linear Spline Interpolation**: Configure the correction settings as follows.
    1. Select **R Channel** from **ChromaticAberrationCorrectionSelecter**.
    2. Select the index you want to configure from **ChromaticAberrationCorrectionIndex**, and set the correction value for the selected index in **ChromaticAberrationCorrectionCoeff**.
    3. Set the amount of correction for both ends of the image in **ChromaticAberrationCorrection**.
- **Custom**: Configure the correction settings as follows.
    1. Select **R Channel** from **ChromaticAberrationCorrectionSelecter**.
    2. Select the index you want to configure from **ChromaticAberrationCorrectionIndex**, and set the correction ratio for the selected index in **ChromaticAberrationCorrectionRatio**.
    3. Set the amount of correction for both ends of the image in **ChromaticAberrationCorrection**.

> **Caution:** If the **ChromaticAberrationCorrectionMethod** is set to anything other than Custom and the **ChromaticAberrationCorrectionRatio** value is changed manually, **ChromaticAberrationCorrectionMethod** will be forced to change to **Custom**.

4. Select **B Channel** from **ChromaticAberrationCorrectionSelecter**, and configure the correction settings as R Channel.
5. Execute **ChromaticAberrationCorrectionSave** to save the settings. The saved settings are for the area (Lens1 ~ 3) selected in **ChromaticAberrationCorrectionMode**.

> **Note**: 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[ChromaticAberrationCorrectionIndex] = pow (ChromaticAberrationCorrectionIndex/10, ChromaticAberrationCorrectionCoeff) x ChromaticAberrationCorrection
> - **[Custom]:** Correction value[ChromaticAberrationCorrectionIndex] = ChromaticAberrationCorrection x ChromaticAberrationCorrectionRatio [ChromaticAberrationCorrectionIndex]

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 (IInteger), a real type (IFloat), an element enumeration type (IEnumeration), a character string (IString), a logical type (IBoolean), and a category type (ICategory) or a command type (ICommand) 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 (IEnumeration) or an integer type (IInteger). 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-4000T-CXPA" "SW-8000T-CXPA"	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.
DeviceSFNCVersion SubMinor	-	0	Display the SFNC Sub Minor version
DeviceManifestEntry Selector	-	1	Display information on valid XML file.
DeviceManifestXML MajorVersion	0 ~ 32bit max	0	Indicates the major version number of the XML file of the selected manifest entry.
DeviceManifestXML MinorVersion	0 ~ 32bit max	0	Indicates the minor version number of the XML file of the selected manifest entry.
DeviceManifestXML SubMinorVersion	0 ~ 32bit max	1	Indicates the subminor version number of the XML file of the selected manifest entry.
DeviceManifestSchema MajorVersion	0 ~ 32bit max	1	Indicates the major version number of the schema file of the selected manifest entry.
DeviceManifestSchema MinorVersion	0 ~ 32bit max	1	Indicates the minor version number of the schema file of the selected manifest entry.
DeviceManifest PrimaryURL			Display the PrimaryURL.
DeviceTLType	-	3: CoaXPress	Display type of transport layer.
DeviceTLVersionMajor	-	2	Display the Major version of transport layer.
DeviceTLVersionMinor	-	0	Display the Minor version of transport layer.

Device Control Item	Setting Range	Default	Description
DeviceTLVersion SubMinor	-	0	Display the Sub Minor version of transport layer.
DeviceLinkThroughput LimitMode	0: Off 1: On	0: Off	**Off**: No CXP bandwidth limit; Device Link Throughput Limit is disabled. **On**: CXP bandwidth is limited; LineRate cannot exceed the Device Link Throughput Limit value.
DeviceLinkThroughput Limit	DeviceMaxThrougout/2 ~ DeviceMaxThrougout	DeviceMaxThrougout	Enabled when DeviceLinkThroughputLimitMode = On. Limits the maximum bandwidth of the data that will be streamed out by the device.
DeviceStreamChannelCount		1	Display the number of supported stream channels.
DeviceReset	-	-	Reset the device. (After the camera receives this command, it returns an ACK response. Then, execute reset.)
DeviceTempeatureSelector	-	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

ImageFormatControl

Configure image format settings.

Image Format Control Item	Setting Range	Default	Description
WidthMax	**4000T**: 4096 (2048) **8000T**: 8192 (4096) ( ): BinningHorizontal = 2		Display the maximum image width.
Width **Related Topic:** ROI (Regional Scanning Function)	128 (64) ~ (WidthMax - OffsetX) Step: 16 (8) Default: WidthMax ( ): BinningHorizontal = 2		Set the image height (number of lines).
Height	1 (Fixed)		Display the image height.
OffsetX	0 (Default) ~ (WidthMax - OffsetX) Step: 16 (8) ( ): BinningHorizontal = 2		Set the horizontal offset.
BinningHorizontalMode **Related Topic:** Binning Function	0: Sum (Default) 1: Average		Set the processing method for horizontal binning.
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.
PixelFormat **Related Topic:** Pixel Format	0x02180014: RGB8 (Default) 0x02300018: RGB10 0x02100032:YUV422_8		Set the pixel format.
TestPattern	0: Off (Default) 1: White 2: GreyPattern1 (Ramp) 3: GreyPattern2 (Stripe) 4: ColorBar		Select the test image.

Image Format Control Item	Setting Range	Default	Description
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	2: Continuous (Fixed)		Display the image capture mode.
Acquisition Start **Related Topic:** Acquisition Control	-	-	Start image capture.
Acquisition Stop	-	-	Stop image capture.
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
Trigger Selector **Related Topic:** Trigger Control	0: Acquisition Start (Default) 1: Acquisition End 2: Line Start		Select the trigger operation.
TriggerMode	0: Off 1: On	Off	Select the trigger mode
TriggerSource	7 ~ 10: PulseGenerator0 ~ 3 11 ~ 14: UserOutput0 ~ 3 23: Line4 TTL In 1 (Default) 24: Line5 Opt In1 26: Line7 CXP In 29: Line10 TTL In2 32: Line13 TTL In3 33: Line14 TTL In4 36 ~ 37: Logical Block0 ~ 1 38: EncoderTrigger		Select the trigger signal source.

Acquisition Control Item	Setting Range	Default	Description
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
ExposureMode **Related Topic:** Exposure Mode	Off Timed (Default) 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		Select the sensor to set ExposureTime. To set the common setting values for all three 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	15149.07	Set the exposure time (in μs) for the setting selected from ExposureTimeSelector . **Note:** Exposure Offset Time: -0.85μs
ExposureModeOption **Related Topic:** ExposureModeOption	0: PrioritizeExposureTime (Default) 1: PrioritizeLineRate		Specifies whether to prioritize exposure time (PrioritizeExposureTime) or line rate (PrioritizeLineRate) when controlling line rate and exposure.
RBExposureInterlocked **Note:** SW-4000T-CXPA Only	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:** Individual Gain Mode	Off (Default) Mode1 Mode2		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 and DigitalBlue settings. When Mode 1/ Mode 2,(= Individual Gain Mode), RGB can be configured individually for the entire gain adjustment range of the sensor.
GainSelector **Related Topic:** Gain Control	0: DigitalAll* 1: DigitalRed 2: DigitalGreen** 3: Digital Blue *IndividualGainMode=OFF Only **IndividualGainMode=ON Only		Select the gain to configure.
Gain	**IndividualGainMode = Off** • DigitalAll: 1.0 ~ 32.0 • DigitalRed/Blue: 0.4 ~ 4.0 **IndividualGainMode = Mode1** • DigitalRed/Green/Blue: 1.0 ~ 64.0 **IndividualGainMode = Mode2** • DigitalRed/Green/Blue: 0.4 ~ 4.0		Set the gain value for the gain setting selected in GainSelector.
GainAuto	0: Off (Default) 1: Once		Enable/disable gain auto adjustment. **Note:** Once is available only when IndividualGainMode is set to Mode 1/Mode 2. **Once** automatically changes to **Off** when the signal level converges once.
AGCReference	30 ~ 95	50	Set the target level for GainAuto.
AGCOnceStatus	0: Idle 1: Succeeded 2: Error1		Allows confirmation of the current status during gain auto adjustment.
AnalogGainSelector **Note:** SW-4000T-CXPA Only	1: Analog Red (Default) 2: Analog Green 3: Analog Blue		Select the analog gain to configure.

Analog Control Item	Setting Range	Default	Description
AnalogGain **Note:** SW-4000T-CXPAOnly	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: Red 2: Green 3: Blue		Select the black level to configure.
BlackLevel	-133 ~ 255	0	Set the black level value.
BalanceWhiteAuto **Related Topic:** Step 5: Adjust the Image Quality	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 Default: WidthMax ( ): BinningHorizontal = 2		Set the area for adjusting white balance.
BalanceWhiteAutoOffsetX	0 (Default) ~ (WidthMax - OffsetX) Step: 16 ( ): 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 **Related Topic:** Gamma Function	**SW-4000T-CXPA:** 0.45 (Default) , 0.50, 0.55, 0.60, 0.65, 0.75, 0.80, 0.90, 1.00 **SW-8000T-CXPA**: 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.

Analog Control Item	Setting Range	Default	Description
SensorType **Note:** SW-4000T-CXPAOnly	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		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	R-R: 1.0 R-G: 0.0 R-B: 0.0 G-R: 0.0 G-G: 1.0 G-B: 0.0 B-R: 0.0 B-G: 0.0 B-B: 1.0	Set the Color Matrix value. (step = 0.1)

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 26: CXP In 27: Line8: TTL Out2 28: Line9: TTL Out3 29: Line10: TTL In2 31: Line12: TTL Out4 32: Line13: TTL In3 33: Line 14 TTL In4		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).
LineSource **Related Topic:** LineSource Items	1: Acquisition Active 4: ExposureActive 6: LVAL 7 ~ 10: PulseGenerator0 ~ 3 11 ~ 14: UserOutput0 ~ 3 23: Line4: TTL In1 (Default) 24: Line5: Opt In1 26: Line7 CXP In 29: Line10: TTL In2 32: Line13: TTL In3 33: Line 14 TTL In 4 36 ~ 37: LogicBlock0 ~ 1 38: EncoderTriger 39: EncoderDirection		Select the line source signal for the item selected in **Line Selector**.
LineFormat	0: NoConnect 2: TTL 5: Opto Coupled		Display the signal format.

Digital IO Control Item	Setting Range	Default	Description
LineStatusAll	bit0: Line1 bit1: Unused bit2: Unused bit3: Line4 bit4: Line5 bit5: Unused bit6: Line7 bit7: Line8 bit8: Line9 bit9: Line10 bit10: Unused bit11: Line12 bit12: Line13 bit13: Line14 bit14-15: Unused		Display the input/output signal status. The state is shown with 16 bits. **Note:** Unused is fixed to 0.
OptInFilterSelector	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**.
ExposureActiveSource **Related Topic:** ExposureActive Signal	1: Common (Default) 2: Red 3: Green 4: Blue		Select the channel for the ExposureActive signal when LineSource is set to ExposureActive. When set to Common, the channel with the longest exposure time is output as the ExposureActive signal.

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 ~ 2: Counter0 ~ 2	Counter0	Select the counter.
CounterEventSource	0: Off (Default) 1: LineTrigger (Counter0) 2: Line Start (Counter1) 3: Exposure Start (Counter2)		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		Set the count timing. The setting value is fixed with the following data
CounterResetSource	0: Software (Default) 23: Line4 TTL In1 24: Line5 Opt In1 26: Line7 CXP In 29: Line10 TTL In2 32: Line13 TTL In3 33: Line14 TTL In4		Specifies the source that resets the counter. This source triggers and resets the counter. When set to **Software**, the counter value is reset by the **CounterReset** command. Otherwise, the counter value is reset by the Line input of the GPIO.
CounterResetActivation	1: Rising Edge (Default) 2: Falling Edge 3: Level High 4: Level Low		Selects the timing of the counter reset when CounterResetSource is set to other than Software.
CounterReset	-	-	Reset the counter.
CounterValue	0 ~ 32bit max	0	Display the count value.
CounterStatus	0: CounterIdle (Default) 1: CounterTriggerWait 2: CounterActive 3: CounterCompleted 4: CounterOvewflow		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 33: Line14 TTL In4		Select where to input the signal from the rotary encoder.
EncoderTriggerOption	0: EncoderDivider (Default) 1: EdgeDetection		Select the encoder triggering method. **EncoderDivider** specifies the number of triggers to generate as a ratio (65536 / EncoderDivider value). **EncoderDetection** specifies the number of edges to pass between encoder trigger signals.
EncoderDivider **Related Topic:** EncoderDivider Trigger Option	1~ 32bit max	65536	When **EncodeDivider** is selected for **EncoderTriggerOption**, set the number of triggers to be generatedas a ratio 65536 / (set value).
EncoderEdgeDectionPassCount **Related Topic:** EdgeDetection Trigger Option	0 ~ 65535	0	When **EdgeDetection** is selected for **EncoderTriggerOption**, set how many edges to pass between encoder trigger signals.

Encoder Control Item	Setting Range	Default	Description
EncoderOutputMode **Related Topic:** Resume Scanning (Backward Counter)	1: PositionUp 2: PositionDown 5: Motion (Default)		Specify the condition under which a valid encoder output signal is generated. **PositionUp**: Outputs images at all new positions in the positive direction (when ObjectDirection] is set to Forward Direction). When the direction of encoder rotation is reversed, the camera stops outputting images until **EncoderOutputMaskedCount** returns 0, while output pulses continue to be generated. **PositionDown**: Outputs images at all new positions in the negative direction (when ObjectDirection] is set to Forward Direction). When the direction of encoder rotation is reversed, the camera stops outputting images until **EncoderOutputMaskedCount** returns 0, while output pulses continue to be generated. **Motion**: Outputs images at all motion increments in both directions.
EncoderOutputMaskedCount	0 ~ 32bit max	0	Display the number of pulses during the reverse rotation after the AcquisitionStart command when **EncoderOutputMode** is set to **PositionUp** or **PositionDown**. The counter counts up during the reverse rotation. The counter counts down when rotation returns to the direction set by **EncodeOutputMode**.
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.
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.

Encoder Control Item	Setting Range	Default	Description
EncoderMaxIntervalFor NonDecimationMode (s)	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.
ObjectDirection	0: Forward Direction (Default) 1: Reverse Direction		Set the direction of moving objects.
ObjectDirectionSource	11-14: UserOutput0-3 (Default = UserOutput0) 23: Line4 TTL In1 24: Line5 Opt In1 26: Line7 CXP In 29: Line10 TTL In2 32: Line13 TTL In3 33: Line14 TTL In4 39: EncoderDirection		Select the input to use for obtaining the movement direction information for the object.

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: PulseGenerator0 8: PulseGenerator1 9: PulseGenerator2 10: PulseGenerator3 11: UserOutput0 12: UserOutput1 13: UserOutput2 14: UserOutput3 23: Line4 TTL In1 (Default) 24: Line5 Opt In1 26: Line7 Cxp In 29: Line10 TTL In2 32: Line13 TTL In3 33: Line14 TTL In4 36: Logic Block0 37: Logic Block1 38: Encoder Trigger		Selects the source signal for the input into the Logic Block.
Logic Block Input Inverter	False 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.

UserSetControl

Configure user settings.

> **Related Topic:** Step 6: 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.

TransportLayerControl

Display information on transport layer control.

Transport Layer Control Item	Setting Range	Default	Description
PayloadSize (bytes)	48 ~ 67109240	-	Display the payload size. (unit: bytes)
DeviceTapGeometry	0: Geometry_1X_1Y (Fixed)		The method of transferring images from the device at one time (TAP configuration).
CoaXPress			
CxpLinkConfigurationPreferred	CXP12		Displays the link structure that allows the camera to operate in default mode.
CxpLinkConfiguration	CXP-3 (3.125 Gbps) CXP-6 (6.25Gbps) CXP-12 (12.5Gpbs)		Set the CoaXPress Link Configuration.

Transport Layer Control Item	Setting Range	Default	Description
JAICxpLinkConfigurationPreferred	0x00010038: CXP3_X1 0x00010048: CXP6_X1 0x00040058: CXP12_X1 (Default)		Custom command to change and save the CxpLinkConfigurationPreferred configuration value. (* CXP12 can only be used when VersionUsed = 2.0 or later)
CxpConnectionSelector	-	-	Select the CoaXPress physical connection you want to control.
CxpConnectionTestMode	0: Off 1: On	0: Off	0: Normal Mode 1: Sends a test packet to each connection that is connected.
CxpConnectionTestErrorCount	-	-	Reports the current connection error count for the test packet.
CxpConnectionTestPacketCount	-	-	Reports the current count of test packets.
CxpVersionUsed	2: CXP1.1 3: CXP2.0		Display the current CXP version. When the frame grabber supports CXP2.0, "3: CXP2.0" is displayed.

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

Pulse Generator Item	Setting Range	Default	Description
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
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 33: Line 14 TTL In 4 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		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

Configure settings related to image correction.

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.
ChromaticAberrationCorrectionSelector	0: R Channel (Default) 2: B Channel		Specify the channel for which to perform Chromatic Aberration Correction Lens1,2,3.
ChromaticAberrationCorrection	**4000T**: - 4.0 ~ + 4.0 **8000T**: - 8.0 ~ + 8.0 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	
ChromaticAberrationCorrection Save			Save the related value of the Chromatic Aberration Correction features.
SubPixelImageShiftR	-1.0 ~ +1.0, step 0.1	0	
SubPixelImageShiftB	-1.0 ~ +1.0, step 0.1	0	
FIRFilterSelector **Related Topic:** Noise Reduction Filter Functions	0: Red (Default) 1: Green 2: Blue		Select the target to apply FIR Filter from Red, Green, Blue.
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		Select the target to apply Median Filter from Red, Green, Blue

Correction Control Item	Setting Range	Default	Description
MEDIANFilterMode	0: Off 1: On	Off	Enable / Disable MEDIAN Filter.
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

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Image Sensor</td><td>4K / 8K line scan CMOS image sensor × 3
<table>
<tr><th></th><th>SW-4000T-CXPA</th><th>SW-8000T-CXPA</th></tr>
<tr><td>Effective Pixels</td><td>4096 × 3 (R, G, B)</td><td>8192 × 3 (R, G, B)</td></tr>
<tr><td rowspan="2">Pixel Size</td><td>TypeA: 3.75 µm x 5.78 µm</td><td rowspan="2">3.75 µm x 5.78 µm</td></tr>
<tr><td>TypeB: 7.5 µm x 10.5 µm</td></tr>
</table></td></tr>
<tr><td>Synchronization</td><td>Internal</td></tr>
<tr><td>Communication Interface</td><td>Coax Press v1.1/2.0 (Link Configuration: CXP12_X1, CXP6_1, CXP3_X1)</td></tr>
<tr><td>Line Rate
(Full ROI)</td><td>
<table>
<tr><th></th><th></th><th>SW-4000T-CXPA</th><th>SW-8000T-CXPA</th></tr>
<tr><td rowspan="3">RGB8</td><td>CXP-12</td><td>66Hz ~ 97kHz</td><td>66Hz ~ 49kHz</td></tr>
<tr><td>CXP-6</td><td>66Hz ~ 49kHz</td><td>66Hz ~ TBD</td></tr>
<tr><td>CXP-3</td><td>66Hz ~ 24kHz</td><td>TBD</td></tr>
<tr><td rowspan="3">RGB10</td><td>CXP-12</td><td>66Hz ~ 78kHz</td><td>66Hz ~ 37kHz</td></tr>
<tr><td>CXP-6</td><td>66Hz ~ 39kHz</td><td>66Hz ~ TBD</td></tr>
<tr><td>CXP-3</td><td>19kHz</td><td>TBD</td></tr>
<tr><td rowspan="3">YUV422_8</td><td>CXP-12</td><td>66Hz ~ 145kHz</td><td>66Hz ~ 73kHz</td></tr>
<tr><td>CXP-6</td><td>66Hz ~ 73kHz</td><td>66Hz ~ TBD</td></tr>
<tr><td>CXP-3</td><td>66Hz ~ 36kHz</td><td>TBD</td></tr>
</table>
Note: When taking a trigger signal from the outside, there is no limitation on the minimum value</td></tr>
<tr><td>Dark SN (DR)
DarkLevel @ 10bit</td><td>
<table>
<tr><th>Channel</th><th>Individual Gain</th><th>SW-4000T-CXPA</th><th>SW-8000T-CXPA</th></tr>
<tr><td>R</td><td rowspan="3">Off*</td><td>57dB</td><td>57dB</td></tr>
<tr><td>G</td><td>57dB</td><td>57dB</td></tr>
<tr><td>B</td><td>56dB</td><td>56dB)</td></tr>
<tr><td>R</td><td rowspan="3">On**</td><td>> 60dB</td><td>> 60dB</td></tr>
<tr><td>G</td><td>> 60dB</td><td>> 60dB</td></tr>
<tr><td>B</td><td>> 60dB</td><td>> 60dB</td></tr>
</table>
Typical values.
*DSNU Correction: On; GainAll/Red/Blue: 0dB
**DSNU Correction: On; Gain Green/Red/Blue: 0dB</td></tr>
</table>

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Bright SNR
890LSB @ 10bit</td><td>
<table>
<tr><th rowspan="2">Channel</th><th rowspan="2">Individual Gain</th><th colspan="2">SW-4000T-CXPA</th><th rowspan="2">SW-8000T-CXPA</th></tr>
<tr><th>TypeA</th><th>TypeB</th></tr>
<tr><td>R</td><td rowspan="3">Off*</td><td>36dB</td><td>39dB</td><td>36dB</td></tr>
<tr><td>G</td><td>36dB</td><td>39dB</td><td>36dB</td></tr>
<tr><td>B</td><td>35dB</td><td>38dB</td><td>35dB</td></tr>
<tr><td>R</td><td rowspan="3">On**</td><td>40 dB</td><td>43dB</td><td>40 dB</td></tr>
<tr><td>G</td><td>40 dB</td><td>43dB</td><td>40 dB</td></tr>
<tr><td>B</td><td>40 dB</td><td>43dB</td><td>40 dB</td></tr>
<tr><td colspan="5">Typical values.
*DSNU /PRNU Correction: On; GainAll/Red/Blue: 0dB
**DSNU / PRNU Correction: On; Gain Green/Red/Blue: 0dB</td></tr>
</table>
</td></tr>
<tr><td>Digital Image Output Format</td><td>
<table>
<tr><th></th><th>SW-4000T-CXPA</th><th>SW-8000T-CXPA</th></tr>
<tr><td>Width (pixels)</td><td>128 (64) ~ 4096 (2048), 16 (8) pixels/step</td><td>128 (64) ~ 8192 (4096), 16 (8) pixels/step</td></tr>
<tr><td>OffsetX</td><td>0 ~3968 (1984), 16 (8) pixels/step</td><td>0 ~ 8064 (4032), 16 (8) pixels/step</td></tr>
<tr><td>Height</td><td colspan="2">1 (Fixed)</td></tr>
<tr><td>Pixel Format</td><td colspan="2">RGB8, RGB10, YUV422_8</td></tr>
<tr><td colspan="3">( ) = Binning On</td></tr>
</table>
</td></tr>
<tr><td>Exposure Mode</td><td>
<table>
<tr><th>Exposure Mode</th><th>ExposureTime (step: 0.01µs)</th></tr>
<tr><td>Off</td><td>Line Period - 3.29µs + 0.85µs</td></tr>
<tr><td>Timed (LineStart Trigger Off)</td><td>3.0µs ~ 15.149ms</td></tr>
<tr><td>Timed (LineStart Trigger On)</td><td>3.0µs ~ 15.149ms</td></tr>
<tr><td>TriggerWidth (LineStart only)</td><td>TriggerWidth + 0.85µs (1.8µs ~ 1s)</td></tr>
</table>
</td></tr>
<tr><td>Trigger Selector</td><td>Acquisition: AcquisitionStart / AcquisitionEnd
Exposure: LineStart</td></tr>
<tr><td>Trigger Inputs</td><td>12pin (DC IN/TRIG): TTL, Opt Input
10pin (AUX): TTL Input
CXP: CXP In
Positive / negative logic switchable. Minimum trigger width: TBDns and more</td></tr>
<tr><td>Trigger Input Signals</td><td>Software, PulseGenerator0 ~ 3, UserOutput 0 ~ 3, Line5 (OptIn1), Line7 (CXP In), Line4 (TTL In1), Liine14 (TTL In4), LogicBlock 0 ~ 1</td></tr>
</table>

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Gain Adjustment</td><td>
<table>
<tr><th>Mode</th><th>Gain Range</th></tr>
<tr><td>Analog Gain*</td><td>0dB / 6dB / 12dB</td></tr>
<tr><td>Individual Gain Mode 1</td><td>DigitalG/R/B: 0 ~ 36.0dB</td></tr>
<tr><td>Individual Gain Mode 2**</td><td>DigitalG/R/B: -7.96 ~ +12.0dB</td></tr>
<tr><td rowspan="2">Master Mode***</td><td>DigitalAll: 0 ~ 30.0dB</td></tr>
<tr><td>Digital R/B: -7.96 ~ +12.0dB</td></tr>
<tr><td colspan="2">*Analog Gain: SW-4000T-CXPA Only
**0dB = same as Master Mode
***Individual Gain Mode = Off</td></tr>
</table>
</td></tr>
<tr><td>Black Level Adjustment</td><td>Digital G/R/B: -133 ~ +255 (LSB@12bit)</td></tr>
<tr><td>White Balance</td><td>BalanceWhiteAuto: Off, Once, Exposure Once, Preset5000K, Preset6500K, Preset7500K</td></tr>
<tr><td>Test Pattern</td><td>Off, White, GreyPattern1(Ramp), GreyPattern2(Stripe), ColorBar</td></tr>
<tr><td>Image Processing</td><td>Pixel Sensitivity Correction: Pixel Correction (DSNU、PRNU)
Shading Correction (ColorShading, FlatShading)
LUT: Off : y =1.0, ON: 257 points can be set.
Gamma (4000T): 0.45 to 1.0 (9 steps available)
Gamma (8000T): 0.45 to 4.0 (20 steps available)
Noise Reduction Filter (MEDIAN, FIR, NoiseReduction)</td></tr>
<tr><td>Power Supply (12-pin)</td><td>
<table>
<tr><th></th><th>SW-4000T-CXPA</th><th>SW-8000T-CXPA</th></tr>
<tr><td>Input Voltage</td><td colspan="2">DC10.8 ~ 26.4V</td></tr>
<tr><td>Power Consumption</td><td>8.0W Typical (Default / 25°C Environment) @ DC+12V, 10.0 W (Max)</td><td>TBDW Typical (Default / 25°C Environment) @ DC+12V, TBDW (Max)</td></tr>
</table>
</td></tr>
<tr><td>Power Supply (PoCXP)</td><td>
<table>
<tr><th></th><th>SW-4000T-CXPA</th><th>SW-8000T-CXPA</th></tr>
<tr><td>Input Voltage</td><td colspan="2">DC18.5 ~ 26.0V</td></tr>
<tr><td>Power Consumption</td><td>8.9W Typical (Default / 25°C Environment), 10.0 W(Max)</td><td>TBDW Typical (Default / 25°C Environment), TBDW(Max)</td></tr>
</table>
</td></tr>
<tr><td>Back Flange Distance</td><td>46.5 mm, tolerance: 0 mm to ~ 0.05 mm (F- and M52-mount)</td></tr>
<tr><td>Verified Performance Temperature/Humidity</td><td>-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.</td></tr>
<tr><td>Storage Temperature/Humidity</td><td>-25°C ~ +60°C (20 to 80%, non-condensing)</td></tr>
<tr><td>Vibration Resistance</td><td>3G (20 Hz~ 200 Hz X-Y-Z direction)</td></tr>
<tr><td>Shock Resistance</td><td>50G</td></tr>
<tr><td>Regulations</td><td>CE (EN55032:2015/A11:2020, EN55035:2017(CISPR35:2016), RoHS / WEEE, FCC Part15 Subpart B, KC</td></tr>
</table>

Item	Specifications
Dimensions	90mm x 90mm x 90mm (WHD; excluding mount and protrusions)
Weight	790g (Typ)

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.

- The camera's internal temperature should not exceed 55 °C during operation.

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

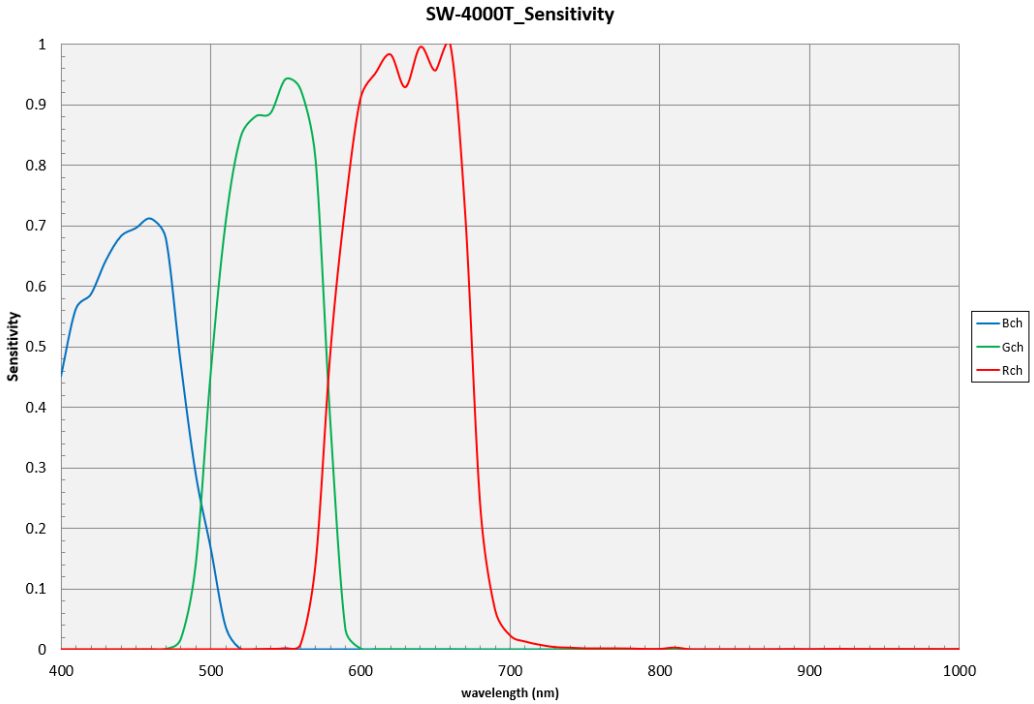
Package Contents

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

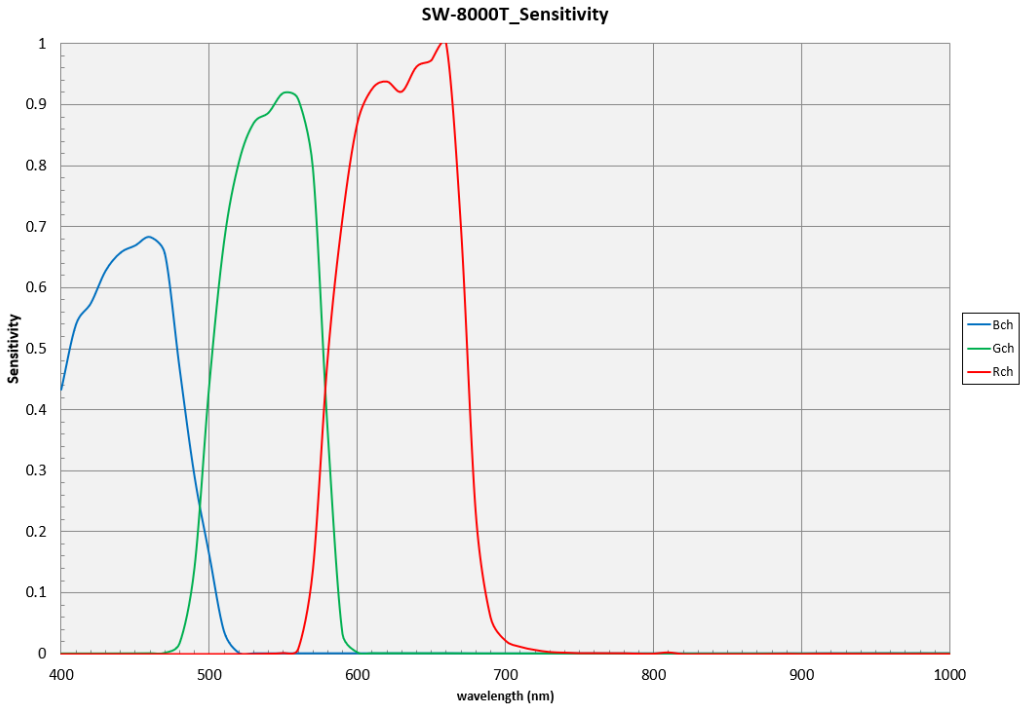
Spectral Response

The spectral responses of each model are shown below.

SW-4000T-CXPA



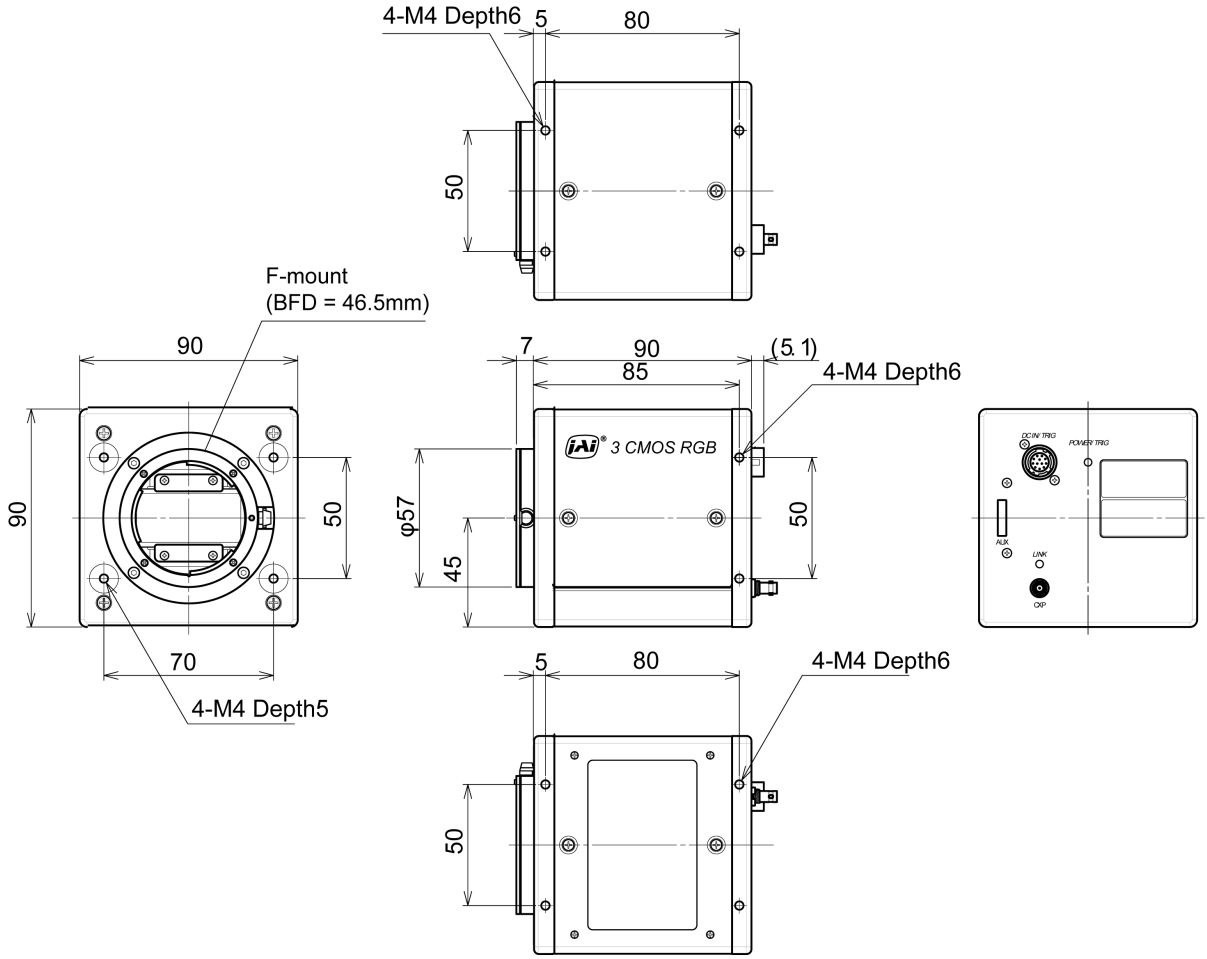
SW-8000T-CXPA



Dimensions

This section shows the dimensional drawings of each camera model.

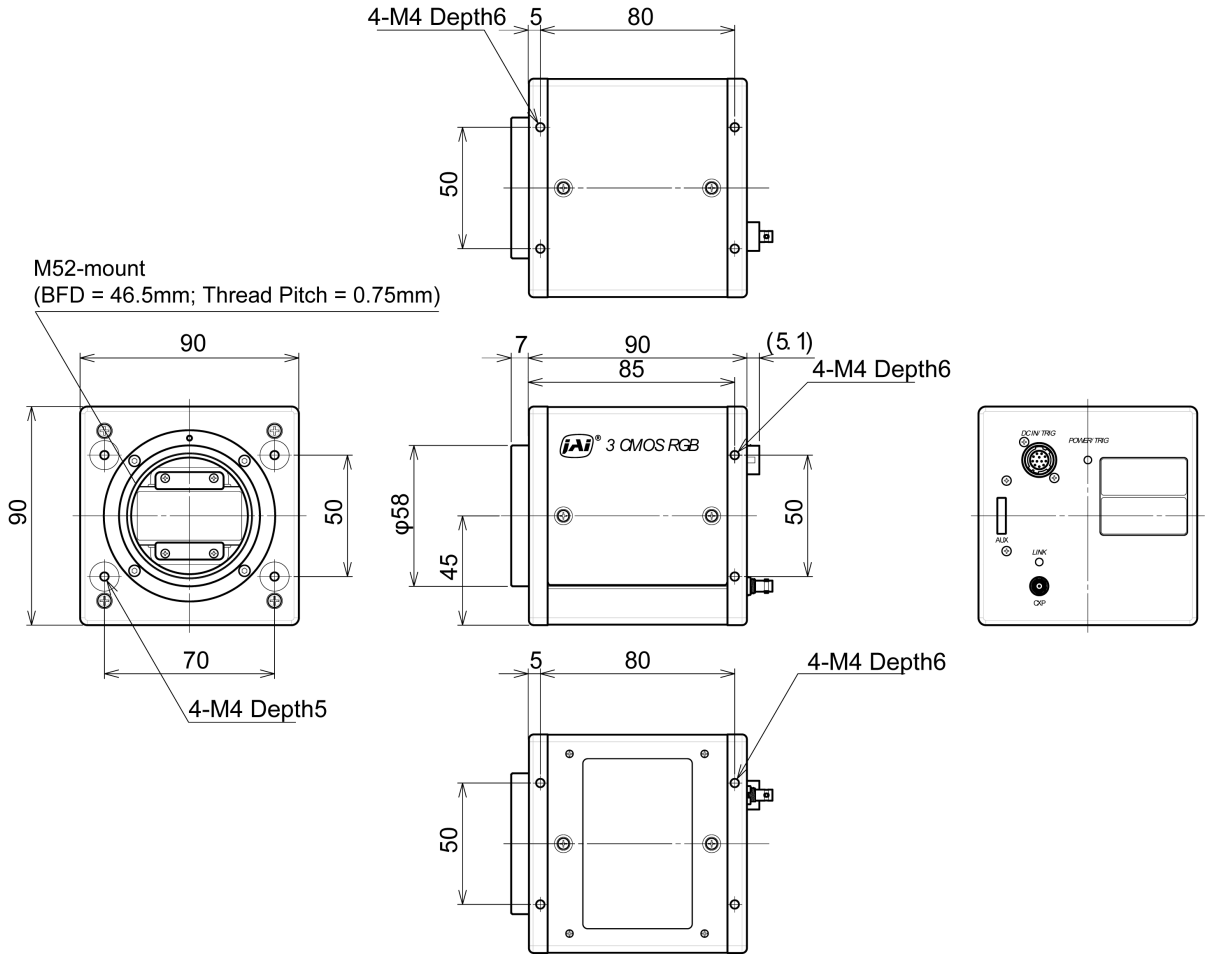
SW-4000T-CXPA-F / SW-8000T-CXPA-F



Notes:

- Dimensional Tolerance: ± 0.3mm
- Unit: mm

SW-4000T-CXPA-M52 / SW-8000T-CXPA-M52



Notes:

- Dimensional Tolerance: ± 0.3mm
- 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.

Revision History

Revision	Date	Changes
Tentative	2025/01/31	

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