




See the possibilities

User Manual

GO-5000M-USB-UV

*CMOS Digital Progressive Scan
Monochrome UV Camera Document
Version: 1.0
GO-5000M-USB-UV_Ver.1.0_Feb.2021*

Thank you for purchasing this product.

 Be sure to read this manual before use.

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

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

© 2021 JAI

Contents

Notice/Warranty/Certifications	3	Calculation of the maximum frame rate	37
Usage Precautions	5	Exposure Mode	38
Features	6	Trigger Control	39
Parts Identifications	7	Normal continuous operation	41
Preparation	9	Timed mode	41
Preparation Process	9	Trigger width mode	42
Step 1:Installing the Software	9	RCT (Reset Continuous Trigger) mode	43
Step 2:Connecting Devices	10	Video Send Mode	45
Step 3:Verifying Camera Operation	12	Multi ROI mode	48
Step 4:Verifying the Connection between the Camera and PC	12	Delayed Readout function	49
Step 5:Configuring Basic Settings for the Camera	15	Operation and function matrix	48
Step 6:Adjusting the Image Quality	16	Black level control	50
Step 7:Saving the Settings	18	Gain control	50
Main Functions	19	LUT	53
Digital IN/OUT interface	19	Gamma	53
Optical Interface	22	Shading Correction mode	54
Opt In Filter Selector function	23	Blemish compensation	54
Pulse Generator	24	ALC	55
Sensor layout	28	HDR(High Dynamic Range)	56
Camera output format	28	External appearance and dimensions	57
Pixel Format	29	Spectral response	58
Output timing(Horizontal)	30	Specifications table	59
Output timing(Vertical)	31	Appendix	61
ROI(Region Of Interest) setting	32	User's Record	63
Digital output Bit allocation	32		
Acquisition control	33		

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, 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 GO-5000M-USB-UV comply with the following provisions applying to their standards.

EN 61000-6-3 (Generic emission standard part 1)

EN 61000-6-2 (Generic immunity standard part 1)

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference 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.

Supplement

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『电子信息产品污染控制管理办法』，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)
电路板	×	○	○	○	○	○
螺丝	×	○	○	○	○	○
插座	×	○	○	○	○	○
.....

○: 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。
 (企业可在此处,根据实际情况对上表中打“×”的技术原因进行进一步说明。)



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基人身、财产造成严重损害的期限。

数字「15」为期限15年。

Usage Precautions

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

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

The GO-5000M-USB-UV is an industrial progressive scan camera equipped with a 1-inch global shutter CMOS image sensor with 5.2 effective megapixels (2560 × 2048). This CMOS image sensor has sensitivity in the UV region. The unit is compact and lightweight in design and is equipped with USB3 Vision interface.

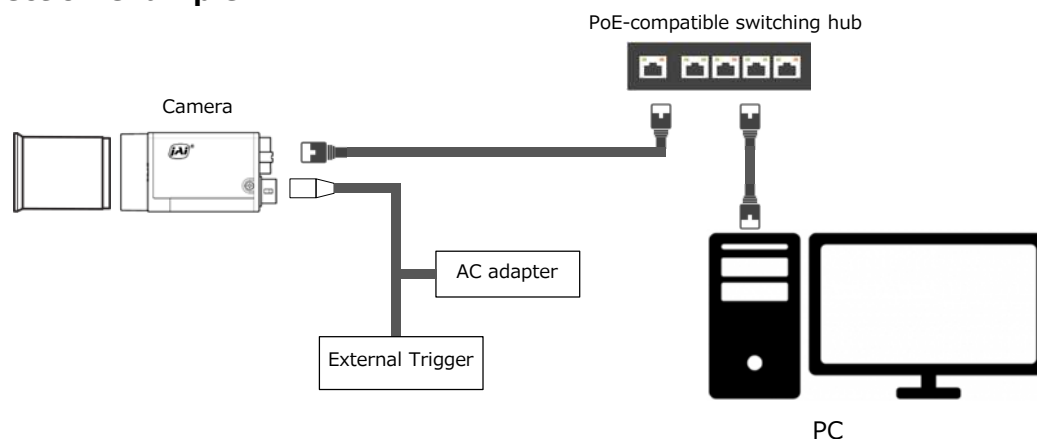
Compact and lightweight

The unit's compact size (approx. 29 × 29 × 41.5 mm, excluding lens mount) and lightweight design (approx. 46 g) allows for easy assembly and installation.

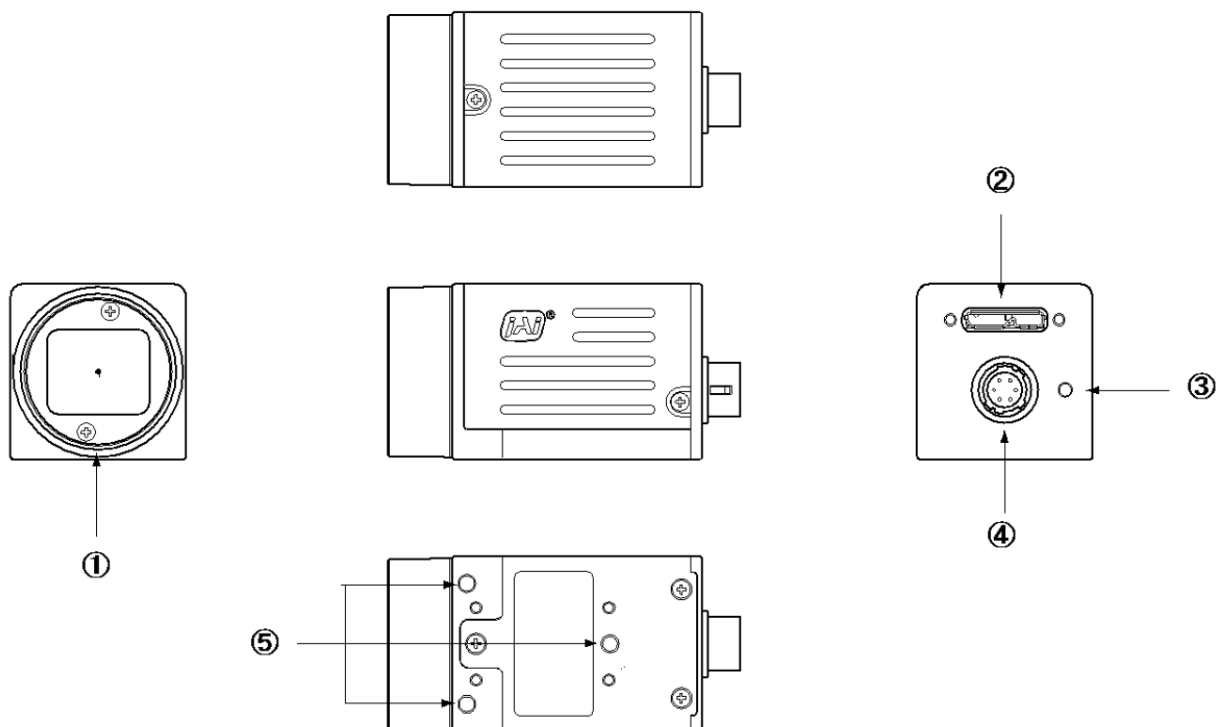
Feature overview

- New Compact and Rugged housing Series, 1" progressive scan camera
- Intelligent body design for easy and flexible installation
- USB3 Vision (USB 3.0) interface with power-over-USB capability.
- Aspect ratio 5:4, 2560(H) x 2048(V) - 5.2 million effective pixels
- 5 μ m square pixels
- S/N 55 dB with Dark Compression ON
- 8-bit, 10-bit or 12-bit output
- 61.9 frames/second with full resolution in continuous operation (8-bit)
- Various readout modes, including horizontal and vertical binning and ROI (Region Of Interest) for faster frame rates
- 0 dB to +24 dB gain control
- 10 μ s (1/100,000) to 8 seconds exposure control in 1 μ s step
- Auto exposure control
- Timed and trigger width exposure control
- RCT trigger mode for specific applications
- ALC control with combined function of AGC and auto shutter
- HDR (High Dynamic Range) function is available
- Various pre-processing circuits are provided
- Programmable LUT
- Gamma correction (3 steps: 0.45, 0.6 and 1.0)
- Blemish compensation
- C-mount for lens mount

Connection example:



Parts Identification



① Lens mount (C-mount)

Mount a C-mount lens, microscope adapter, etc. here.

❖ Before mounting a lens, be sure to refer to “Step 2:Connecting Devices” and confirm the precautions for attaching a lens and the supported lens types.




② USB 3.0 connector

Use a USB 3.0 compatible cable to connect this to a USB port on the computer.

③ POWER/TRIG LED

Indicates the power and trigger input status.

LED status and camera status

LED	Light	Status
POWER/ TRIG LED	 (Lit amber)	Camera initializing.
	 (Lit green)	Camera in operation.
	 (Blinking green)	During operation in trigger mode, trigger signals are being input. ❖ The blinking interval is not related to the actual input interval of the external trigger.

④ LINK LED

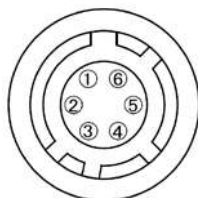
Indicates whether the GigE network connection is established or not.

⑤ ACT LED

Indicates the GigE network status.

⑥ DC IN/TRIG connector (6-pin round)

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



Compatible connectors

Camera side : HR10A-7R-6PB (73) (Hirose Electric or equivalent)

Cable side : HR10A-7P-6S (plug) (Hirose Electric or equivalent)

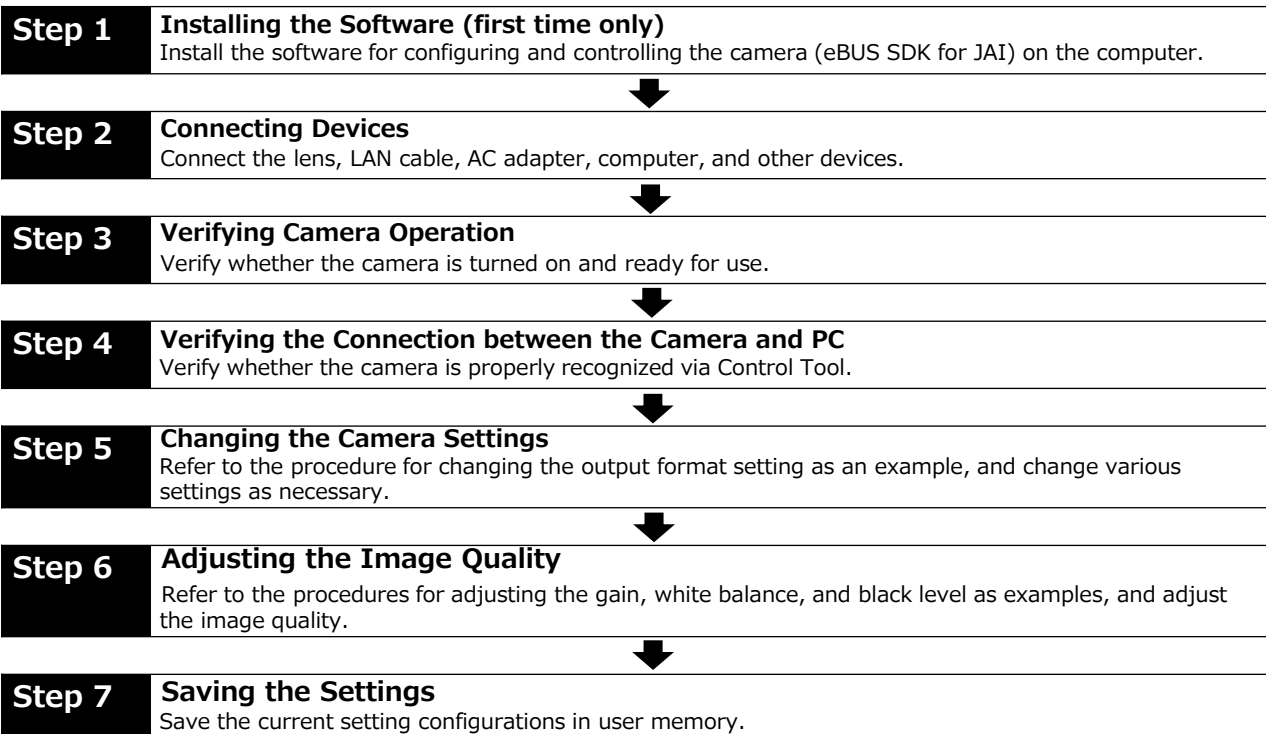
Pin No.	Input/Output	Signal	Description
1	Power In	DC In	DC 10 V ~ 25 V
2	In	Opto In +	
3	In	Opto In -	
4	Out	Opto Out +	
5	Out	Opto Out -	
6	GND	GND	

⑦ Camera locking screw holes (M3, 3mm depth)

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

Preparation

Preparation Process



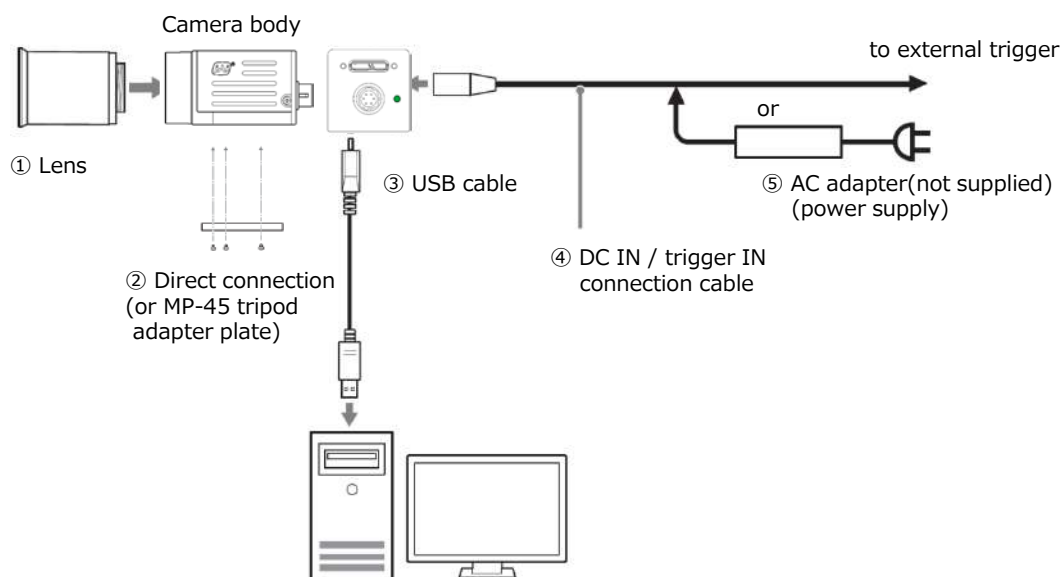
Step 1: Installing the Software (first time only)

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

❖ When you install eBUS SDK for JAI, eBUS SDK for JAI player will also be installed.

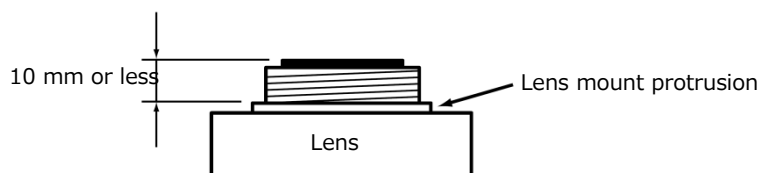
- 1 Download the eBUS SDK for JAI from the JAI website.**
URL <https://www.jai.com/support-software/jai-software>
- 2 Install eBUS SDK for JAI on the computer.**

Step 2: Connecting Devices



① Lens

- C-mount lenses with lens mount protrusions of 10 mm or less can be attached.



- To prevent vignetting and to obtain the optimal resolution, use a lens that will cover the image sensor size.

Model name	Image Sensor		
GO-5000M-USB-UV	Mono	1 inch	12.8mm x 10.24mm (16.392mm diagonal)

Caution

- The maximum performance of the camera may not be realized depending on the lens.
- Attaching a lens with a mount protrusion of 10 mm or longer may damage the lens or camera.

Note

The following formula can be used to estimate the focal length.

$$\text{Focal length} = \text{WD} / (1 + \text{W}/\text{w})$$

WD : Working distance (distance between lens and object)

W : Width of object

w : Width of sensor

② Direct connection (or MP-43 tripod adapter plate)

When mounting the camera directly to a wall or other device, use screws that match the camera locking screw holes on the camera (M3, depth: 3 mm). Use the supplied screws to attach the tripod adapter plate.

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 USB 3.0 cable

Connect a USB cable to the USB 3.0 connector.

Caution

The camera is equipped with a USB 3.0 compatible Micro B connector. Although this connector includes USB 2.0 connectors, the camera does not support use of USB 2.0.

④ DC IN / trigger IN connection cable**⑤ AC adapter (power supply) (if necessary)**

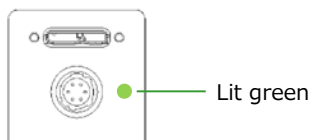
Connect the AC adapter and the round connector of the connection cable to the DC IN / trigger IN connector on the camera.

Step 3: Verifying 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



* For details on how to read the LEDs, see "LED status and camera status" in the "Parts Identification" section.

Step 4: Verifying the Connection between the Camera and PC

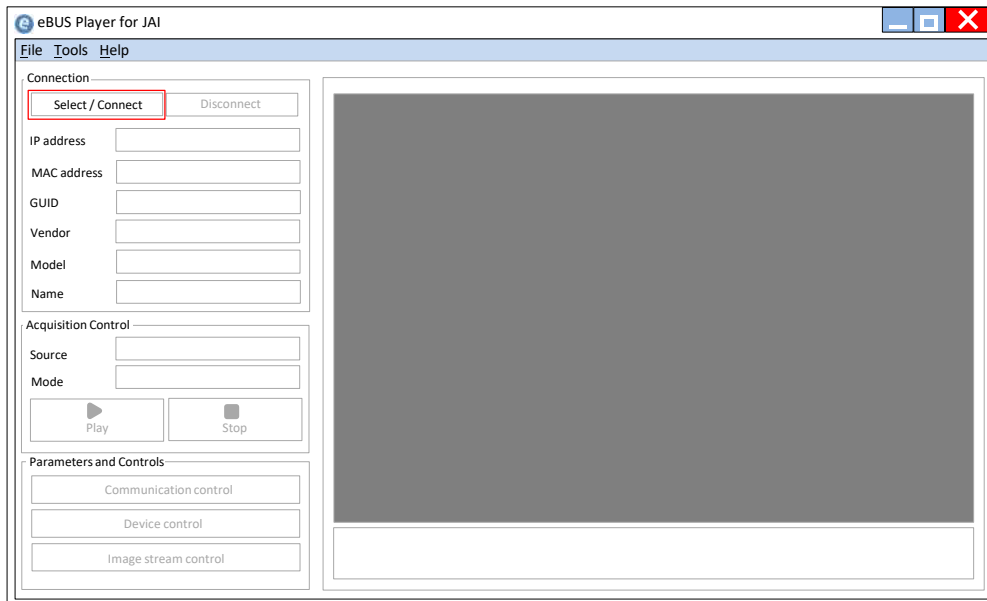
Verify whether the camera is properly recognized via Control Tool.

Connecting the Camera to Control Tool

1 Startup eBUS Player for JAI

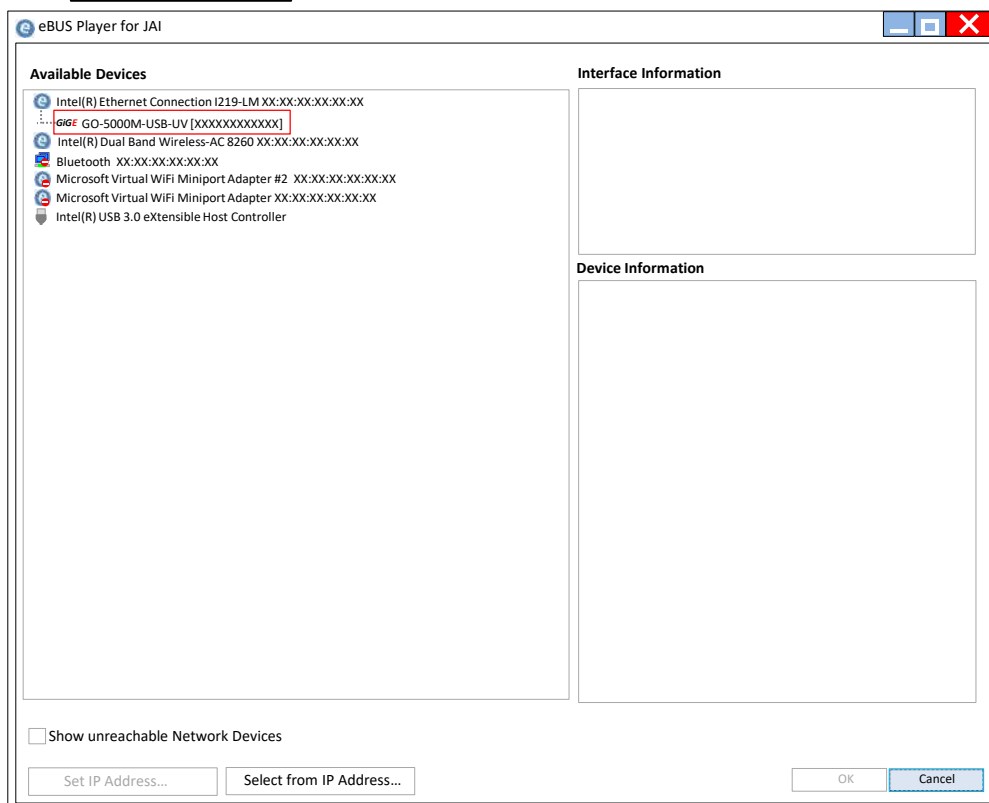


eBUS Player for JAI startup screen appears.



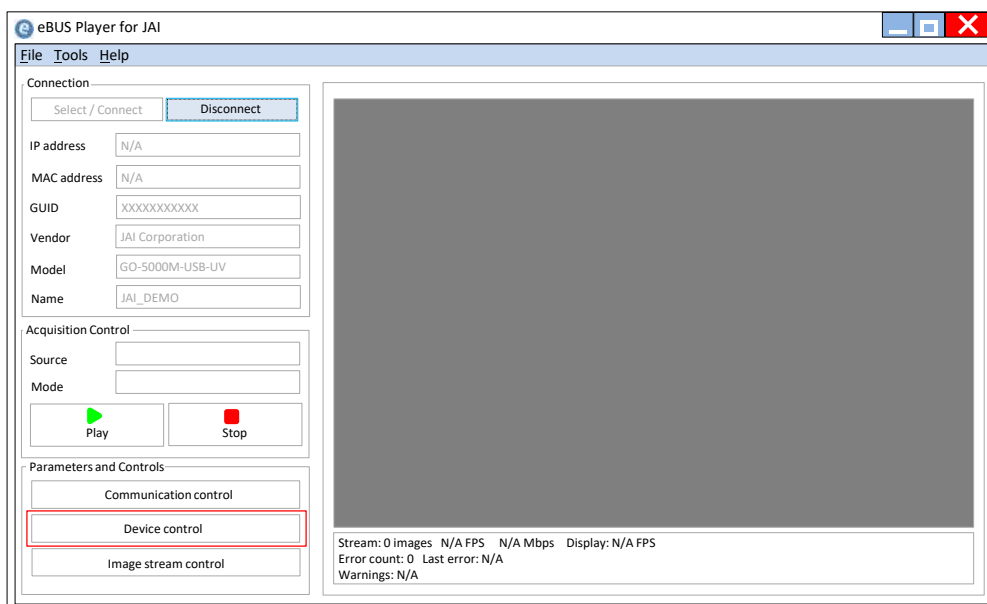
2 Select the camera you want to configure.

Push Select / Connect button

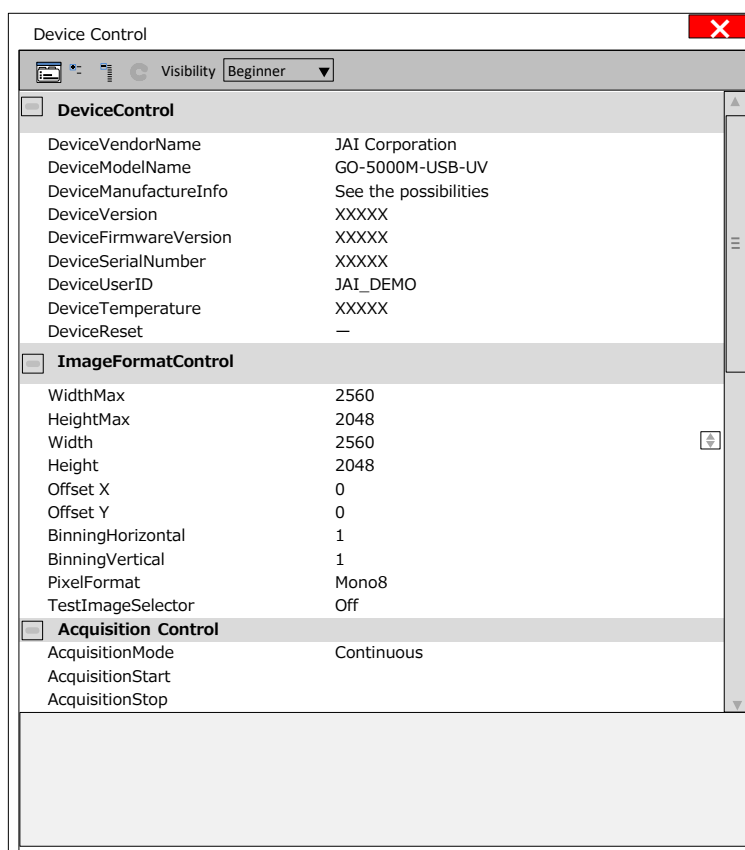


The connected camera is listed.
Please select one camera.

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



Push the Device control button.
The screen shown below will be displayed. In this window you can adjust various settings of the camera.



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

Step 5: Changing the Camera Settings

This section explains how to change settings by describing the procedure for changing the output format as an example.

Configuring the Output Format

Configure the size, position, and pixel format of the images to be acquired. The factory settings are as follows. Change the settings as necessary.

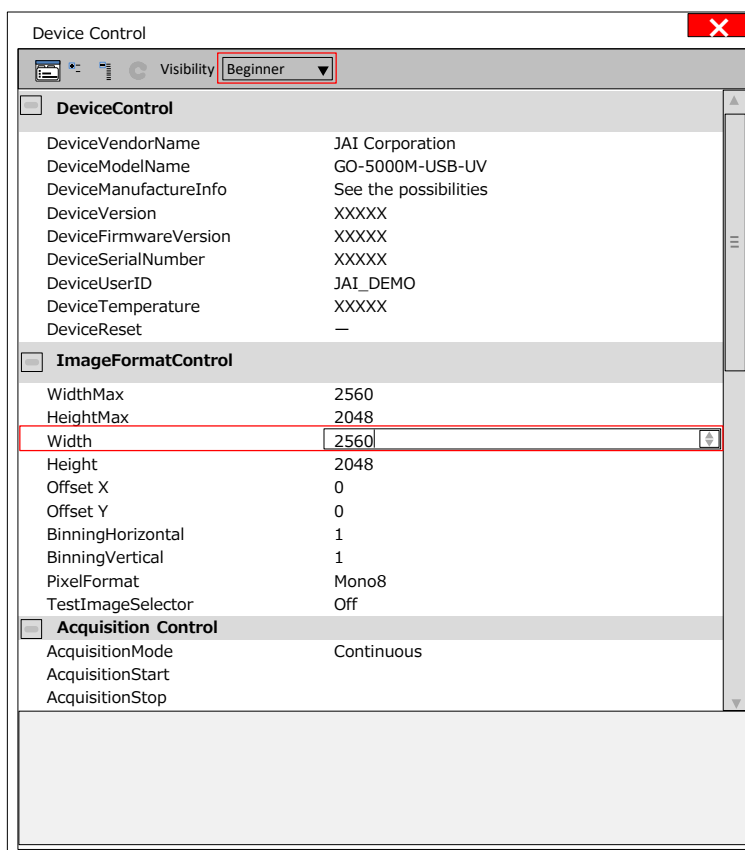
Factory default values

Item		Default value
ImageFormatControl	Width	2560
	Height	2048
	OffsetX (horizontal position)	0
	OffsetY (vertical position)	0
	PixelFormat	Mono8

* You can specify the image acquisition area. For details, see "ROI (Regional Scanning Function)".

1 Configuring the [Width] of [ImageFormatControl]

By selecting the item of [Width], you can change the value as shown below.



Note

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

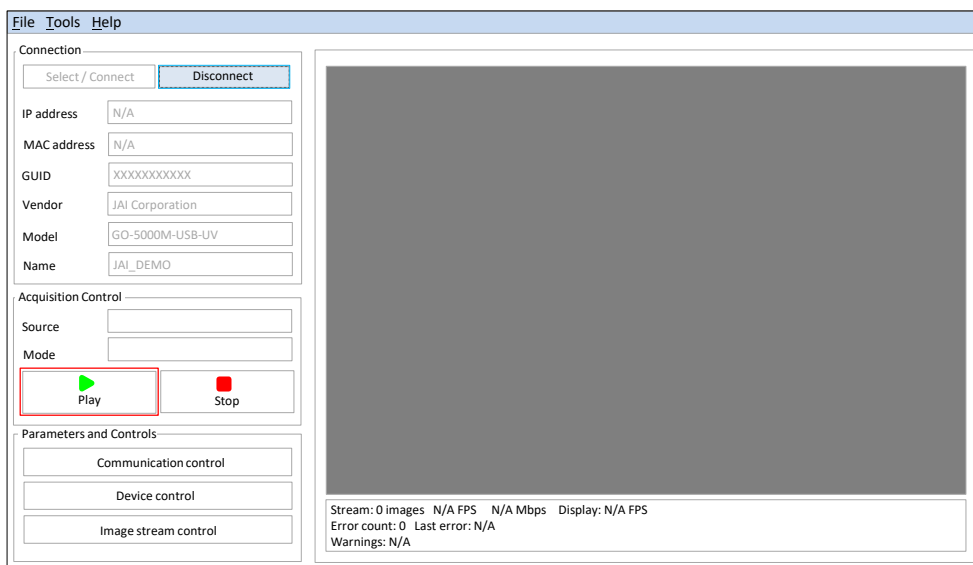
Step 6: Adjusting the Image Quality

Display the camera image and adjust the image quality.

Displaying the Image

Display the image captured by the camera.

When you push [Play] button, the camera image appears in right area.



Adjusting the Gain

The gain control uses Analog Base Gain and Digital Gain.
Analog Base Gain can be set at 0dB, +6dB or +12dB.
The digital gain is used for the master gain setting.

For setting the gain,

1. Set analog gain (Select from 0dB, +6dB and +12dB)
2. Set digital gain

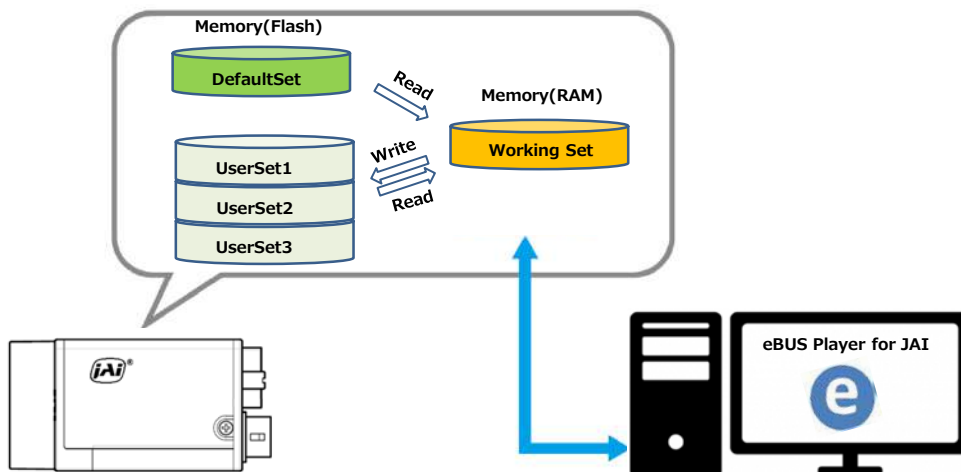
The master gain (DigitalAll) can be set x1 (0dB) to x16 (+24dB) against the analog base gain. The resolution for gain setting is x0.01/step which is 0.05dB to 0.08dB, depending on the setting value.

Adjusting the Black Level

The black level can be set in the following range.
GO-5000M-USB-UV: DigitalAll : -256~ +255

Step 7: Saving the Settings

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



Note

Changes to settings are not saved to the computer (eBUS SDK for JAI).

■ 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 [Execute 'UserSetSave' Command].

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 [Execute 'UserSetLoad' Command].

The selected user settings are loaded.

Main Functions

Digital IN/OUT interface

In the GO-5000M-USB-UV, the digital IN/OUT capability in the software control tool can assign the necessary signals needed for the system.

Line Selector

In the Line Selector, the following input and output signals can be assigned.

Line Selector item	Description
Line 1 Opt 1 Out	Opt 1 output from # 3 of DC In/Trigger 6-Pin on the rear
Line 2 Opt 2 Out	Opt 2 output from #4 of DC In/Trigger 6-Pin on the rear
NAND 0 In 1	No. 1 input to NAND 0 gate in GPIO
NAND 0 In 2	No. 2 input to NAND 0 gate in GPIO
NAND 1 In 1	No. 1 input to NAND 1 gate in GPIO
NAND 1 in 2	No. 2 input to NAND 1 gate in GPIO

Note1: Select and connect the line source signal against the item selected in the line selector.

Line Source

Line source signal can be selected from the following table to connect it to the line item which is selected in the line selector.

Line Source item	Description
Low	Connect Low Level signal to line item selected in Line Selector, Default setting
High	Connect High Level signal to line item selected in Line Selector
Acquisition Trigger Wait	Connect Acquisition Trigger Wait signal to line item selected in Line Selector
Frame Trigger Wait	Connect Frame Trigger Wait signal to line item selected in Line Selector
Frame Active	Connect Frame Active signal to line item selected in Line Selector
Exposure Active	Connect Exposure Active signal to line item selected in Line Selector
FVAL	Connect FVAL signal to line item selected in Line Selector
PulseGenerator0 Out	Connect Pulse Generator 0 signal to line item selected in Line Selector
User Out 0	Connect User Out 0 signal to line item selected in Line Selector
User Out 1	Connect User Out 1 signal to line item selected in Line Selector
Line 5 Opt In	Connect Opt In signal to line 6 in Line Selector
NAND 0 Out	Connect NAND 0 signal to line item selected in Line Selector
NAND 1 Out	Connect NAND 1 signal to line item selected in Line Selector

Line Mode

Indicates the status of the interface. (Input, Output or Internal)

Line Inverter

Sets the polarity of the selected input or output. (False or True)

Line Status

Indicates the status of the selected signal, input or output (True=High or False=Low)

Line Format

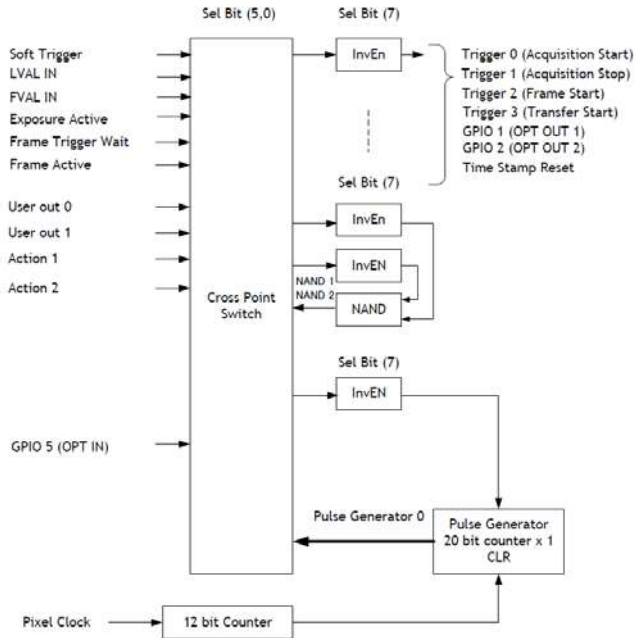
Indicates the format of the line item selected in Line Selector.
(No Connect, TTL, LVDS, Opt Coupled or Internal Signal)

Note: In the GO-5000M-USB-UV, TTL and LVDS interface are not equipped.

GPIO

This is a general interface for input and output and controls input and output for trigger signals or valid signals and pulse generator. By using this interface, you can control an external light source, make a delayed function to input a trigger signal or make a precise exposure control with PWC trigger.

Basic block diagram

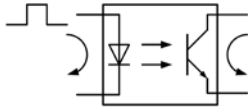


GPIO IN/OUT Matrix

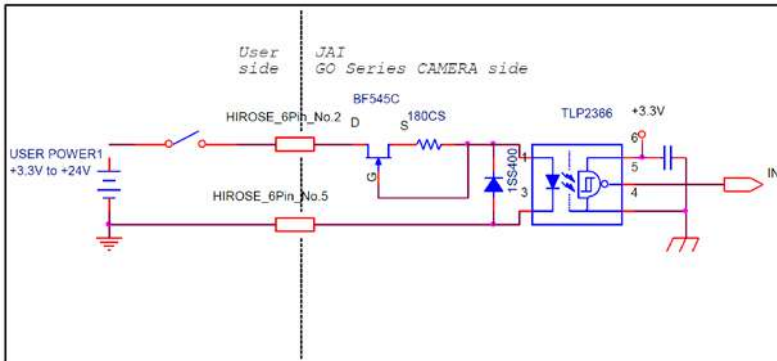
Selector (Cross point switch output)	Trigger Selector				Line Selector				Pulse Generator Selector		
	Acquisition Start	Acquisition Stop	Frame Start	Transfer Start	GPIO 1 - 12P Opt Out 1	GPIO 2 - 12P Opt Out 2	NAND 1 In 1	NAND 1 In 2	NAND 2 In 1	NAND 2 In 2	Pulse Generator 0
Source signal (Cross point switch input)											
LOW	o	o	o	o	o	o	o	o	o	o	o
HIGH	o	o	o	o	o	o	o	o	o	o	o
GPIO 5 - 6P OPT 1 In	o	o	o	o	o	o	o	o	o	o	o
NAND 1 Out 1	o	o	o	o	o	o	x	x	o	o	o
NAND 2 Out 1	o	o	o	o	o	o	o	o	x	x	o
Pulse Generator 0	o	o	o	o	o	o	o	o	o	o	x
User Output 0	o	o	o	o	o	o	o	o	o	o	o
User Output 1	o	o	o	o	o	o	o	o	o	o	o
Software Trigger	o	o	o	o	x	x	x	x	x	x	o
Action 1	o	o	o	o	x	x	x	x	x	x	o
Action 2	o	o	o	o	x	x	x	x	x	x	o
FVAL	x	x	x	x	o	o	o	o	o	o	o
LVAL	x	x	x	x	x	x	x	x	x	x	o
Exposure Active	x	x	x	x	o	o	o	o	o	o	o
Frame Trigger Wait	x	x	x	x	o	o	o	o	o	o	o
Frame Active	x	x	x	x	o	o	o	o	o	o	o
	Trigger Source				Line Source				Pulse Generator Clear Source		

Optical Interface

The GO-5000M-USB-UV is equipped with opto-isolated inputs and outputs, providing galvanic separation between the camera's inputs/outputs and peripheral equipment. In addition to galvanic separation, the opto-isolated inputs and outputs can cope with a wide range of voltages; the voltage range for inputs is +3.3V to +24V DC whereas outputs will handle +5V to +24V DC. The following drawing is the concept of photo coupler

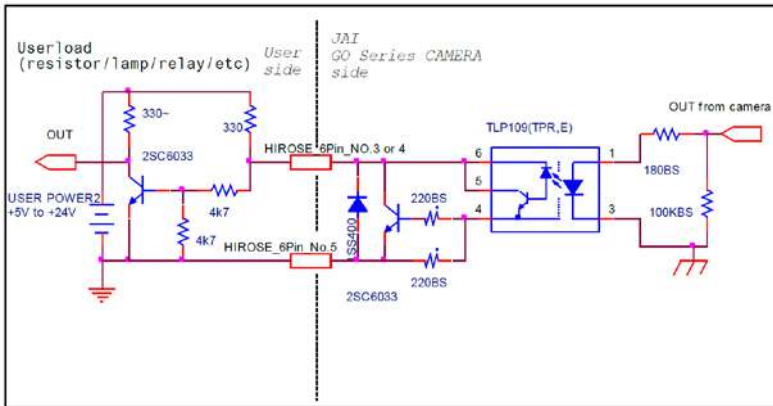


Recommended External Input circuit diagram for customer

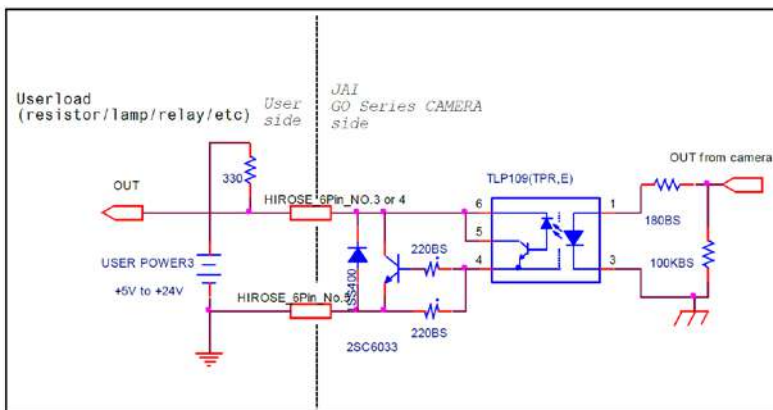


Recommended External Output circuit diagram for customer

Standard circuit



Simple circuit



Characteristics of optical interface

The relationship of the input signal to the output signal through the optical interface is as follows.

Input Line Voltage Range : +3.3v~+24V

Input Current : 6mA~30mA

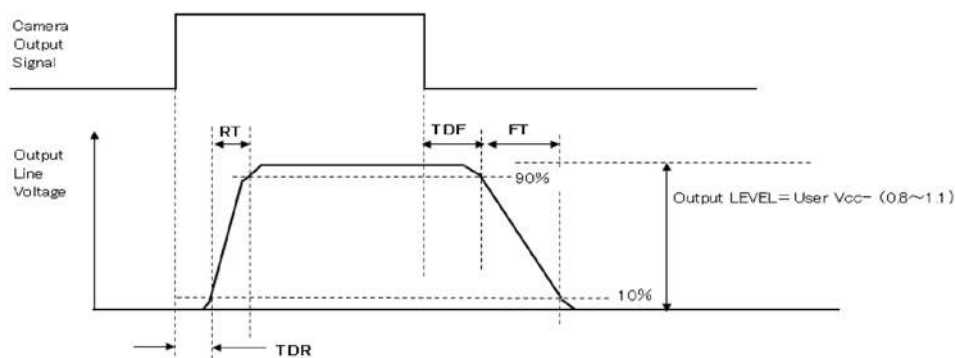
Output Load(Maximum Current) : 100mA

Minimum Input Pulse Width to Turn ON : 0.5us

Minimum Output Pulse Width : 20us

R1, R4 = 330ΩPULL_UP	User Power (Vcc)			
	3.3v	5.0v	12v	24v
Time Delay Rise TDR(us)	0.78	0.82	1.8	2.65
Rise Time RT(us)	4.1	4.7	6.1	9.1
Time Delay Fall TDF(us)	0.26	0.48	0.56	0.78
Fall Time FT(us)	1.3	1.6	3.1	4.8

OUTPUT LINE RESPONSE TIME



Opt In Filter Selector function

As for the surge protection of the optical input, the filter can be selected from 5 steps which are 10 μ s (Typical), 100 μ s, 500 μ s, 1 ms and 10 ms. If the filter is set, a pulse with a shorter width than the filter setting value cannot be accepted.

Pulse Generator

The GO-5000M-USB-UV has a frequency divider using the pixel clock as the basic clock and a pulse generator. In the Pulse Generator, various Clear settings are connected to GPIO. The following shows the Pulse Generator default settings.

Pulse Generator default settings

Display Name	Value							
Clock Pre-scaler	1							
Pulse Generator Selector	Pulse Generator							
	Length	Start Point	End Point	Repeat Count	Clear Source	Clear Inverter	Clear Activation	Clear Sync Mode
- Pulse Generator 0	1	0	1	0	Off	True	Off	Async Mode

Note: When Pulse Generator Repeat Count is set to "0", the camera is operating in free-running mode. However, based on the above default setting, Length=1, Start Point=0 and End Point=1, Pulse Generator stops at High output. Therefore, if Start Point=0 and End Point=1 are configured, Length should be "2" as the minimum active width.

Clock Pre-scaler

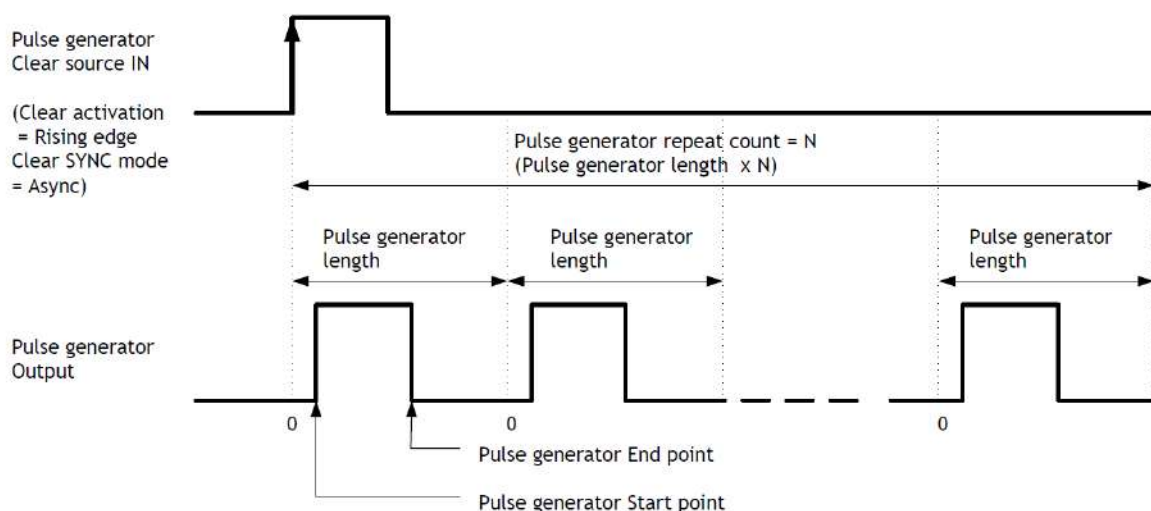
Clock pre-scaler (Divide Value) can set the dividing value of the frequency divider (12-bit length) and the pixel clock is used for this. In the GO-5000M-USB-UV, the pixel clock is set at 48 MHz.

Pulse Generator Selector

This is where you select a pulse generator. In the GO-5000M-USB-UV, it is fixed to Pulse Generator 0.

Pulse Generator setting / Pulse Generator pulse construction

Trigger Selector item	Description
Pulse Generator 0	If Pulse Generator 0 is selected, Length Start Point, End Point, Repeat Count, Clear Source, Clear Inverter, Clear Activation and Clear Sync Mode of pulse generator 0 are displayed under the selector.



Pulse Generator Length

Set the counter up value (number of clocks, refer to Table 11) for the pulse generator. If Repeat Count value is "0", and if Pulse Generator Clear signal is not input, the pulse generator generates the pulse repeatedly until reaching this counter up value.

Pulse Generator Start Point

Set the active output start count value for the pulse generator. However, please note that a maximum 1 clock jitter for the clock which is divided in the clock pre-scaler can occur.

Pulse Generator End Point

Set the active output ending count value for the pulse generator.

Pulse Generator Repeat Count

Set the repeating number of the pulse for the pulse generator. After Trigger Clear signal is input, the pulse generator starts the count set in Repeat Count. Accordingly, an active pulse which has a start point and end point can be output repeatedly. However, if Repeat Count is set to "0", it works as a free-running counter.

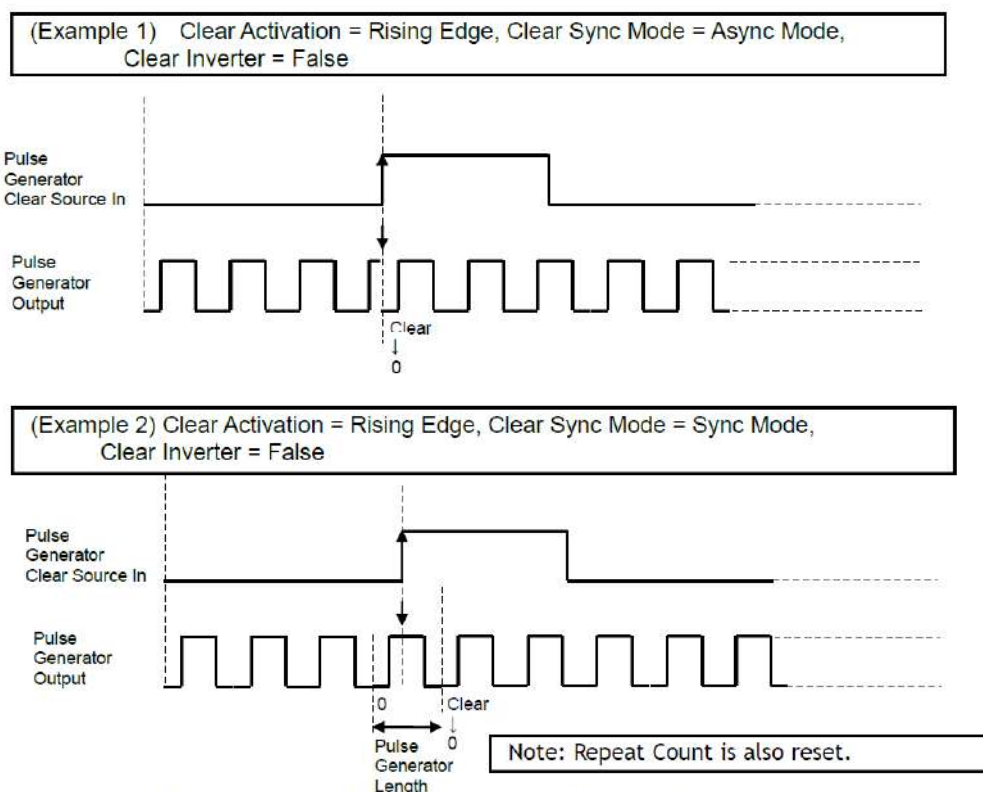
Pulse Generator Clear Activation

Set the clear conditions of clear count pulse for the pulse generator.

Pulse Generator Clear Sync Mode

Set the count clear method for the pulse generator. In the case of Async Mode, if the clear signal is input during the length setting value, the counter will stop counting according to the clear signal input. In the case of Sync Mode, if the clear signal is input during the length setting value, the counter will continue to count until the end of the length setting value and then clear the count. Both modes clear the repeat count when the counter is cleared.

Counter clear in Async mode



Pulse Generator Clear Source

The following clear source can be selected as the pulse generator clear signal.

Pulse Generator Clear Source item	Description
Low	Connect Low level signal to Clear Source for the selected pulse generator. Default setting
High	Connect High level signal to Clear Source for the selected pulse generator.
Frame Trigger Wait	Connect Frame Trigger Wait signal to Clear Source for the selected pulse generator.
Frame Active	Connect Frame Active signal to Clear Source for the selected pulse generator.
Exposure Active	Connect Exposure Active signal to Clear Source for the selected pulse generator.
FVAL	Connect FVAL signal to Clear Source for the selected pulse generator.
LVAL	Connect LVAL signal to Clear Source for the selected pulse generator.
Action 0 Out	Connect Action 0 output to Clear Source for the selected pulse generator.
Action 1 Out	Connect Action 1 output to Clear Source for the selected pulse generator.
User 0 Out	Connect User 0 output to Clear Source for the selected pulse generator.
User 1 Out	Connect User 1 output to Clear Source for the selected pulse generator.
Line 5 Opt 1 In	Connect Opt 1 In signal to Clear Source for the selected pulse generator.
Nand 0 Out	Connect NAND 0 output signal to Clear Source for the selected pulse generator.
Nand 1 Out	Connect NAND 1 output signal to Clear Source for the selected pulse generator.

Pulse Generator Inverter

Clear Source Signal can have polarity inverted.

Pulse Generator Setting Parameters

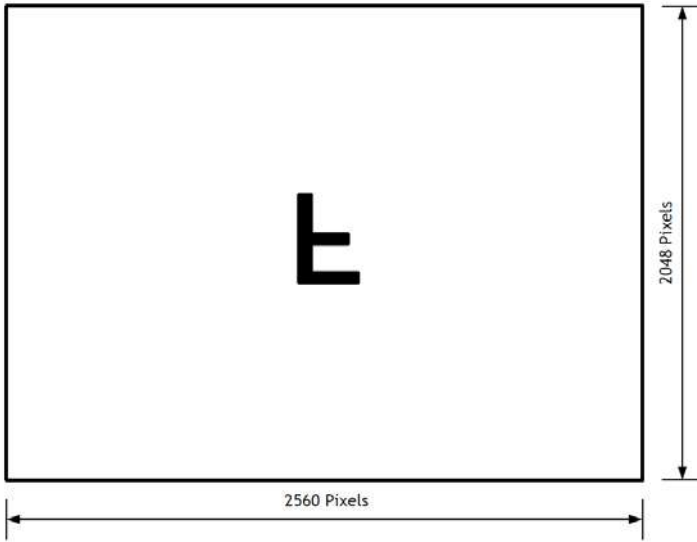
Display Name	Vale
Clock Pre-scaler	1 to 4096
Pulse Generator Clock (MHz)	[Pixel Clock:48MHz]/[Clock Per-scaler]
Pulse Generator Selector	- Pulse Generator 0
- Pulse Generator Length	1 to 1048575
- Pulse Generator Length (ms)	$([\text{Clock Source}]/[\text{Clock Per-scaler}])^{-1} \times [\text{Pulse Generator Length}]$
- Pulse Generator Frequency (Hz)	$[\text{Pulse Generator Length (ms)}]^{-1}$
- Pulse Generator Start Point	0 to 1048574
- Pulse Generator Start Point (ms)	$([\text{Clock Source}]/[\text{Clock Per-scaler}])^{-1} \times [\text{Pulse Generator Start Point}]$
- Pulse Generator End Point	1 to 1048575
- Pulse Generator End Point (ms)	$([\text{Clock Source}]/[\text{Clock Per-scaler}])^{-1} \times [\text{Pulse Generator End Point}]$
- Pulse Generator pulse-width (ms)	$[\text{Pulse Generator End Point (ms)}] - [\text{Pulse Generator Start Point (ms)}]$
- Pulse Generator Repeat Count	0 to 255
- Pulse Generator Clear Activation Clear Mode for the Pulse Generators	- Off - High Level - Low level - Rising Edge - Falling Edge
- Pulse Generator Clear Sync Mode	- Async mode - Sync mode
- Pulse Generator Clear Source	- Low - High - Frame Trigger Wait - Frame Active - Exposure Active - FVAL - LVAL - PulseGenerator0 - Opt 1 In - User Output 0 - User Output 1 - Action 1 - Action 2 - Nand0 Out - Nand1 Out
- Pulse Generator Inverter(Polarity) Pulse Generator Clear Inverter	- False - True

Note:

1. If Pulse Generator Repeat Count is set to "0", the pulse generator works in Free Running mode.

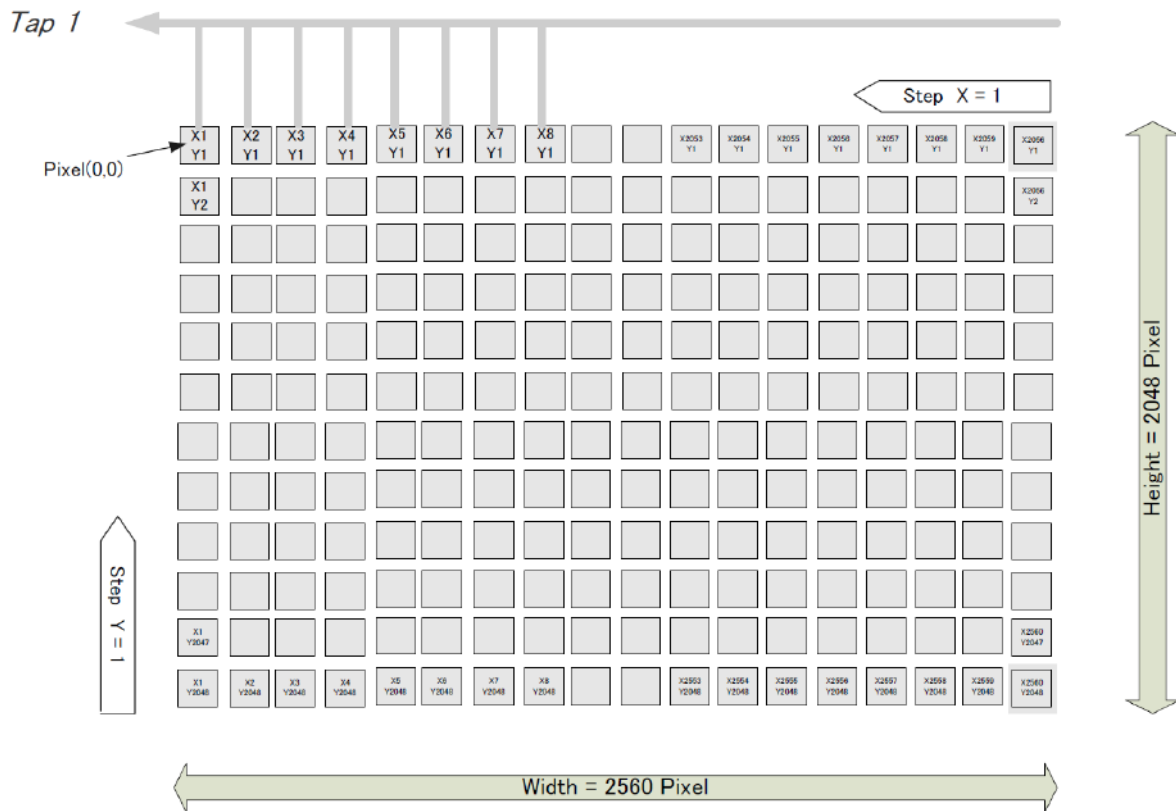
Sensor layout

The CMOS sensors used in the GO-5000M-USB-UV have the following tap and pixel layout.



Camera output format

Camera output format: 1X – 1Y
 Sensor readout system: 1-tap readout
 Note: The description of camera output format is based on GenICam SFNC Ver.1.5.1.



Pixel Format

Model	Supported Pixel Formats
GO-5000M-USB-UV	Mono8, Mono10, Mono12, Mono10_Packed, Mono12_Packed

Pixel Type

GVSP_PIX_MONO8 8-bit output

Y0								Y1								Y2							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

GVSP_PIX_MONO10_Packed 10-bit output

Y0										Y0	Y1										Y1	Y2										Y2	Y3										Y3						
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9

GVSP_PIX_MONO10 16-bit output

Y0										Y0						Y1						Y1									
0	1	2	3	4	5	6	7	8	9	X	X	X	X	X	X	0	1	2	3	4	5	6	7	8	9	X	X	X	X	X	X

GVSP_PIX_MONO12Packed 12-bit output

Y0												Y0			Y1			Y1					
0	1	2	3	4	5	6	7	8	9	10	11	0	1	2	3	4	5	6	7	8	9	10	11

GVSP_PIX_MONO12 16-bit output

Y0										Y0						Y1						Y1															
0	1	2	3	4	5	6	7	8	9	10	11	X	X	X	X	X	X	X	X	0	1	2	3	4	5	6	7	8	9	10	11	X	X	X	X	X	X

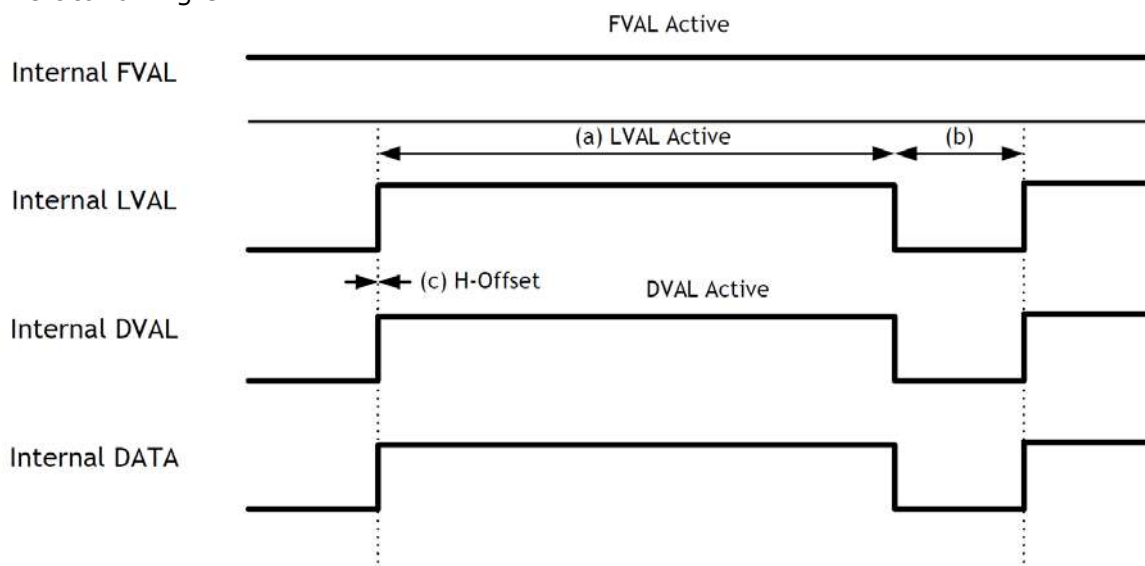
Pixel Size

Bit per Pixel	Pixel Format
	GO-5000M-USB-UV
Bpp8	Mono8
Bpp10	Mono10_Packed
Bpp12	Mono12_Packed
Bpp16	Mono10, Mono12

Output timing(Horizontal)

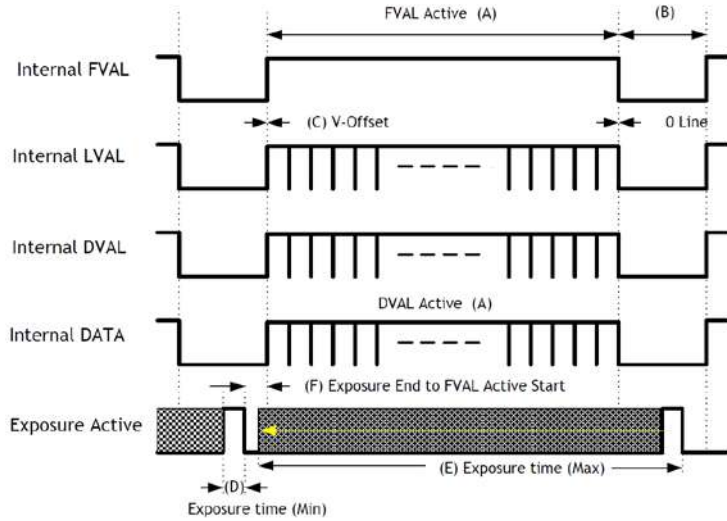
The horizontal timing of the GO-5000M-USB-UV is described below. Although the GO-5000M-USB-UV has a horizontal binning function, its horizontal frequency does not change if it is ON. So, the frame rate is not increased.

*) Vertical binnig OFF



H Binning (Note 1)	Pixel Type	Horizontal Frequency[kHz	C		A		B	Freme Rate (fps)
			H-Offset		LVAL Active		LVAL Non-active	
			Interval (us)	clk	Interval (us)	clk	clk	
H1	8Bit	145.455	6.875	330	6.84	328	2	61.895
	10Bit Packed	145.455	6.875	330	6.84	328	2	49.508
	12Bit Packed	145.455	6.875	330	6.84	328	2	41.358
	10Bit	145.455	6.875	330	6.84	328	2	30.902
	12Bit	145.455	6.875	330	6.84	328	2	30.895
H2	8Bit	145.455	6.875	330	3.50	168	162	61.895
	10Bit Packed	145.455	6.875	330	3.50	168	162	49.508
	12Bit Packed	145.455	6.875	330	3.50	168	162	41.357
	10Bit	145.455	6.875	330	3.50	168	162	30.902
	12Bit	145.455	6.875	330	3.50	168	162	30.895
H4	8Bit	145.455	6.875	330	1.84	88	242	61.895
	10Bit Packed	145.455	6.875	330	1.84	88	242	49.508
	12Bit Packed	145.455	6.875	330	1.84	88	242	41.346
	10Bit	145.455	6.875	330	1.84	88	242	30.902
	12Bit	145.455	6.875	330	1.84	88	242	30.902

Output timing(Vertical)



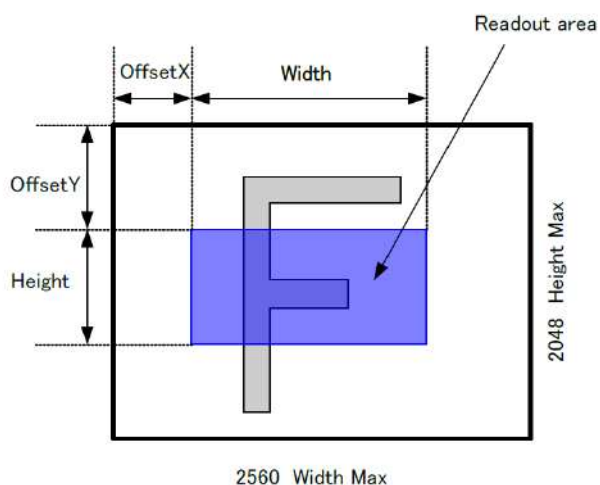
			A	B	C	
	Frame Rate	1Line Total clock	FVAL & DVAL Active	FVAL Non-active	V-Offset	
V-Binning (Note 1)	Pixel Type	Interval (fps)	L	L	L	
V1, H1	8Bit	61.895	2350	2048	302	0
	10Bit Packed	49.508	2938	2048	890	0
	12Bit Packed	41.358	3517	2048	1469	0
	10Bit	30.902	4707	2048	2659	0
V1, H2	12Bit	30.902	4707	2048	2659	0
	8Bit	61.895	2350	2048	302	0
	10Bit Packed	49.508	2938	2048	890	0
	12Bit Packed	41.358	3517	2048	1469	0
V1, H4	10Bit	30.902	4707	2048	2659	0
	12Bit	30.895	4708	2048	2660	0
	8Bit	123.58	1177	1024	153	0
	10Bit Packed	99.219	1466	1024	442	0
V2, H1	12Bit Packed	82.598	1761	1024	737	0
	10Bit	61.804	2354	1024	1330	0
	12Bit	61.804	2354	1024	1330	0
	8Bit	123.58	1177	1024	153	0
V2, H2	10Bit Packed	99.219	1466	1024	442	0
	12Bit Packed	82.598	1761	1024	737	0
	10Bit	61.804	2354	1024	1330	0
	12Bit	61.804	2354	1024	1330	0
V2, H4	8Bit	123.58	1177	1024	153	0
	10Bit Packed	99.219	1466	1024	442	0
	12Bit Packed	82.598	1761	1024	737	0
	10Bit	61.791	2354	1024	1330	0
V4, H1	12Bit	61.791	2354	1024	1330	0
	8Bit	245.7	592	512	80	0
	10Bit Packed	198.71	732	512	220	0
	12Bit Packed	165.235	880	512	368	0
V4, H2	10Bit	123.37	1179	512	667	0
	12Bit	123.37	1179	512	667	0
	8Bit	245.7	592	512	80	0
	10Bit Packed	198.71	732	512	220	0
V4, H4	12Bit Packed	165.235	880	512	368	0
	10Bit	123.37	1179	512	667	0
	12Bit	123.37	1179	512	667	0
	8Bit	245.76	592	512	80	0
V4, H4	10Bit Packed	198.71	732	512	220	0
	12Bit Packed	165.29	880	512	368	0
	10Bit	123.48	1178	512	666	0
	12Bit	123.48	1178	512	666	0

ROI (Region Of Interest) setting

In the GO-5000M-USB-UV, a subset of the image can be output by setting Width, Height, Offset-X, and Offset-Y. If the height is decreased, the number of lines read out is decreased and as the result, the frame rate is increased. In the GO-5000M-USB-UV, the minimum width is "16" and minimum height for GO-5000M-USB-UV is "1".

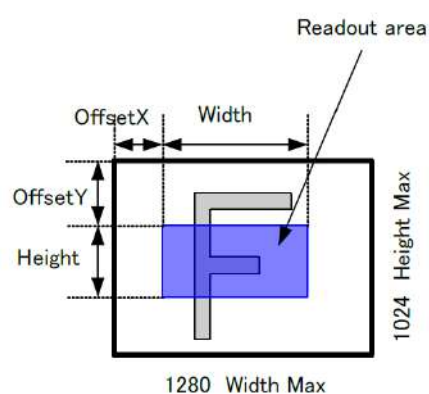
Setting example (1)

Binning Horizontal = 1
Binning Vertical = 1



Setting example (2)

Binning Horizontal = 2
Binning Vertical = 2



Digital output Bit allocation

Below figures are the average value of 100 x 100 pixels in the center.

	Video	Black	Offset
8bit	247LSB		8LSB
10bit	989.5LSB		33.5LSB
12bit	3962LSB		133LSB

Acquisition control

Acquisition control contains the following commands.

Command	Parameter	Description
Acquisition Mode	Single Frame	One frame can be output by AcquisitionStart command
	Multi Frame	The number of frames which is specified in Acquisition Frame Count, are output by AcquisitionStart command
	Continuous	Images are continuously output by AcquisitionStart command until AcquisitionStop command is input.
Acquisition Start	No(EXE command)	Start Acquisition
Acquisition Stop	No(EXE command)	Stop Acquisition
Acquisition Frame Count	1~255	Set the number of frames to be used in Multi Frame mode.
Acquisition Frame Rate	0.125 to Maximum FrameRate	Set the frame rate in fps value
Acquisition Frame Rate Raw	8sec to Minimum FramePeriod	Set the frame rate in Frame period (μ s)

Acquisition Mode

In the GO-5000M-USB-UV, the following three acquisition modes are available.

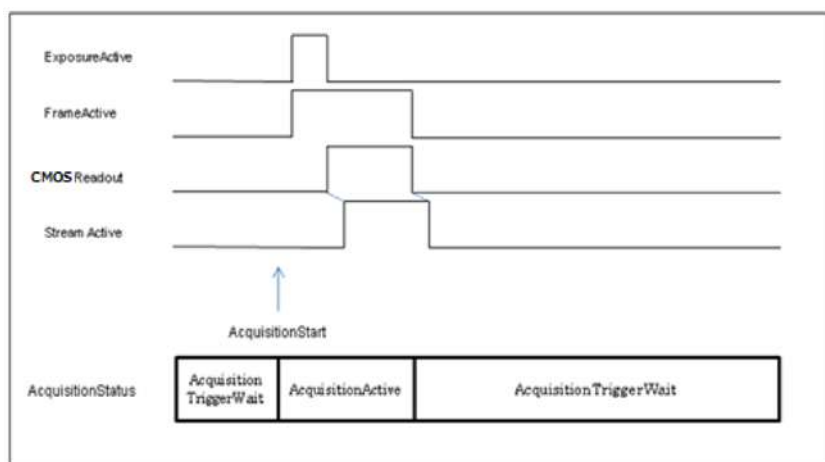
Single Frame

In single frame mode, executing the AcquisitionStart command causes one frame to be captured. After one frame is captured, this operation is automatically stopped.

In order to restart the capture, it is necessary to input the AcquisitionStart command again. BlockID is not reset until AcquisitionStop is input and is incremented when the AcquisitionStart command is called.

◆ Normal single frame operation

- 1) AcquisitionStart command is input
- 2) AcquisitionActive becomes "TRUE" (accepts capture)
- 3) 1 frame is output
- 4) AcquisitionActive becomes "FALSE" (stop capturing)
- 5) Output is stopped



Note: This figure is if the trigger mode is OFF. When the trigger mode is ON, FrameActive becomes True at different AcquisitionActive timing.

Single Frame operation.

◆ Forcing acquisition to stop

While AcquisitionActive is "TRUE", if AcquisitionStop or AcquisitionAbort is initiated, AcquisitionActive becomes "FALSE" (stop capturing).

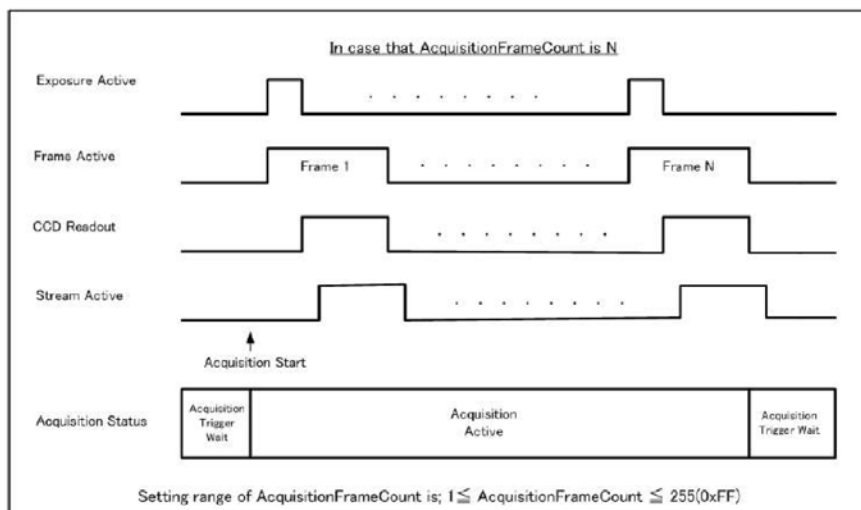
However, if AcquisitionStop command is initiated during image output period, AcquisitionActive becomes "FALSE" (stop capturing) after image output is completed.

Multi Frame

In this mode, the AcquisitionStart command captures the number of frames which are specified by AcquisitionFrameCount.

◆ Normal multi-frame operation

- 1) AcquisitionStart command is input
- 2) AcquisitionTriggerWait becomes effective
- 3) AcquisitionActive becomes "TRUE"(accepts capture)
- 4) Output N frames as specified by AcquisitionFrameCount
- 5) AcquisitionActive becomes "FALSE". Then the output stops. (See the following diagram)



Note: This figure is if the trigger is set to ON. When the trigger is OFF, FrameActive becomes True at the same timing of AcquisitionActive.

Multi Frame operation

◆ Forcing acquisition to stop

While AcquisitionActive is "TRUE", if AcquisitionStop or AcquisitionAbort is initiated, AcquisitionActive becomes "FALSE" (stop capturing). Once the operation is set to "FALSE", the internal FrameCount is reset. However, if AcquisitionStop command is initiated during image output period, AcquisitionActive becomes "FALSE" (stop capturing) after image output is completed.

Once AcquisitionActive becomes "FALSE", the internal count is reset.

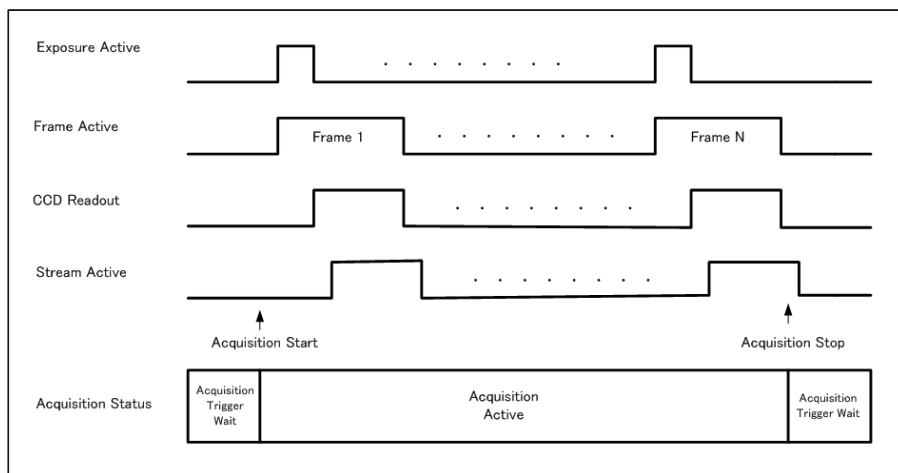
□ Acquisition Frame Count : Can be set in the range of 1 to 255

Continuous

In this mode, when the AcquisitionStart command is set, the image is continuously output at the current frame rate. This is the default setting for the GO-5000M-USB-UV.

◆ Normal continuous operation

- 1) AcquisitionStart command is input
- 2) AcquisitionTriggerWait becomes effective
- 3) AcquisitionActive becomes "TRUE"
- 4) Images begin outputting continuously
- 5) AcquisitionStop command is sent
- 6) AcquisitionActive becomes "FALSE". At this moment, the output stops. However, if AcquisitionStop command is initiated during image output period, AcquisitionActive becomes "FALSE" (stop capturing) after image output is completed.



Note: This figure is if the trigger is set to ON, and when the trigger is OFF, FrameActive becomes True at the same timing of AcquisitionActive.

Continuous operation

◆ Forcing acquisition to stop

If AcquisitionStop is executed and the video is already output when the camera receives the stop command, AcquisitionActive becomes False (disabling the capture) after the video output is completed.

Acquisition Start

This is the command to start the capture.

Acquisition Stop

This is the command to stop the capture.

Acquisition frame rate

With Trigger OFF, the default frame rate of the camera is based on the specified ROI. The smaller the ROI, the faster the default frame rate. However, it is possible to specify a free-running frame rate (i.e., no trigger needed) that is slower than the default rate. This can be useful when a longer exposure time is needed for a specific ROI.

Modification of the frame rate is done by entering a value in the AcquisitionFrameRate control corresponding to the frame frequency. Allowed values range from 3846 Hz to 0.125 Hz for GO-5000M-USB-UV. However, if the value entered is less than the time required for the default frame rate of the specified format, the setting is ignored and the default frame rate is used. For example, the minimum frame period for the smallest possible ROI (1 line) requires 3846 Hz (fps), so any entry more than 3846 Hz (fps) will always be ignored.

The setting range in Acquisition Frame Rate is:

Shortest	to	Longest
Inverse number of time required to drive all pixels in the area set by ROI command or inverse number of time required to transmit one frame data	to	0.125 Hz (fps) = 8 seconds

For the above setting, Acquisition Frame Rate is used and its unit is Hz (fps).
Acquisition Frame Rate range: 3846 Hz (fps) to 0.125 Hz (fps)

Calculation of the maximum frame rate

$$\text{Maximum frame rate(fps)} = 1 / (\text{Roundup}^*3([\text{Line Period}] \times [\text{Height}^*2] + [\text{V Blank Value}]) / 1000000)$$

Where

$$[\text{Line Period}] = [\text{Trow}] / 24$$

$$[\text{Trow}] = \text{Rounddown}^*1(24000000 / ((A \times (2048 / [\text{Height}^*2])) \times ([\text{Height}^*2] + 32)))$$

If the result is less than 165, it is calculated as fixed value 165.

$$[\text{V Blank Value}] = \text{Roundup}^*3([\text{Line Period}] \times 32) + B$$

The following table shows figures for A and B in the different pixel format.

Pixel Format	Binning Vertical	A	B	Max. Frame Rate(fps)*4
8bit	1(off)	61.9	33	61.9
	2(on)			123.6
	4(on)			245.7
10/12bit	1(off)	30.9	31	30.9
	2(on)			61.8
	4(on)			123.4
10bit Packed	1(off)	49.5	0	49.5
	2(on)			99.2
	4(on)			198.7
12bit Packed	1(off)	41.3	0	41.3
	2(on)			82.6
	4(on)			165.2

The following table shows Height figure range in the binning mode.

	Height *2	
	Mono	Color
Binning OFF 1	1 ~ 2048	2 ~ 2048
Binning ON 2	1 ~ 1024	-
Binning ON 4	1 ~ 512	-

*1 Rounddown after the decimal point

*2 Refer to the Height value on the above table. In the binning Vertical, the maximum value is changed.

*3 Roundup after the decimal point

*4 Maximum frame rate at the full image size

If the width is changed, the frame rate is not changed.

Exposure Mode

The exposure mode can be selected from the following three ways.

Exposure Mode setting	Exposure operation
OFF	No exposure control (free-running operation)
Timed	Exposure operation at the value set in Exposure Time. Setting value is μs unit. <ul style="list-style-type: none"> If Trigger Mode setting is OFF, the camera is in free-running operation. If Trigger Mode setting is ON, the exposure operation depends on the setting of Trigger Option.
Trigger Width	The exposure is controlled by the pulse width of the external trigger. <ul style="list-style-type: none"> If Trigger Mode setting is OFF, the camera is in free-running operation. If Trigger Mode setting is ON, the exposure time is controlled by the external trigger pulse width.

For trigger operation, Exposure Mode must be set to something other than OFF and Trigger Mode of Frame Start must be ON.

If Exposure Mode is set at Timed, the exposure operation can be selected as follows by setting Trigger Option.

Trigger Option setting	Exposure operation
OFF	Timed (EPS) mode
RCT	RCT mode

The effect of the combination of Exposure Mode, Trigger Option and Trigger Mode is as follows. The combination of Exposure Mode, Trigger Option and Trigger Mode

Exposure Mode	Trigger Option	Trigger Mode (Frame Start)	Operation
OFF	N/A	N/A	Free-running operation Exposure control by Exposure Time is not possible
Timed	OFF	OFF	Free-running operation Exposure control by Exposure Time is not possible
		ON	Timed (EPS) Operation Exposure can be controlled by Exposure Time
	RCT	ON	RCT Operation Exposure can be controlled by Exposure Time
Trigger Width	N/A	ON	Exposure is controlled by the pulse width of the external trigger

Exposure Time

This command is effective only when Exposure Mode is set to Timed. It is for setting exposure time. The setting step for exposure time is 1 μsec per step.

Minimum: 10 μsec

Maximum: 8 seconds (Note – noise may make image unusable after 1 second)

Exposure Auto

This is a function to control the exposure automatically. It is effective only for Timed. JAI ALC Reference controls the brightness.

There are two modes, OFF and Continuous.

OFF: No exposure control

Continuous: Exposure continues to be adjusted automatically

In this mode, the following settings are available.

ALC Speed: Rate of adjustment can be set (Common with GainAuto)

ExposureAuto Max: The maximum value for the exposure time to be controlled can be set

ExposureAuto Min: The minimum value for the exposure time to be controlled can be set

ALC Reference: The reference level of the exposure control can be set (Common with GainAuto)

ALC Area Selector: The portion of the image used for controlling exposure can be set (Common with GainAuto)

ALC Channel Area

High Left	High Mid-left	High Mid-right	High Right
Mid-High Left	Mid-High Mid-left	Mid-High Mid-right	Mid-High Right
Mid-Low Left	Mid-Low Mid-left	Mid-Low Mid-right	Mid-Low Right
Low Left	Low Mid-left	Low Mid-right	Low Right

Trigger Control

The following 5 types of Trigger Control are available by the combination of Trigger Selector, Trigger Mode, Exposure Mode and Trigger Option.

Camera Settings				JAI Custom	Description
Trigger Selector	Trigger Mode	Exposure Mode	Trigger Option	Trigger Mode Name	
Frame Start	Off	Off	Off	Continuous Trigger	Free-running operation with the maximum exposure time per the frame rate
	Off	Timed	Off	Continuous Trigger	Free-running operation with a user-set exposure time.
	On	Timed	Off	EPS Trigger	Externally triggered operation with a user-set exposure time
	On	Timed	RCT	RCT Trigger	Externally triggered operation for RCT
	On	Trigger Width	Off	PWC Trigger	Externally triggered operation with a pulse width exposure time

Trigger Selector

Selects the trigger operation. In the GO-5000M-USB-UV, the following trigger operation can be selected as the trigger.

Trigger Selector Item	Description
Frame Start	Frame Start Trigger operation
Acquisition Start	Acquisition Start Trigger operation
Acquisition End	Acquisition End Trigger operation
Acquisition Transfer Start	Transfer Trigger operation (for delayed readout)

Each trigger has the following setting parameters and those parameters are configured on each trigger selector item.

Setting parameters: Trigger Mode, Trigger Software, Trigger Source, Trigger Activation

Trigger Mode

Select either free-running operation or external trigger operation.

OFF: Free-running operation

ON: External trigger operation

(Initiate the trigger operation selected in Trigger selector)

Trigger Source

The following signals can be used as the trigger source signal.

Trigger Source item	Description
Low	Connect LOW level signal to the selected trigger operation Default setting
High	Connect HIGH level signal to the selected trigger operation
Soft Trigger	Connect Soft Trigger signal to the selected trigger operation Trigger can be input manually by the execution of the software trigger Trigger software is available on each trigger source.
PulseGenerator0 Out	Connect Pulse Generator 0 signal to the selected trigger operation
User Output 0	Connect User Output 0 signal to the selected trigger operation
User Output 1	Connect User Output 1 signal to the selected trigger operation
Line 5 - OPT IN	Connect OPTO IN 1 signal to the selected trigger operation
NAND 0 Out	Connect NAND 0 OUT signal to the selected trigger operation
NAND 1 Out	Connect NAND 1 OUT signal to the selected trigger operation

Trigger activation

This command can select how to activate the trigger.

Rising edge: At the rising edge of the pulse, the trigger is activated.

Falling edge: At the falling edge of the pulse, the trigger is activated.

Level High: During the high level of trigger, the accumulation is activated

Level Low: During the low level of trigger, the accumulation is activated

If Exposure Mode is set to Trigger Width, Level High or Level Low must be used.

Camera Settings			Trigger Option	JAI Custom Trigger Mode Name	Trigger Activation Setting			
Trigger Selector	Trigger Mode	Exposure Mode			Rising Edge	Falling Edge	Level High	Level Low
Frame Start	On	Timed	Off	EPS Trigger	○	○	×	×
	On	Timed	RCT	RCT Trigger	○	○	×	×
	On	Trigger Width	Off	PWC Trigger	×	×	○	○

Note: When Trigger Width mode is used, the level High or level Low must be used.

Trigger Overlap

In the GO-5000M-USB-UV, the trigger overlap function is fixed to Read Out.

Read Out : The trigger pulse can be accepted during the sensor readout.

Normal continuous operation

This is used for applications which do not require triggering.

Primary settings to use this mode

Minimum frame interval

Readout mode	Minimum frame interval
Full	16.155 ms
ROI 1/2 (Height=1024)	8.092 ms
ROI 1/4 (Height=512)	4.07 ms
1/2V Binning	8.092 ms

Timed mode

This mode allows a single image frame to be captured with a preset exposure time by using the external trigger. Additional settings determine if the trigger pulse can be accepted during the exposure period.

Primary settings to use this mode

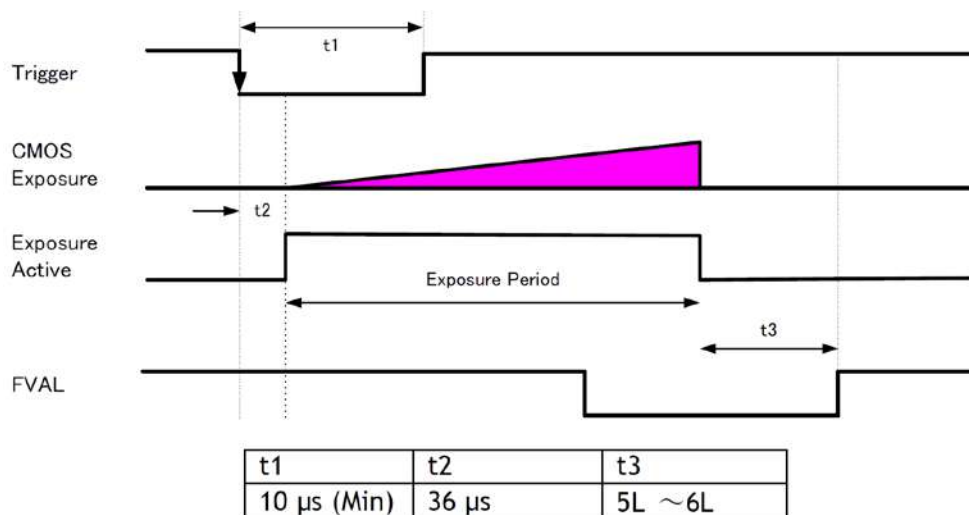
Exposure Mode: Timed

Trigger Mode: ON

Trigger Option: OFF

Optical Filter Selector: 10 μ s

Readout mode	Minimum trigger interval
Full	16.155 ms
ROI 1/2 (Height=1024)	8.09 ms
ROI 1/4 (Height=512)	4.077 ms
1/2V Binning	8.09 ms



Note 1: The trigger is input through 6P optical input. Accordingly, the timing will be changed if the optical filter is set to the other figures.

Note 2: Other timings are internal operating timing of the camera.

Trigger width mode

In this mode, the exposure time is equal to the trigger pulse width. Accordingly, longer exposure times are supported. Additional settings determine if the trigger pulse can be accepted during the exposure period.

Note: As the exposure time is shortened against an input trigger width, the input trigger width should be "the necessary exposure time plus 5 μ s".

Primary settings to use this mode

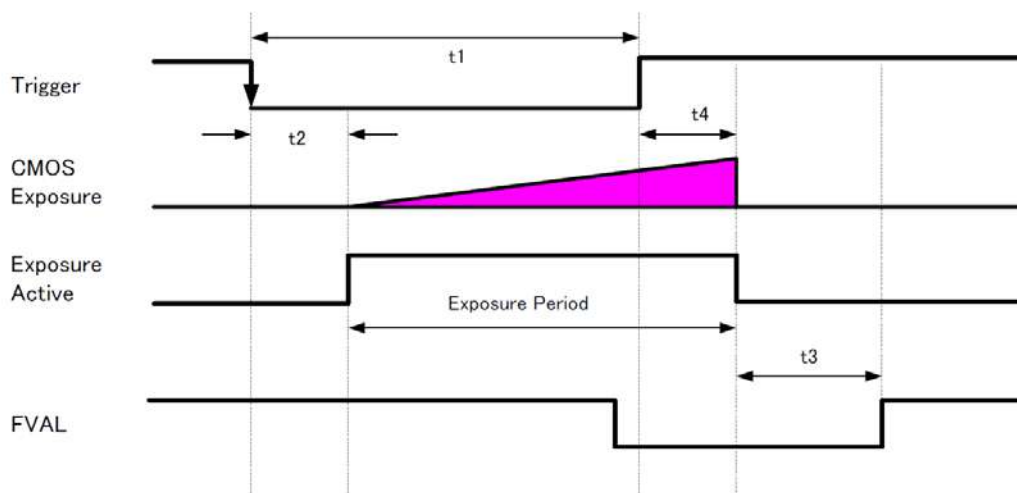
Exposure Mode: Trigger Width

Trigger Mode: ON

Trigger Option: OFF

Optical Filter Selector: 10 μ s

Readout mode	Minimum trigger interval
Full	16.155 ms
ROI 1/2 (Height=1024)	8.092 ms
ROI 1/4 (Height=512)	4.07 ms
1/2V Binning	8.092 ms



t1	t2	t3	t4
10 μ s (Min)	36 μ s	5L ~6L	32 μ s

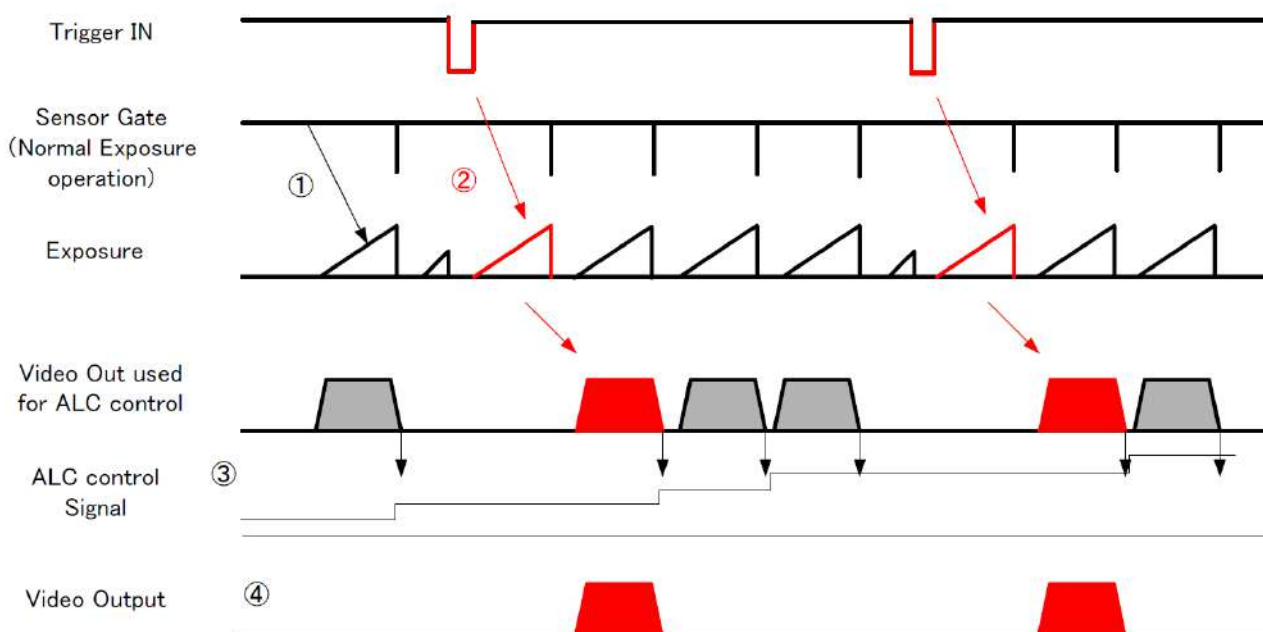
Note 1: The trigger is input through 6P optical input. Accordingly, the timing will be changed if the optical filter is set to the other figures.

Note 2: Other timings are internal operating timing of the camera.

RCT (Reset Continuous Trigger) mode

RCT mode can use ALC control to ensure that the proper exposure is set when the trigger pulse is input. In the following drawing, the steps to achieve this combination are explained.

- ① The exposure control is the same as in continuous mode.
- ② When the trigger signal is input, the charge that has already been accumulated during the current exposure period is read out very quickly and a new exposure period starts. The exposure continues as in continuous mode.
- ③ All video level data from every exposure is transferred to ALC control.
- ④ The video output sent to the GigE interface is only the signal after the trigger is input.



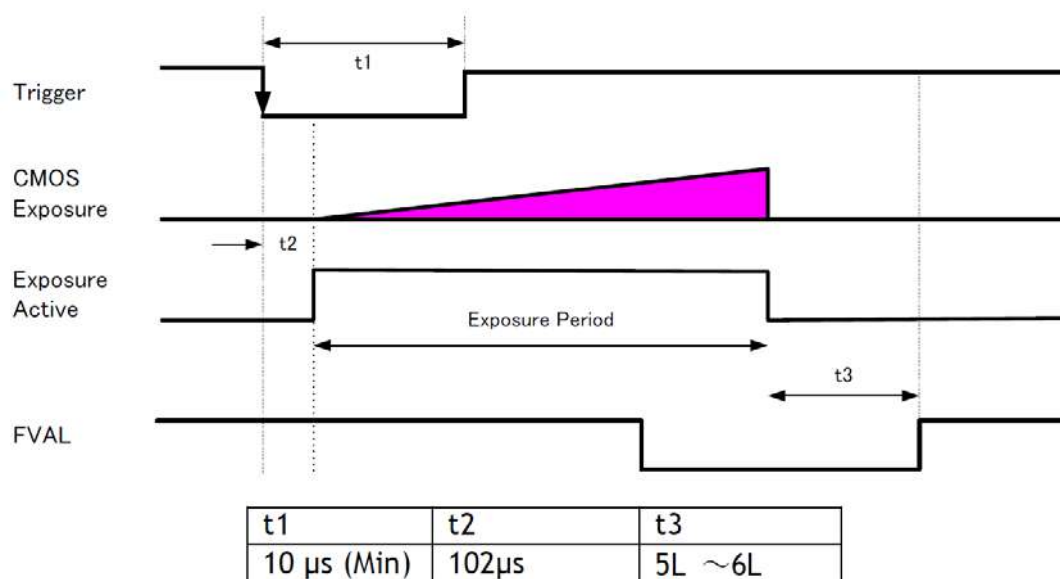
RCT mode timing after the trigger is input

Primary settings to use this mode

Exposure Mode: Timed
 Trigger Mode: ON
 Trigger Option: RCT
 Optical Filter Selector: 10 μ s

If ALC control is used together with RCT mode, then
 Exposure auto: Continuous
 Gain Auto: Continuous

Readout mode	Minimum trigger interval
Full	16.447 ms
ROI 1/2 (Height=1024)	8.375 ms
ROI 1/4 (Height=512)	4.35 ms
1/2V Binning (Note 1)	8.375 ms



Note 1: The trigger is input through 6P Optical input. Accordingly, the timing will be changed if the optical filter is set to the other figures.

Note 2: Other timings are internal operating timing of a camera.

Video Send Mode

The GO-5000M-USB-UV has a Video Send Mode and it includes the following operations.

Mode selected	Index selection method
Normal	Normal operation
Multi ROI	Up to 5 ROI images can be set up. Each image is output independently.
Trigger Sequence	Up to 10 indexes can be set for ROI, Exposure Time and Gain. Select the index by using the Frame Start trigger signal.
Command Sequence	Up to 10 indexes can be set for ROI, Exposure time and Gain. Select the index number to assign directly by using the Command Sequence Index command.
Delayed Readout	Up to 7 frames can be stored (8-bit). Each image can be output by Acquisition Transfer Start trigger timing.

Sequence ROI Trigger

This mode allows the user to define a preset sequence of up to 10 images, each with its own ROI, exposure time and gain values. This mode has two operation modes.

Mode selected	Index selection method
Trigger Sequence	Select the index by using the Frame Start trigger signal. (The setting index can be determined by the Next Index setting.)
Command Sequence	Select the index number to assign directly by using the Command Sequence Index command.

Primary settings to use this mode

Exposure Mode: Timed

Trigger Mode: ON

Video Send Mode: Trigger Sequence or Command Sequence

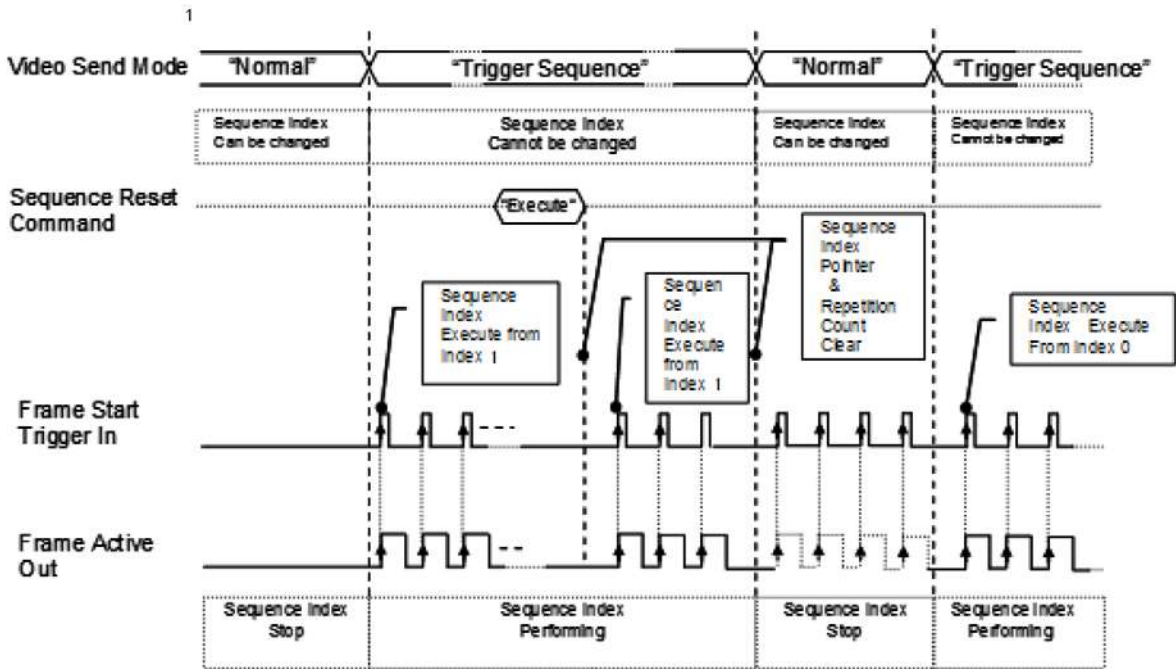
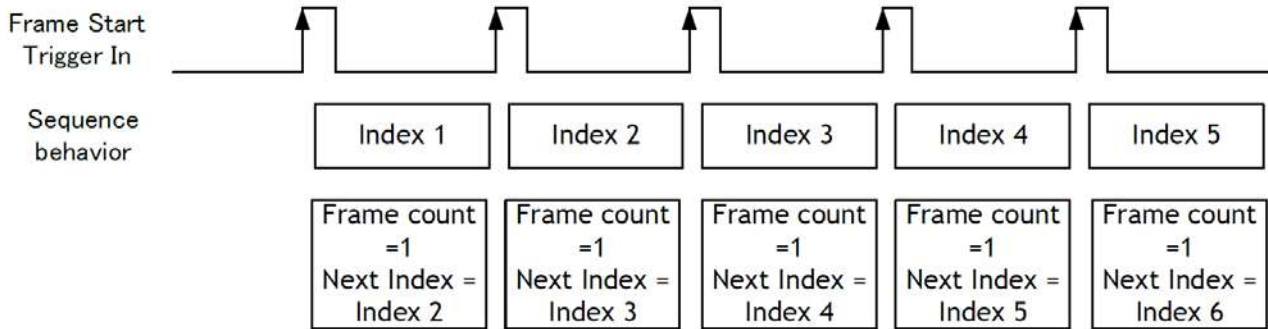
Readout mode	Minimum trigger interval
Full	16.155 ms + Exposure time
ROI 1/2 (Height=1024)	8.09 ms + Exposure time
ROI 1/4 (Height=512)	4.077 ms + Exposure time
1/2V Binning	8.09 ms + Exposure time

Trigger Sequence mode basic timing

In this mode, as each trigger input is received, the image data associated with the next index within the preset sequence is output.

In the trigger sequence mode, it is not possible to input the trigger while the current index is executing.

The sequence index table always starts at Index 1 and changes to next index which is preset in the next index setting after the current index is completed.



Sequence index table (Default)

The following table shows the default settings.

Sequence ROI Index	Sequence ROI												LUT Enable	Frame Count	Next Index
	Width	Height	Offset		Gain Selector			Exposure Time	Black Level	Binning (Note 1)					
			X	Y	Gain (ALL)	Red	Blue			Horizontal	Vertical				
- Index 1	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 2	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 3	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 4	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 5	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 6	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 7	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 8	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 9	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	
- Index 10	2560	2048	0	0	100	0	0	180000	0	1 (Off)	1 (Off)	Off	1	Index 1	

Descriptions of index table parameters

Command	Parameter	Description
Sequence ROI Index	Index 1~10	Select an index to be set
Sequence ROI Frame Count	1~255	<Set to each Index> Set fame number for display per a frame
Sequence ROI Next Index	Index 1~10 Off	<Set to each Index> <Used for Trigger Sequence Mode> Set the index to be active at the next
		Off: Stop a sequence operation at the current index.
Sequence ROI Width	16~2560 (Note 1)	<Set to each Index> Set the width value
Sequence ROI Height	1~2048 (Note 1, Note3) 2~2048 (Note 2)	<Set to each Index> Set the height value
Sequence ROI Offset X	0~2560 (Note 1)- [Sequence ROI Width]	<Set to each Index> Set the offset value.
Sequence ROI Offset Y	0~2048(Note1) - [Sequence ROI Height]	<Set to each Index> Set the offset Y.
Sequence ROI Gain All	100~1600	<Set to each index> Set the gain value.
Sequence ROI Exposure Time	10~8000000	<Set to each Index> Set the exposure time value.
Sequence ROI Black Level	-256~255	<Set to each index> Set the black level value.
Sequence ROI LUT enable	0 (Disable) 1 (Enable)	<Set to each Index> Set the disable or enable of LUT. If it is set to enable, the function is selected in the Sequence LUT mode.
Sequence ROI H Binning	1, 2, 4 (3 is disable)	<Set to each Index> Set the H Binning value.
Sequence ROI V Binning	1, 2, 4 (3 is disable)	<Set to each Index> Set the V Binning value.
Sequence Repetition	1~255	<For Trigger Sequence Mode> Set the repeat number of the sequence.
Command Sequence Index	Index 1~10	<For Command Sequence Mode> Set the performed index.
Current Sequence Index	Index 1~10	<READ only> Refer to the current Sequence Index.
Sequence LUT Mode	Gamma LUT	Set the function if Sequence ROI LUT is set to enable. Set the value on Gamma or LUT control.
Reset Sequence Index	No (EXE command)	Reset the Sequence Index to 0. At the same time, the Frame Count is also initialized.

Note 1: If the binning mode is used, the maximum value is changed.

Multi ROI mode

In the GO-5000M-USB-UV, the width and height of 5 separate ROIs within the full image area can be set as required. Each image can be overlapped. The location of each ROI can also be set as required. The Multi ROI data is output as an independent frame.

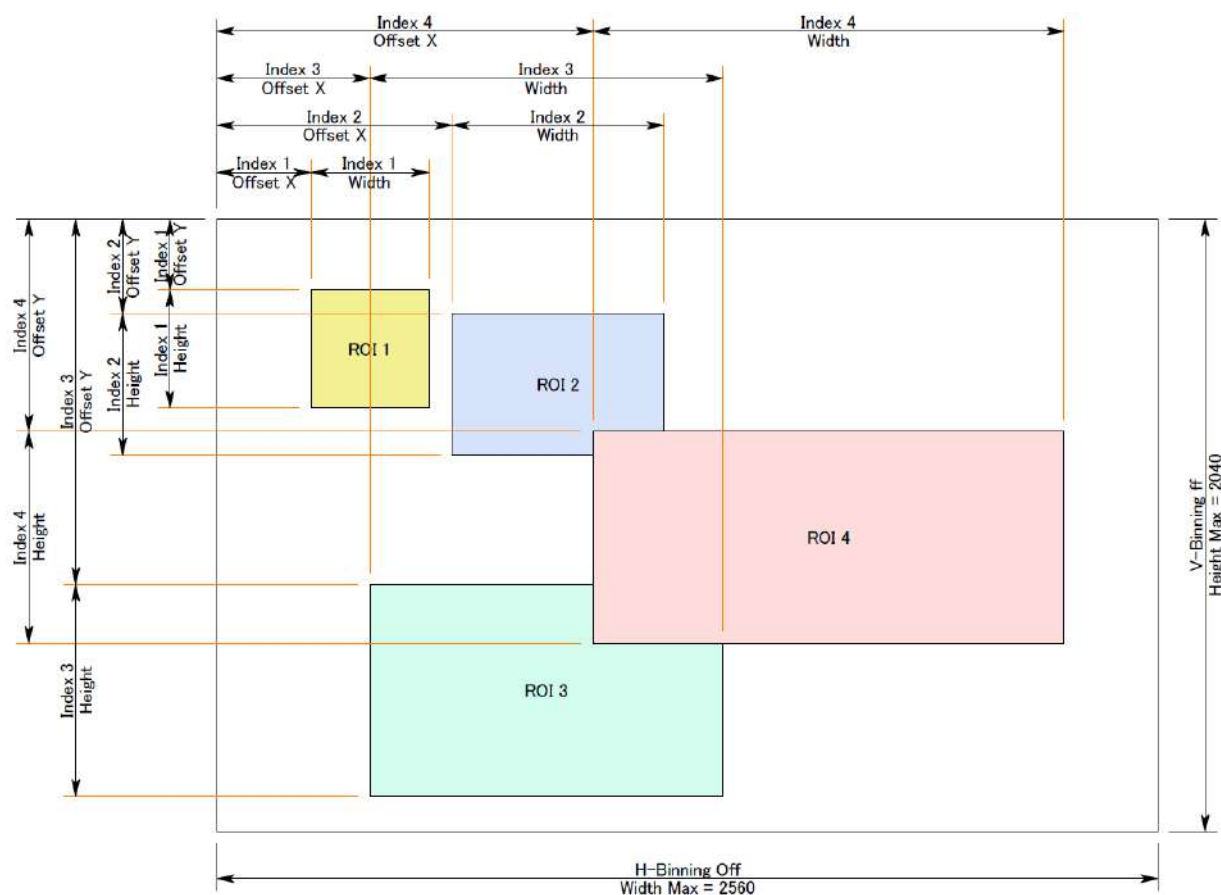
The multi ROI mode is enabled if [Video Sending Mode] is set to “Multi ROI”.

Multi ROI Index Selector	Multi ROI			
	Width	Height	Offset	
			X	Y
- Index 1	2560	2048	0	0
- Index 2	2560	2048	0	0
- Index 3	2560	2048	0	0
- Index 4	2560	2048	0	0
- Index 5	2560	2048	0	0

Multi ROI setting parameters

Command	Parameter	Description
Multi ROI Index	Index 1~5	Select the index to be configured.
Multi ROI Width	16~2560 (Note 1)	<Set to each Index> Set the width value.
Multi ROI Height	1~2048 (Note 1)	<Set to each Index> Set the Height value.
Multi ROI Offset X	0~2560(Note 1) - [Sequence ROI Width]	<Set to each Index> Set the Offset X value.
Multi ROI Offset Y	0~2048 (Note 1) - [Sequence ROI Height]	<Set to each Index> Set the Offset Y value.
Multi ROI Index Max	1~5	Set the number of index to be used.

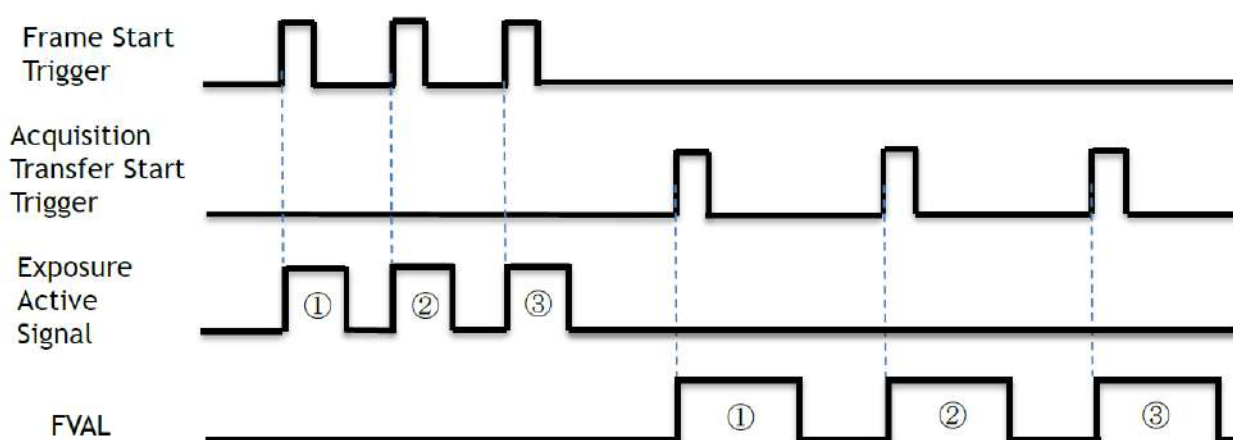
Note 1: If binning mode is used, the maximum values are adjusted accordingly.



Delayed Readout function

The images captured by Frame Start trigger can be stored inside the camera and readout by Acquisition Transfer Start trigger. Up to 7 frames can be stored.

Command	Setting	Description
Trigger Selector	Acquisition Transfer Start	Select the Trigger Selector at Acquisition Transfer Start to operate this function.
Trigger Mode	On	Refer to Chapter Trigger Control
Trigger Source	Select the source to be used	
Trigger Activation	Select the polarity of the source to be used.	



Operation and function matrix

Exposure Operation	Trigger mode	Trigger Option	V-Binning	H-Binning	Exposure Time	ROI	Auto Gain	Auto Exposure	Video Send Mode		HDR
									Multi ROI	Sequence	
OFF	OFF	OFF	1	1	×	○	○	×	○	×	×
			2 / 4	2 / 4	×	○	○	×	○	×	×
Timed	OFF	OFF	1	1	○	○	○	○	○	×	○
			2 / 4	2 / 4	○	○	○	○	○	×	○
Timed (EPS)	ON	OFF	1	1	○	○	○	○	○	○	○
			2 / 4	2 / 4	○	○	○	○	○	○	○
Trigger Width	ON	OFF	1	1	×	○	○	×	○	×	×
			2 / 4	2 / 4	×	○	○	×	○	×	×
Timed (RCT)	ON	RCT	1	1	○	○	○	○	○	×	×
			2 / 4	2 / 4	×	×	×	×	×	×	×

Black level control

This function adjusts the setup level.

Reference level	33.5LSB (Average of 100 x 100)
Video level adjusting range	0~approx. 100 LSB
Adjusting level	-256 to 255 (Default: 0)
Resolution of adjust	1STEP=0.25LSB

Note: the above figures are for 10-bit.

Black Level Selector

The following factors can be set.

GO-5000M-USB-UV: DigitalAll

Black Level

The black level can be set in the following range.

GO-5000M-USB-UV: DigitalAll : -256~ +255

Gain control

In the GO-5000M-USB-UV, the gain control uses Analog Base Gain and Digital Gain.

Analog Base Gain can be set at 0dB, +6dB or +12dB.

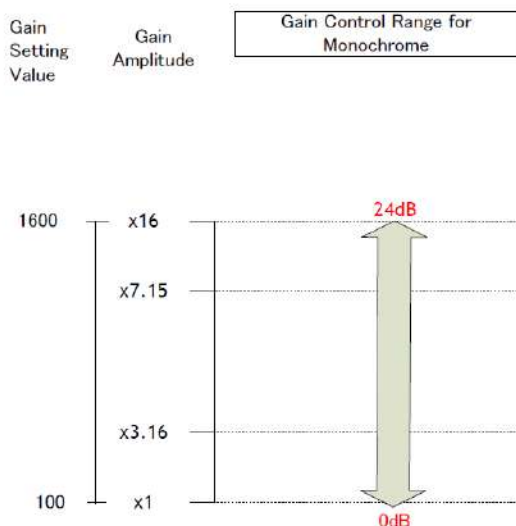
The digital gain is used for the master gain setting.

For setting the gain,

1. Set analog gain (Select from 0dB, +6dB and +12dB)
2. Set digital gain

The master gain (DigitalAll) can be set x1 (0dB) to x16 (+24dB) against the analog base gain. The resolution for gain setting is x0.01/step which is 0.05dB to 0.08dB, depending on the setting value.

The master gain control uses Digital Gain Control. All digital gain can be set by x0.01/step. If the digital gain is set too high, gaps in the Histogram may occur



The above drawing shows the relationship between gain setting value (command), gain amplitude, and dB indication. For example, the gain amplitude “x 5.62” equals 15dB.

Gain Selector

The following parameters can be set.
GO-5000M-USB-UV: DigitalAll

Gain

This is the reference value upon which gain adjustments are based. The operational adjustment is done in Gain Raw.

GO-5000M-USB-UV: DigitalAll : 1~16 (0dB to +24dB)

Gain RAW

Gain RAW can be set in the following range.

GO-5000M-USB-UV: Gain Raw Digital All : 100 ~ 1600 (0dB~24dB)

Gain Auto

This function automatically controls the gain level.
This is controlled by the command JAI ALC Reference.

There are three modes.

OFF: Adjust manually.

Once: Operate only one time when this command is set

Continuous: Operate the auto gain continuously

The following detailed settings are also available.

ALC Speed: The rate of adjustment of GainAuto can be set (Common with ExposureAuto).

Gain Auto Max: The maximum value of GainAuto control range can be set

Gain Auto Min: The minimum value of GainAuto control range can be set

ALC Reference: The reference level of Gain Auto control can be set (Common with ExposureAuto)

ALC Area Selector: The portion of the image used for auto gain control can be set (common with Exposure Auto)

ALC Area Enable: This command can make selected area(s) disabled or enabled. If ALC Area Selector selects ALC Area Enable ALL, and it is set to True, all areas are enabled and in this case, preset areas are all disabled.

High Left	High Mid-left	High Mid-right	High Right
Mid-High Left	Mid-High Mid-left	Mid-High Mid-right	Mid-High Right
Mid-Low Left	Mid-Low Mid-left	Mid-Low Mid-right	Mid- Low Right
Low Left	Low Mid-left	Low Mid-right	Low Right

LUT

This function can be used to convert the input to the desired output characteristics. The Look-Up Table (LUT) has 32 points for setup in the GO-5000M-USB-UV. The output level can be created by multiplying the gain data by the input level.

LUT Mode

Can be set to OFF, gamma, or Lookup Table. If Lookup Table is selected, the dark compression is forced to be OFF.

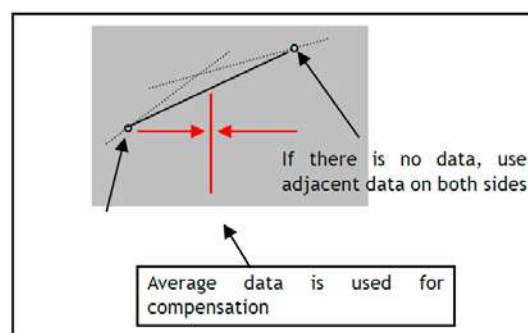
LUT Index

This represents the "starting" or "input" pixel value to be modified by the Lookup Table. The GO-5000M-USB-UV has a 32-point Lookup Table. Thus, in the GO-5000M-USB, an index value of 0 represents a full black pixel and a value of 31 represents a full white pixel. The index point values are automatically scaled to fit the internal pixel format of the camera. This is common for all output configurations.

LUT value

This is the "adjusted" or "output" pixel value for a given LUT index. It has a range of 0 to 4095 (12 bits) and is automatically scaled to the bit depth of the current output mode (8-bit, 10 bit, or 12-bit). Linear interpolation is used to calculate LUT values between index points.

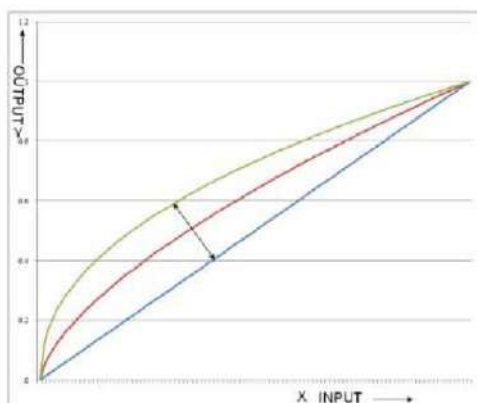
*Note: The LUT must have a positive slope, i.e., the value for each index must be greater than the previous index. If the value for an index is set \leq one or more previous indexes, those indexes will be automatically adjusted to maintain a positive slope.



$$\text{Output Data} = \text{Video IN} \times \text{LUT data}$$

Gamma

This command is used to set gamma 0.45, gamma 0.6 and gamma 1.0 (OFF) in 3 steps. The gamma value is an approximate value.



Linear and Dark Compression

GO-5000M-USB-UV has a dark compression circuit to improve the signal-to-noise ratio in the dark portion of the image. This function is OFF as factory default setting and can be ON according to applications.

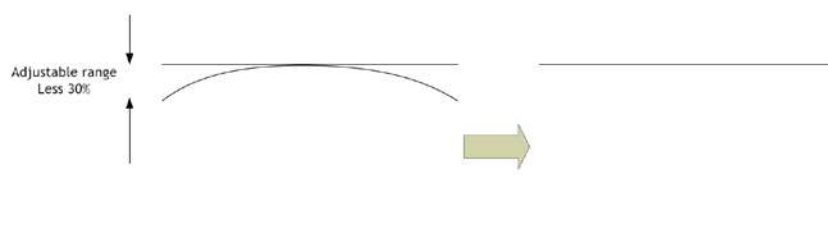
Dark Compression	Function
Linear(Factory default)	No compression, Gamma=1.0
Dark Compression	Compress the signal level in the dark portion. It can improve the signal to noise ratio, but on the other hand, the linearity will be deteriorated.

Shading Correction mode

Flat shading correction:

The method to compensate the shading is to measure the highest luminance level in the image and use that data as the reference. Luminance levels of other areas are then adjusted so that the level of the entire area is equal. Compensation is performed using a block grid of 20 blocks (H) x 16 blocks (V). Each block contains 128 x 128 pixels. The complementary process is applied to produce the compensation data with less error.

Flat shading correction concept drawing



Shading Mode

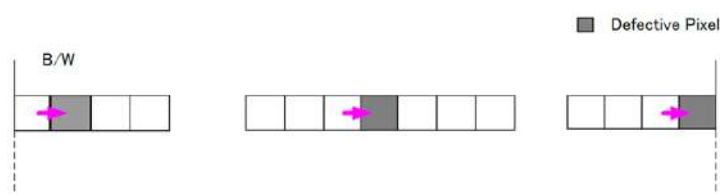
Shading mode	Description
Off	Shading correction is OFF.
User 1	The correction data in user area 1 is stored or loaded to the camera
User 2	The correction data in user area 2 is stored or loaded to the camera
User 3	The correction data in user area 3 is stored or loaded to the camera

Perform Shading Calibration

This is a .exe command to execute a shading correction. The correction data after executing the shading correction is automatically stored in the used user area.

Blemish compensation

The GO-5000M-USB-UV have a blemish compensation circuit. This function compensates blemishes on the CMOS sensor (typically pixels with extremely high response or extremely low response). Pixels that fulfill the blemish criteria can be compensated by adjacent pixel in left column and, Please refer to the following drawing. As for white blemishes, the automatic detection function is available and after its execution, the data is stored in memory. The customer can use the data by setting the blemish compensation ON. For black blemishes, only compensation that has been done in the factory is available. The number of pixels that can be compensated by the user is up to 256 pixels.

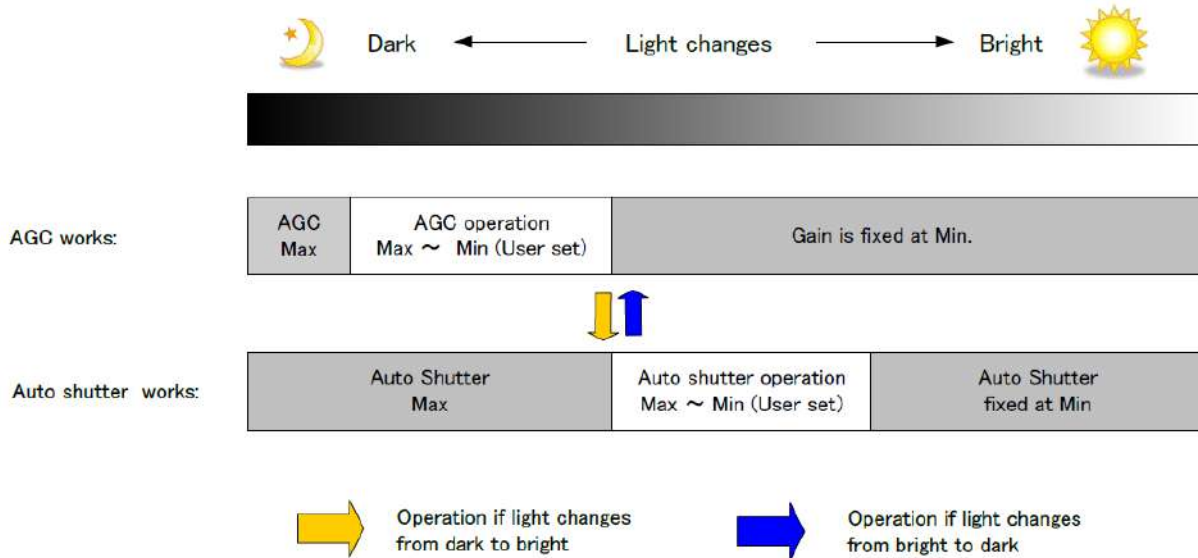


Note: If defective pixels are found consecutively in the horizontal direction, the blemish compensation circuit does not work.

ALC

In the GO-5000M-USB-UV, auto gain and auto exposure can be combined to provide a wide ranging automatic exposure control from dark to bright or vice versa. The functions are applied in the sequence shown below and if one function is disabled, the remaining function will work independently.

If the lighting condition is changed from bright to dark ASC — AGC
 If the lighting condition is changed from dark to bright AGC — ASC



ALC Reference will determine the target video level for AGC and Auto Shutter. For instance, if ALC Reference is set to 100% video level, AGC and Auto Shutter will function to maintain 100% video level.

Please note that ALC function is available only in continuous mode, as well as RCT mode.

HDR (High Dynamic Range)

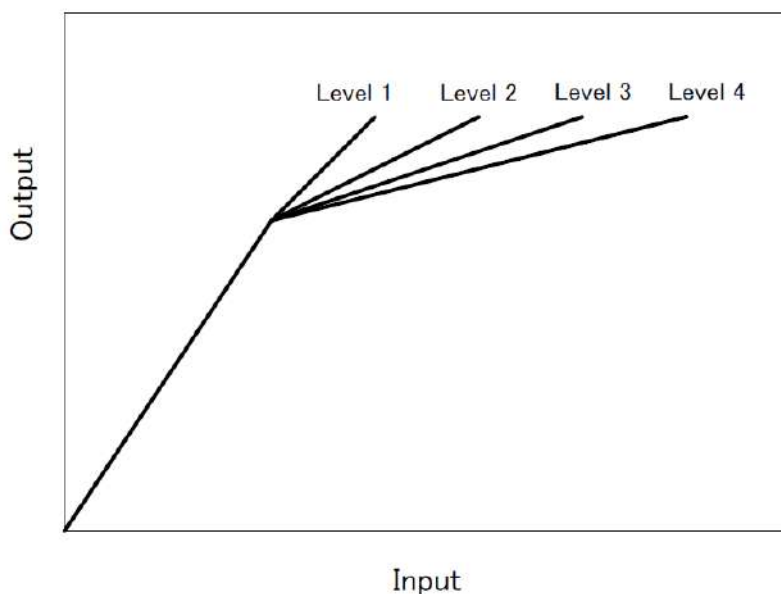
HDR sensing mode can be set when HDR Mode is set to ON while Exposure Mode is Timed. The parameters to configure dynamic range are HDR_SLOPE Level 1, Level 2, Level 3 and Level 4.

The user can select any one of those parameters as required for their application.

In this mode, the timed exposure is used as the reference and the value selected in HDR_SLOPE will compensate to get an appropriate dynamic range by changing the exposure time.

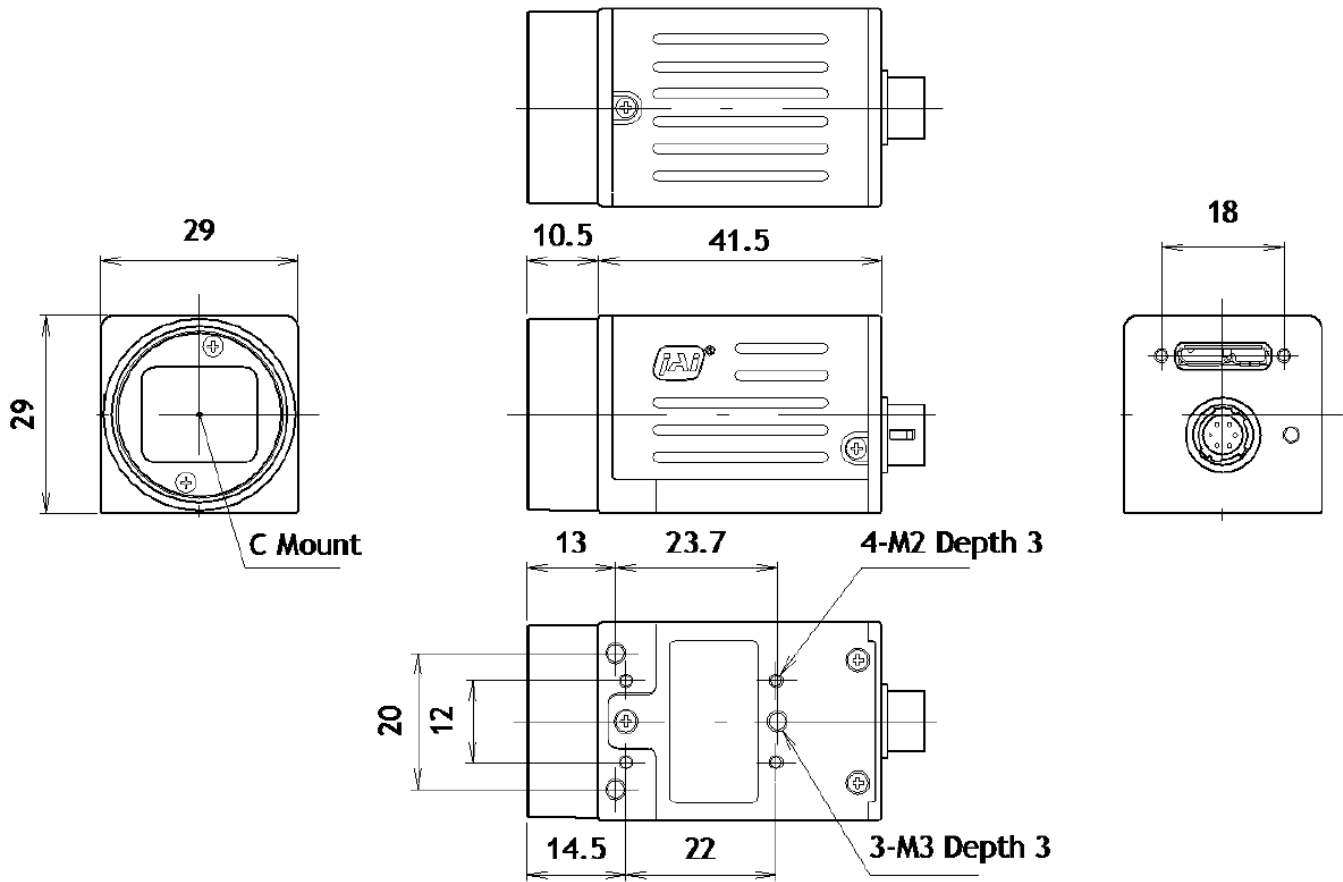
Notes:

1. If the exposure mode is OFF and the HDR mode is set to ON, the exposure mode is automatically changed to Timed.
2. If horizontal binning and/or vertical binning are set to ON, the HDR mode cannot be set. In this case, the HDR mode must be set first before H-Binning and/or V-Binning are set.
3. In this mode, exposure overlapped behavior is not available and the frame rate is slower than normal operation.
4. The exposure time value is fixed at the value when HDR Mode is activated. When the exposure time is changed, HDR Mode should be off. Once the exposure time is changed, HDR Mode can be set to ON again.
5. In this mode, Exposure Auto function is disabled.



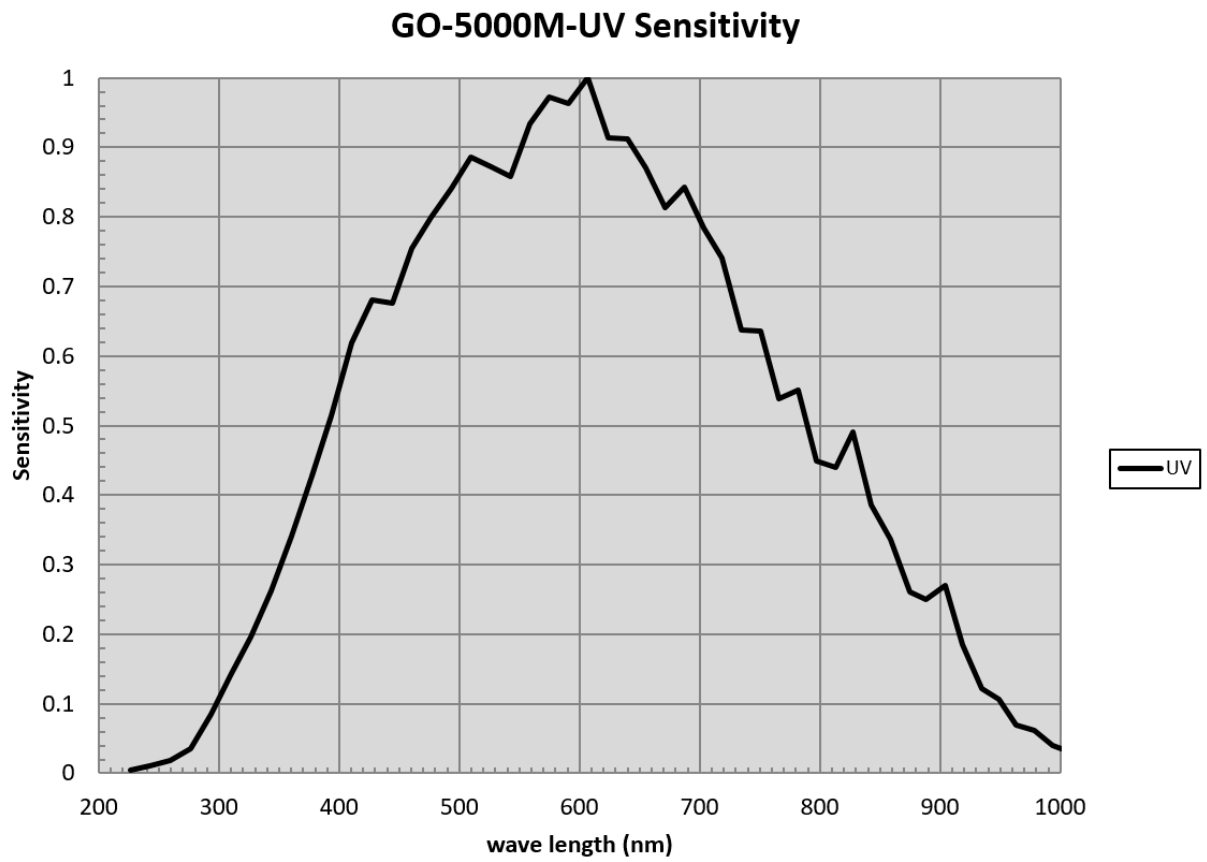
Knee Slope	Dynamic Range [%]
1	(200)
2	(400)
3	(800)
4	(1600)

External appearance and dimensions



Dimensions tolerance: ± 0.3 mm
Unit: mm

Spectral response



Specifications table

Specifications		GO-5000M-USB-UV		
Scanning system		Progressive scan, 1-tap		
Synchronization		Internal		
Interface		Complies with USB3 Vision (Specification v1.0 RC4.12)		
Image sensor		1-inch Monochrome CMOS		
Aspect Ratio		5:4		
Image size(Effective Image)		12.8 (h) x 10.24 (v) mm, 16.39 mm diagonal		
Pixel size		5 (h) x 5 (v) μm		
Effective Image output Pixels		2560 (h) x 2048 (v)		
Pixel Clock		48 MHz		
Maximum Acquisition Frame Rate per Pixel Format (minimum is 0.125 fps for all formats)	8-bit	Binning	H1, V1	61.9 fps (Max)
			H1, V2	123.6 fps (Max)
			H1, V4	245.7 fps (Max)
			H2, V1	61.9 fps (Max)
			H2, V2	123.6 fps (Max)
			H2, V4	245.7 fps (Max)
			H4, V1	61.9 fps (Max)
			H4, V2	123.6 fps (Max)
	10bit Packed	Binning	H1, V1	49.5 fps (Max)
			H1, V2	99.2 fps (Max)
			H1, V4	198.7 fps (Max)
			H2, V1	49.5 fps (Max)
			H2, V2	99.2 fps (Max)
			H2, V4	198.7 fps (Max)
			H4, V1	49.5 fps (Max)
			H4, V2	99.2 fps (Max)
	12bit Packed	Binning	H1, V1	41.3 fps (Max)
			H1, V2	82.6 fps (Max)
			H1, V4	165.2 fps (Max)
			H2, V1	41.3 fps (Max)
			H2, V2	82.6 fps (Max)
			H2, V4	165.2 fps (Max)
			H4, V1	41.3 fps (Max)
			H4, V2	82.6 fps (Max)
	10bit/12-bit	Binning	H1, V1	30.9 fps (Max)
			H1, V2	61.8 fps (Max)
			H1, V4	123.4 fps (Max)
			H2, V1	30.9 fps (Max)
H2, V2			61.8 fps (Max)	
H2, V4			123.4 fps (Max)	
H4, V1			30.9 fps (Max)	
H4, V2			61.8 fps (Max)	
SN ratio (traditional method)		49dB (Typical) (at Linear) 55dB (Typical) (at Dark compression ON) (0dB gain, Black)		
Image Output format Digital	Full pixels			
	ROI	Width	16 ~ 2560, 16 pixels/step	
		OFFSET X	0 ~ 2544, 16 pixels/step	
		Height	1 ~ 2048 lines, 1 line/step	
		OFFSET Y	0 ~ 2047 lines, 1 line/step	
	Binning	H	1	2560(H)
			2	1280(H)
			4	640(H)
		V	1	2048(V)
			2	1024(V)
4			512(V)	
Bit assignment		Mono8, Mono10, Mono12 Mono10Packed, Mono12Packed		

Acquisition mode		Continuous / Single Frame / Multi Frame (1 ~ 255)	
Trigger Selector	Acquisition	Acquisition Start/ Acquisition Stop	
	Exposure	Frame Start	
	Transfer	JAI Frame Transfer	
Exposure mode		OFF, Continuous, Timed (EPS), Trigger Width	
Trigger option		OFF / RCT (with ALC function)	
Trigger Overlap		Fixed (Readout)	
Trigger Input Signal		Line 5 (Opt In), Software, PG 0, NAND Out 0/1, User out 0/1	
Opt. Filter		5 steps (10 μ s (Typ), 100 μ s, 500 μ s, 1ms, 5ms, 10ms)	
Exposure Mode	Timed	Exposure Auto: OFF 10 μ s (Min.) ~ 8 second (Max.) (Note1), Variable unit: 1 μ s Exposure Auto: Continuous 10 μ s (Min.) ~ 8 second (Max.) (Note1), Variable unit: 1 μ s	
	Trigger Width	10 μ s (Min.Note1) ~ ∞ (Max.) (Note1)	
Exposure Auto		OFF / Continuous	
Auto Exposure Response Speed		1 ~ 8	
Video Send mode		Normal ROI, Multi ROI, Trigger Sequence, Command Sequence, Delayed readout	
Digital I/O		Line Selector (6P): GPIO IN / GPIO OUT	
Black Level Adjust.	Ref. level	33.5LSB 10-bit (Average value of 100*100)	
	Video level adj. range	0 ~ approx. 100LSB	
	Adj. range	-256 ~ +255LSB 10-bit	
	Resolution	1 STEP = 0.25LSB	
Analog Base Gain (For manual)		0dB, 6dB, 12dB	
Gain Control	Manual	0dB ~ +24dB (Note2)	
	Adj. range	1 step=x0.01 (0.005dB to 0.08dB) Varies by setting value	
Blemish Comp.	Detection	Detect white blemish above the threshold value (Black blemish is detected only by factory)	
	Compensation	Complement by adjacent pixels (Continuous blemishes are not compensated)	
	Numbers	256 pixels	
ALC		AGC and auto exposure can be combined and automatically controlled	
Gamma		0.45, 0.6 and 1.0 (OFF) (3 steps are available)	
LUT		32 points can be set	
HDR		4 settings, Level 1, 2, 3 and 4	
Dark compression		Dark Compression (ON) / Linear (OFF)	
Shading Compensation		Flat Field Block Comp. (20 x 16 locks), Block size: 128 x 128 pixels	
Power	6-Pin Connector	Input range	DC+12V to +24V \pm 10% (At the input terminal)
		Current	240mA (At 12V input, Full pixels)
		Power	2.8W (At 12V input, Full pixels)
	USB Bus Power	Input range	DC 5V \pm 10%
		Current	720mA (At 5V input, Full pixels)
		Power	3.6W (At 5V input, Full pixels)
Lens mount		C mount Rear protrusion of the lens is less than 10 mm	
Flange back		17.526 mm, Tolerance: 0 to -0.05 mm	
Optical filter		Protection glass: Not provided	
Operating temperature/Humidity Performance guaranteed		-5 $^{\circ}$ C to +45 $^{\circ}$ C / 20 to 80% (No-condensing)	
Storage Temp. / Humidity		-25 $^{\circ}$ C to +60 $^{\circ}$ C / 20 to 80% (No-condensing)	
Regulation		CE (EN61000-6-2 and EN61000-6-3), FCC part 15 class B, RoHS, WEEE	
Housing Dimensions		29 x 29 x 52 mm (W x H x D) (excluding protrusion)	
Weight		46g	

Note1): Usable performance will be up to 1 second.

Note2): A minimum of +12dB of gain can be applied without causing any breaks in the histogram.

Note3): Approximately 5 minutes pre-heating is required to achieve these specifications.

Note4): The above specifications are subject to change without notice.

Appendix

1. Precautions

Personnel not trained in dealing with similar electronic devices should not service this camera. The camera contains components sensitive to electrostatic discharge. The handling of these devices should follow the requirements of electrostatic sensitive components.

Do not attempt to disassemble this camera.

Do not expose this camera to rain or moisture.

Do not face this camera towards the sun, extreme bright light or light reflecting objects.

When this camera is not in use, put the supplied lens cap on the lens mount.

Handle this camera with the maximum care.

Operate this camera only from the type of power source indicated on the camera.

Power off the camera during any modification such as changes of jumper and switch setting.

2. Typical Sensor Characteristics

The following effects may be observed on the video monitor screen. They do not indicate any fault of the camera, but are associated with typical sensor characteristics.

V. Aliasing

When the CMOS camera captures stripes, straight lines or similar sharp patterns, jagged edges may appear on the monitor.

Blemishes

All cameras are shipped without visible image sensor blemishes.

Over time some pixel defects can occur. This does not have a practical effect on the operation of the camera. These will show up as white spots (blemishes).

Exposure to cosmic rays can cause blemishes to appear on the image sensor. Please take care to avoid exposure to cosmic rays during transportation and storage. It is recommended using sea shipment instead of air flight in order to limit the influence of cosmic rays on the camera.

Pixel defects/blemishes also may emerge due to prolonged operation at elevated ambient temperature, due to high gain setting, or during long time exposure. It is therefore recommended to operate the camera within its specifications.

Patterned Noise

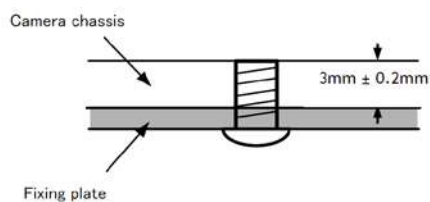
When the sensor captures a dark object at high temperature or is used for long time integration, fixed pattern noise may appear on the video monitor screen.

3. Caution when mounting a lens on the camera

When mounting a lens on the camera dust particles in the air may settle on the surface of the lens or the image sensor of the camera. It is therefore important to keep the protective caps on the lens and on the camera until the lens is mounted. Point the lens mount of the camera downward to prevent dust particles from landing on the optical surfaces of the camera. This work should be done in a dust free environment. Do not touch any of the optical surfaces of the camera or the lens.

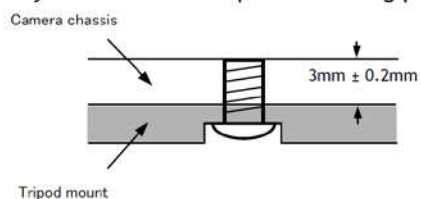
4. Caution when mounting the camera

When you mount the camera on your system, please make sure to use screws of the recommended length described in the following drawing. Longer screws may cause serious damage to the PCB inside the camera.



Mounting the camera to fixing plate

If you mount the tripod mounting plate, please use the provided screws.



5. Exportation

When exporting this product, please follow the export regulation of your own country.

6. References

1. This manual can and datasheet for GO-5000M-USB-UV can be downloaded from www.jai.com
2. Camera control software can be downloaded from www.jai.com

User's Record

Camera type: GO-5000M-USB-UV

Model name:

Revision:

Serial No:

Firmware version:

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

Trademarks

- Microsoft and Windows are trademarks or registered trademarks of Microsoft Corporation in the United States and other countries.
- Intel and Intel Core are trademarks of Intel Corporation in the United States and other countries.

Other system and product names described in this document are trademarks or registered trademarks of their respective owners. The ™ and ® symbols are not used in this document.

