SEN TECH

USB3 Vision Sony CMOS
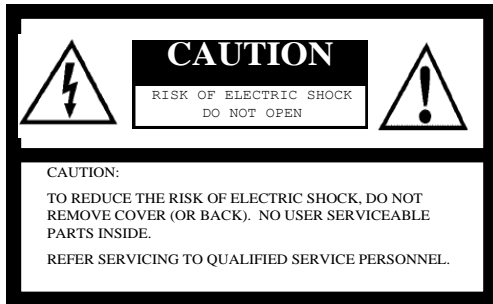## Product Specifications

Features
- USB3 Vision Compatibility
- 3.2 & 5 MP CMOS Sensor
- Color or Monochrome
- Available with Multiple ROI

Safety / Product Precautions

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION:

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

For U.S.A.

Warning:

This equipment generates and uses radio frequency energy and if not installed and used properly, I.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

Warning:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

Product Precautions

➢ **Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.**

➢ **Do not pull or damage the camera cable.**

➢ **During camera use, do not wrap the unit in any material. This will cause the internal temperature of the unit to increase.**

➢ **Do not expose the camera to moisture, or do not try to operate it in wet areas.**

➢ **Do not operate the camera beyond its temperature, humidity and power source ratings.**

➢ **While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the sensor or filter area and scratching or damaging this area.**

➢ **Do not keep the camera under the following conditions:**

- **In wet, moist, and high humidity areas**
- **Under hot direct sunlight**
- **In high temperature areas**
- **Near an object that releases a strong magnetic or electric field**
- **Areas with strong vibrations**

➢ **Apply the power that satisfies the requirements specified in this document to the camera.**

➢ **Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.**

- ➤ **The camera is a general-purpose electronic device; using the camera for the equipment that may threaten human life or cause dangers to human bodies directly in case of failure or malfunction of the camera is not guaranteed. Use the camera for special purposes at your own risk.**
- ➤ **Defect pixels may appear due to the sensor characteristics.**
- ➤ **During camera use, do not plug or unplug other USB devices (USB storage, etc.). Plugging or unplugging other devices may result in a failure to recognize the USB camera.**
- ➤ **Increasing gain level may increase the noise level.**
- ➤ When the camera is in Long Exposure mode, the noise level may increase.

Contents

1   Overview

This document describes the specification of the following cameras.

STC-MCS510U3V / STC-MBS510U3V
STC-MCS322U3V / STC-MBS322U3V

1.1   Features

- ・ USB3 Vision
- ・ Frame Rate (Full Scan) : 75.7 FPS @5 MP 8bit, 121 FPS @3.2M 8bit
- ・ CMOS Global Shutter
- ・ Up to 64 Pixel Defect Correction (Default: ON)
- ・ 8bit,10bit, 12bit output

1.2   Item Numbers Naming Method

Below is a description of the camera naming method:

STC-MxS510U3V

U3V: USB3 Vision
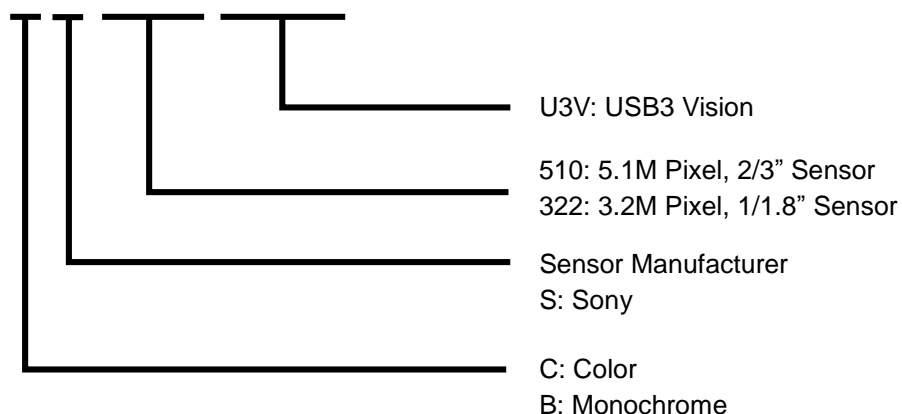
510: 5.1M Pixel, 2/3" Sensor
322: 3.2M Pixel, 1/1.8" Sensor

Sensor Manufacturer
S: Sony

C: Color
B: Monochrome

Figure 1: Naming Method

2   Specifications

2.1   Electronic Specifications

2.1.1   STC-MBS510U3V / STC-MCS510U3V

Model Number		STC-MBS510U3V	STC-MCS510U3V
Image Sensor		2/3" 5.1M Progressive Monochrome CMOS（Sony:IMX250LLR-C）	2/3" 5.1M Progressive Color CMOS（Sony: IMX250LQR-C）
Shutter Type		Global	
Active Picture Elements		2448 (H) x 2048 (V)	
Cell Size		3.45 (H) x 3.45 (V) µm	
Sync System		Free run, External trigger(Hardware, Software)	
Maximum Frame Rate (Full Scan)	8bit output	75.7 fps	
	10bit output	37.6 fps	
	10bit Packed output	58.3 fps	
	12bit output	37.6 fps	
	12bit Packed output	50.9 fps	
ADC bit width		10bit / 12bit	
Video Format		8/10/12 bit output (Support packed on 10bit, 12bit)	8/10/12 bit output (Support packed on 10bit, 12bit)
Noise Level	8bit output	≤ 3 LSBs (Gain 0 dB)	
	10bit / 10bitPacked output	≤ 12 LSBs (Gain 0 dB)	
	12bit / 12bitPacked output	≤ 48 LSBs (Gain 0 dB)	
Sensitivity		550 Lux	1240 Lux
Exposure time	8bit output	20.1µseconds to 26 seconds	
	10bit output	26.5µseconds to 53 seconds	
	10bit Packed output	22.0µseconds to 34 seconds	
	12bit output	26.5µseconds to 53 seconds	
	12bit Packed output	23.2µseconds to 39 seconds	
Gain	Analog Gain	0 to 24 dB	
	Digital Gain	0 to 6 dB	
Black Level	8bit output	0 to 31	
	10bit / 10bitPacked output	0 to 127	
	12bit / 12bitPacked output	0 to 511	
White Balance Gain		N/A	-40dB to 12dB
ROI (AOI)		Horizontal: 64 to 2448 (2432 on Packed) / Vertical: 32 to 2048 Adjustable Steps for offset: 16 pixels in horizontal direction (64 pixels on Packed) / 4 lines in vertical direction Adjustable Steps for offset: 4 pixels in horizontal direction / 4 lines in vertical direction	
Multi ROI		16 Regions (Horizontal 4 regions x Vertical 4 regions)	
Gamma		Gamma Table =0.1 to 4.0	
Binning		Individual x2 Horizontal, Vertical Binning (Horizontal: Average, Vertical: Addition)	N/A
Decimation		Individual x2 Horizontal, Vertical Decimation	
Image Flip		Horizontal / Vertical / Horizontal and Vertical / OFF	
Pixel Defect Correction		Up to 64 points	
Auto Image Control	Auto Exposure	Support	Support
	Auto Gain	Support	Support
	Auto White Balance	N/A	Support
Operational Mode		Free-run / Edge-preset Trigger / Pulse width Trigger / Start Stop Trigger	
User Setting Storage		Support	
Communication		Via USB3.0 bus	

Interface		USB3.0 Super speed (USB3.0 Micro B)
Protocol		USB3 Vision® 1.0.1,　GenICam Standard Version (SFNC 2.2, PFNC 2.0) compliant and Sentech's unique protocol (on Normal SDK, Trigger SDK)
Input / Output		Three GPIO, One Camera Hardware Reset
Power	Input Voltage	+5V(typ.) (This conforms to the USB standard)
	Consumption	Less than 4.2 W

2.1.2 STC-MBS322U3V / STC-MCS322U3V

Model Number		STC-MBS322U3V	STC-MCS322U3V
Image Sensor		1/1.8" 3.2M Progressive Monochrome CMOS（Sony: IMX252LLR-C）	1/1.8" 3.2M Progressive Color CMOS（Sony: IMX252LQR-C）
Shutter Type		Global	
Active Picture Elements		2048 (H) x 1536 (V)	
Cell Size		3.45 (H) x 3.45 (V) μm	
Sync System		Free run, External trigger(Hardware, Software)	
Maximum Frame Rate (Full Scan)	8bit output	121.0 fps	
	10bit output	60.5 fps	
	10bit Packed output	91.6 fps	
	12bit output	60.5 fps	
	12bit Packed output	80.2 fps	
ADC bit width		10bit / 12bit	
Video Format		8/10/12 bit output (Support packed on 10bit, 12bit)	8/10/12 bit output (Support packed on 10bit, 12bit)
Noise Level	8bit output	≤ 3 LSBs (Gain 0 dB)	
	10bit / 10bitPacked output	≤ 12 LSBs (Gain 0 dB)	
	12bit / 12bitPacked output	≤ 48 LSBs (Gain 0 dB)	
Sensitivity		550 Lux	1240 Lux
Exposure time	8bit output	19.0μseconds to 22 seconds	
	10bit output	24.3μseconds to 44 seconds	
	10bit Packed output	20.7μseconds to 29 seconds	
	12bit output	24.3μseconds to 44 seconds	
	12bit Packed output	21.7μseconds to 33 seconds	
Gain	Analog Gain	0 to 24 dB	
	Digital Gain	0 to 6 dB	
Black Level	8bit output	0 to 31	
	10bit / 10bitPacked output	0 to 127	
	12bit / 12bitPacked output	0 to 511	
White Balance Gain		N/A	-40dB to 12dB
ROI (AOI)		Horizontal: 64 to 2048 / Vertical: 32 to1536 Adjustable Steps for offset: 16 pixels in horizontal direction (64 pixels on Packed) / 4 lines in vertical direction Adjustable Steps for offset: 4 pixels in horizontal direction / 4 lines in vertical direction	
Multi ROI		16 Regions (Horizontal 4 regions x Vertical 4 regions)	
Gamma		Gamma Table =0.1 to 4.0	
Binning		Individual x2 Horizontal, Vertical Binning (Horizontal: Average, Vertical: Addition)	N/A
Decimation		Individual x2 Horizontal, Vertical Decimation	
Image Flip		Horizontal / Vertical / Horizontal and Vertical / OFF	
Pixel Defect Correction		Up to 64 points	
Auto Image Control	Auto Exposure	Support	Support
	Auto Gain	Support	Support
	Auto White Balance	N/A	Support
Operational Mode		Free-run / Edge-preset Trigger / Pulse width Trigger / Start Stop Trigger	
User Setting Storage		Support	
Communication		Via USB3.0 bus	

Interface		USB3.0 Super speed (USB3.0 Micro B)
Protocol		USB3 Vision® 1.0 , GenICam Standard Version (SFNC 2.2, PFNC 2.0) compliant and Sentech's unique protocol (on Normal SDK, Trigger SDK)
Input / Output		Three GPIO, One Camera Hardware Reset
Power	Input Voltage	+5V(typ.) (This conforms to the USB standard)
	Consumption	Less than 4.2 W

Precautions

*1 The procedure used to measure Sensitivity is as follows:
    Measure the luminance when white level achieved 100% on F5.6

Camera Setting		Environment	
Parameter	Setting	Parameter	Setting
Gain Up	0 db	Light Source	Light Box(White)
AGC	OFF	Color temperature	5100K
White Balance	Optimum	Exposure Time	1/30
Electrical Shutter	1/30	F on Lens	F 5.6
Black Level	Optimum	Target Luminance	Illuminometer
Gamma	Factory Setting		

*2 Please refer to section ROI for further details on the ROI.
*3 Binning & Decimation cannot work simultaneously.
*4 The Binning & Decimation units do not change.
*5 The user should not input the trigger more frequently than the maximum frame rate.
   If the trigger was input during the sensor ReadOut timing, ReadOut will be interrupted. This trigger will cause the exposure to end.
*6 Start/Stop trigger mode is only available for the software trigger.
*7 When using this camera with a USB 2.0 port, the user should take precautions in regards to power consumption due to this camera operating on the USB 3.0 standard.

How to obtain full frame rate

This general guideline may help the user obtain the full frame rate from the camera.

To obtain the full frame rate, the data transfer speed on the USB bus depends on the capability of the host controller.

Renesas / Fresco Logic's host controller improved the data transfer speed drastically in the second generation. Intel's chipset increased the transfer speed 10% to 20%.

When PCIExpress board of USB3.0 interface is used, please insert the PCIExpress Gen2.0(5.0[GT/s]) slot. If non-PCIExpress Gen2.0(5.0[GT/s]) is used, data transfer speed could decrease by about 50%.

If an incapable host controller causes a lower frame rate, the camera frame rate should be set lower than the maximum to adjust for the incapable host controller spec. This may resolve the issue.

Due to the huge data transfer, PC resources may be consumed during the process. If this occurs, the frame rate of the camera may be effected.

2.2 Spectral Sensitivity Characteristics
2.2.1 STC-MBS510U3V
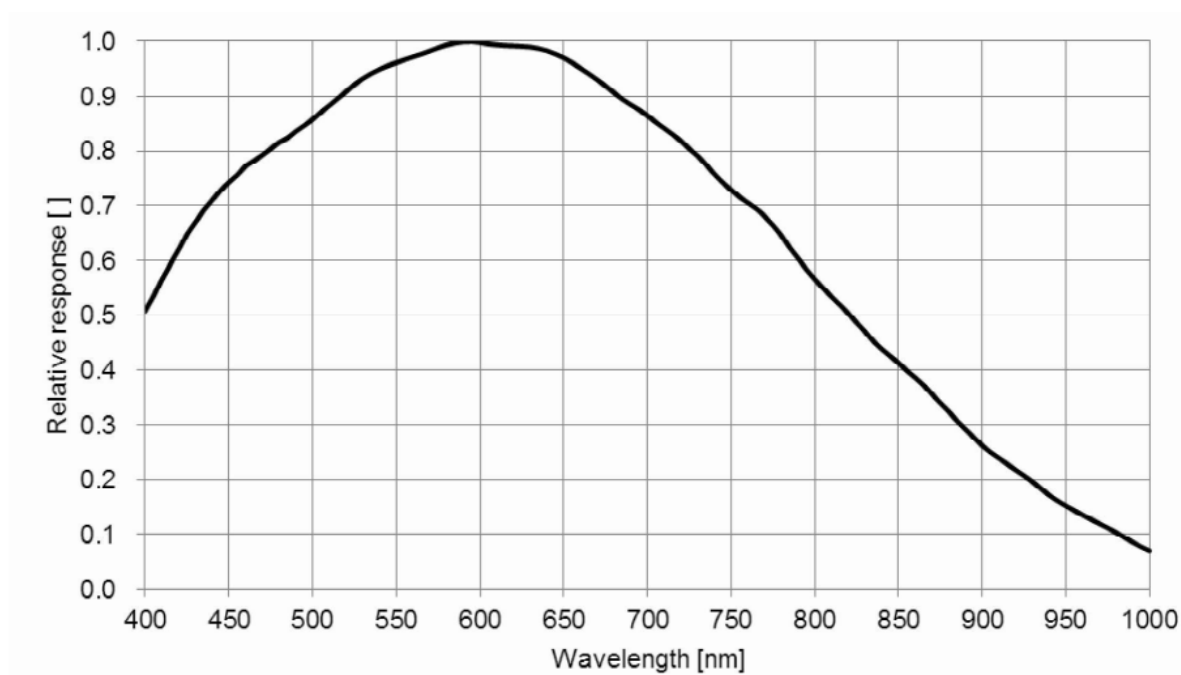
2.2.2 STC-MCS510U3V (without IR cut filter)

TBD

2.2.3 STC-MBS322U3V
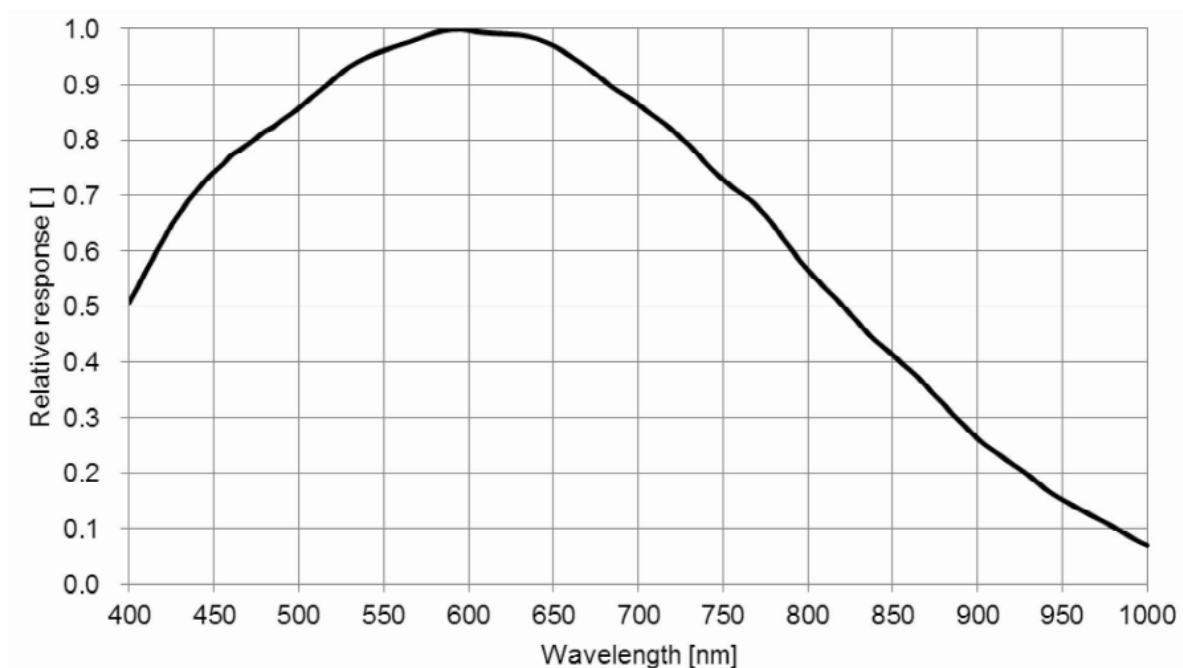
2.2.4 STC-MCS322U3V (without IR cut filter)

TBD

2.3 Mechanical Specifications
2.3.1 STC-MBS510U3V / STC-MCS510U3V

Model Number	STC-MBS510U3V	STC-MCS510U3V
Dimensions	C Mount: 28 (W) x 28 (H) x 40 (D) mm (*1)	
Optical Filter	No IR Cut Filter	IR Cut Filter
Optical Center Accuracy	Positional accuracy in Horizontal and Vertical directions: +/- 0.3 mm Rotational accuracy of Horizontal and Vertical: +/- 1.5 deg.°	
Material	Aluminum alloy	
Lens Mount	C Mount	
Interface Connectors	USB Connector: USB3.0 Micro B type I/O Connector: HR10A-7R-6PB (Hirose) or equivalent	
Weight	Approx. 48g	

(*1) excluding the connectors

2.3.2 STC-MBS322U3V / STC-MCS322U3V

Model Number	STC-MBS322U3V	STC-MCS322U3V
Dimensions	C Mount: 28 (W) x 28 (H) x 40 (D) mm (*1)	
Optical Filter	No IR Cut Filter	No IR Cut Filter
Optical Center Accuracy	Positional accuracy in Horizontal and Vertical directions: +/- 0.3 mm Rotational accuracy of Horizontal and Vertical: +/- 1.5 deg.°	
Material	Aluminum alloy	
Lens Mount	C Mount	
Interface Connectors	USB Connector: USB3.0 Micro B type I/O Connector: HR10A-7R-6PB (Hirose) or equivalent	
Weight	Approx. 48g	

(*1) excluding the connectors

2.4 Environmental Specifications
### 2.4.1 STC-MBS510U3V / STC-MCS510U3V

Model Number		STC-MBS510U3V / STC-MCS510U3V
Operational Temperature	Minimum	Environmental Temperature: 0 deg. ºC
	Maximum	Camera housing temperature (top plate) shall not exceed 55 deg. ºC　（*1）
Storage Temperature		Environmental Temperature: -30 to +65 deg. C, Environmental Humidity: 0 to 85%
Vibration		20Hz to 200Hz to 20Hz (5min./cycle), acceleration 10G, XYZ 3 directions 30 min. each
Shock		Acceleration 38G, half amplitude 6ms, XYZ 3 directions 3 times each
Standard Compliancy		EMS: EN61000-6-2, EMI: EN55011
RoHS		RoHS Compliant

2.4.2 STC-MBS322U3V / STC-MCS322U3V

Model Number		STC-MBS322U3V / STC-MCS322U3V
Operational Temperature	Minimum	Environmental Temperature: 0 deg. ºC
	Maximum	Camera housing temperature (top plate) shall not exceed 55 deg. ºC　（*1）
Storage Temperature		Environmental Temperature: -30 to +65 deg. C, Environmental Humidity: 0 to 85%
Vibration		20Hz to 200Hz to 20Hz (5min./cycle), acceleration 10G, XYZ 3 directions 30 min. each
Shock		Acceleration 38G, half amplitude 6ms, XYZ 3 directions 3 times each
Standard Compliancy		EMS: EN61000-6-2, EMI: EN55011
RoHS		RoHS Compliant

*1: Please insure the camera is installed with the appropriate heat dissipation. If camera has a mounted lens and a tripod with an aluminum plate, this could decrease the camera housing temperature for heat dissipation. When the internal temperature sensor on the camera shows less than 65 ºC, the camera housing temperature (top plate) will be less than 55 ºC.

Upper side of camera

Measuring point

2.5 External connector
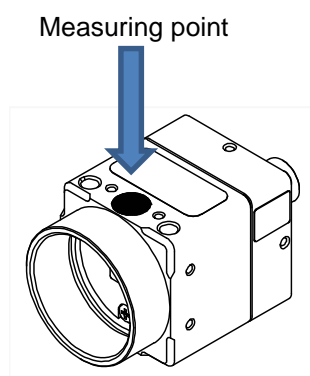
IO Connector →

← USB 3.0 microB Connector
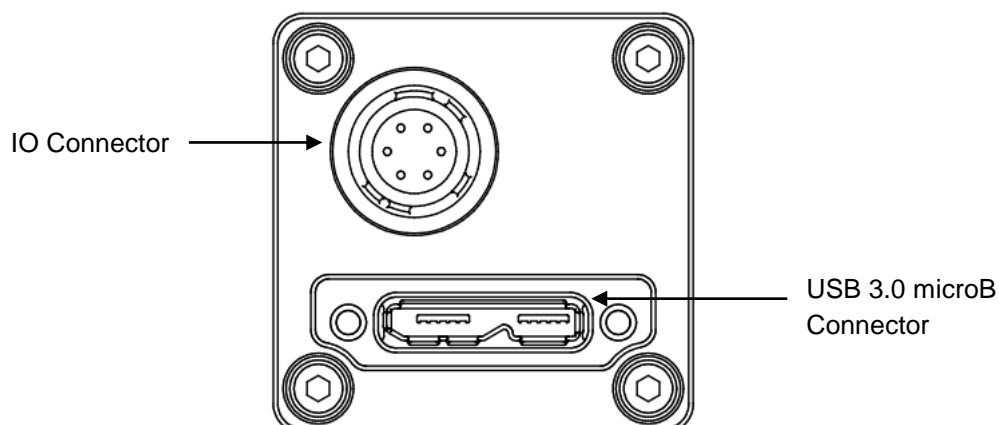
2.5.1 USB 3.0 micro B

This connector is compatible with a USB 3.0 microB connector.
Connector size includes screw lock size and complies with USB3 Vision 1.0.1.

Pin assignment

Pin No.	Signal Name	Description
1	VBUS	Power
2	D−	USB 2.0 differential pair (D−)
3	D+	USB 2.0 differential pair (D+)
4	USB OTG	USB OTG ID
5	GND	GND
6	SSTX−	SuperSpeed transmitter differential pair (−)
7	SSTX+	SuperSpeed transmitter differential pair (+)
8	GND	GND
9	SSRX−	SuperSpeed receiver differential pair (−)
10	SSRX+	SuperSpeed receiver differential pair (+)

12345   678910
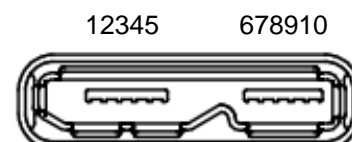
2.5.2 IO Connector

- HR10A-7R-6PB (Hirose) or equivalent.
- This connector is for input and output signals.
- The trigger input and sync input /output signals can be assigned through the camera setting communication.
  As for the cable part (Female connector), HR10A-7P-6S (Hirose) or equivalent can be used.

Pin assignment

Pin No.	Signal Name	IN/OUT
1	GPIO_GND	-
2	GPIO2	IN/OUT
3	GPIO1	IN/OUT
4	GPIO0	IN/OUT
5	CAM_RESET	IN
6	N.C.	-

*Possible Maximum Rated Voltage is +24V.on CAM_RESET, GPIO0, GPIO1 and GPIO2.
*Please set electrically "OPEN" on NC (Pin 6).
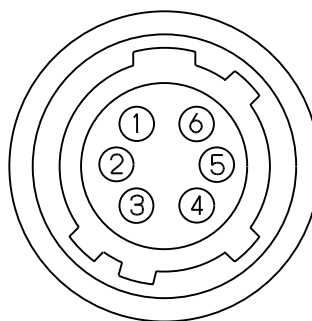
Input Output DC characteristics

Pin No.	Signal Name	Function	IN/OUT		Voltage		Current	Reference
					Low Voltage	High Voltage		
1	IO_GND	GND	-				-	-
2	GPIO2	General Purpose Input Output	IN/OUT	IN	Less than+1.00V	+3.00 to +24V	4uA(typ.)(*4)	2
				OUT	0 to +2.20V(*1)	+3.00 to +24V(*2)	15mA (Max.)(*3)	3,4
3	GPIO1	General Purpose Input Output	IN/OUT	IN	Less than+1.00V	+3.00 to +24V	4uA(typ.)(*4)	2
				OUT	0 to +2.20V(*1)	+3.00 to +24V(*2)	15mA (Max.)(*3)	3,4
4	GPIO0	General Purpose Input Output	IN/OUT	IN	Less than+1.00V	+3.00 to +24V	4uA(typ.)(*4)	2
				OUT	0 to +2.20V(*1)	+3.00 to +24V(*2)	15mA (Max.)(*3)	3,4
5	CAM_RESET	Camera Hardware Reset	IN	IN	Less than +0.80V	+3.00 to +24V	4uA(typ.)(*4)	1
6	N.C.	NC	-		-		-	-

(*1): If the current on the IO port is at 15mA when using low voltage output, the output voltage could increase for the internal register.
(*2): This is the maximum charging voltage when the external IO port is connected. Equivalent VCCext is on Reference 4.
(*3): When the external IO port is connected, control the current less than 15mA on the IO port.
(*4): This value is the typical current value of the Input Port when High Voltage is input.

Default Setting of Input Output

Pin No.	Signal Name	Default	
		IN/OUT	Setting
2	GPIO2	IN	Disable
3	GPIO1	IN	Disable
4	GPIO0	IN	Disable

2.5.3 Reference Input Circuit
CAM_RESET (Reference 1)
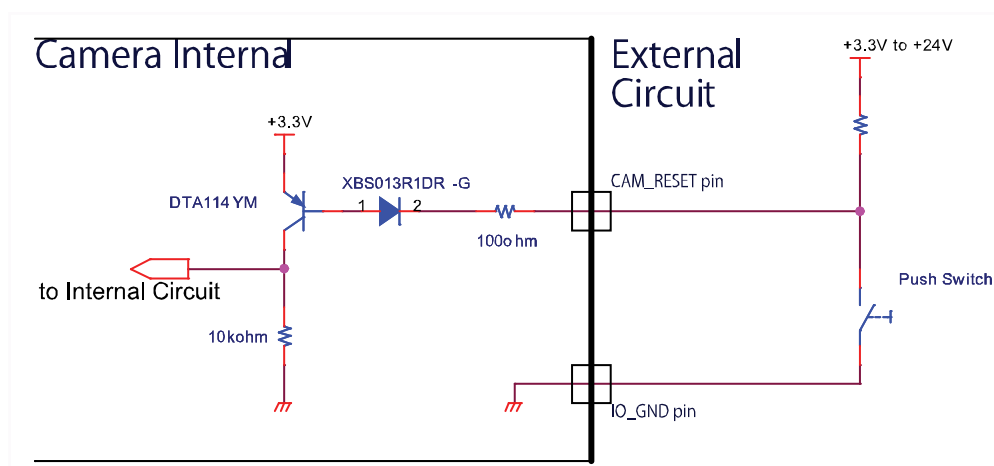
General Purpose Input (Reference 2)
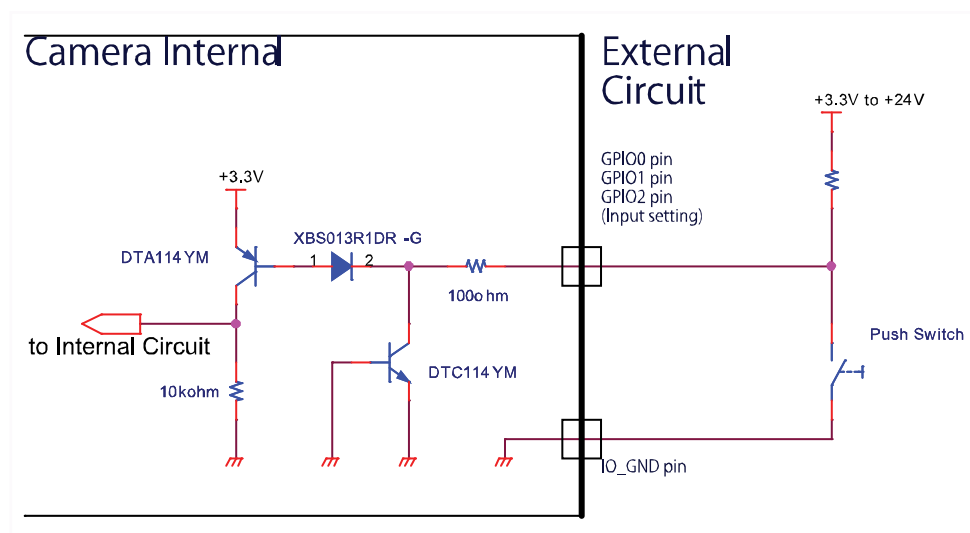
Input Response Characteristics

Response characteristics of CAM_RESET (Reference1), General Purpose Input (Reference 2) are shown in the following diagrams

tIPDHL	0.13 usec
tIPDLH	6.54 usec
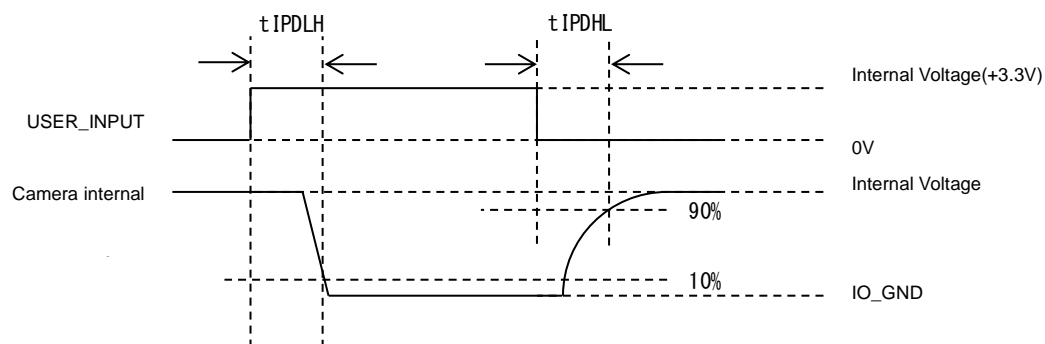
Capable input trigger's pulse width is
Positive Trigger: More than tIPDLH
Negative Trigger: More than tIPDHL

2.5.4 Reference Output Circuit
General Purpose Output (Reference 3)
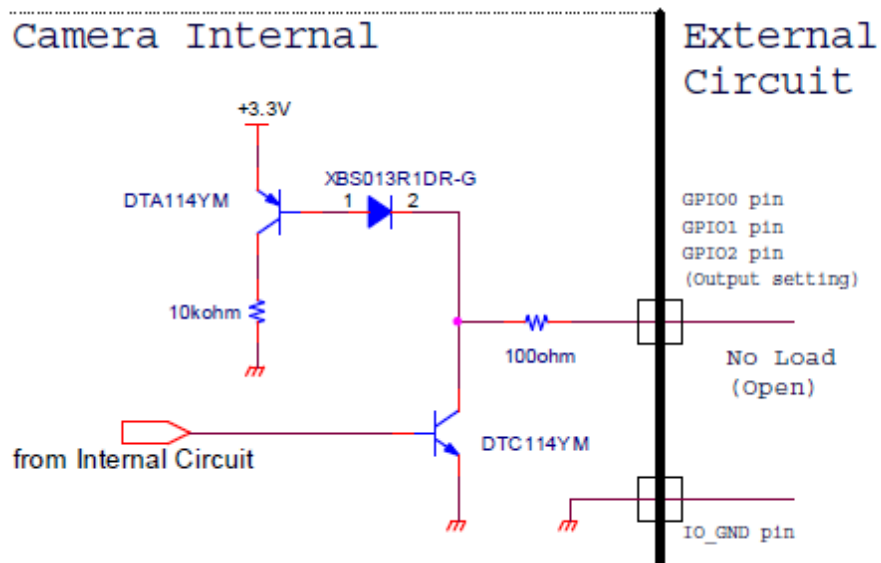
General Purpose Output (Reference 4)
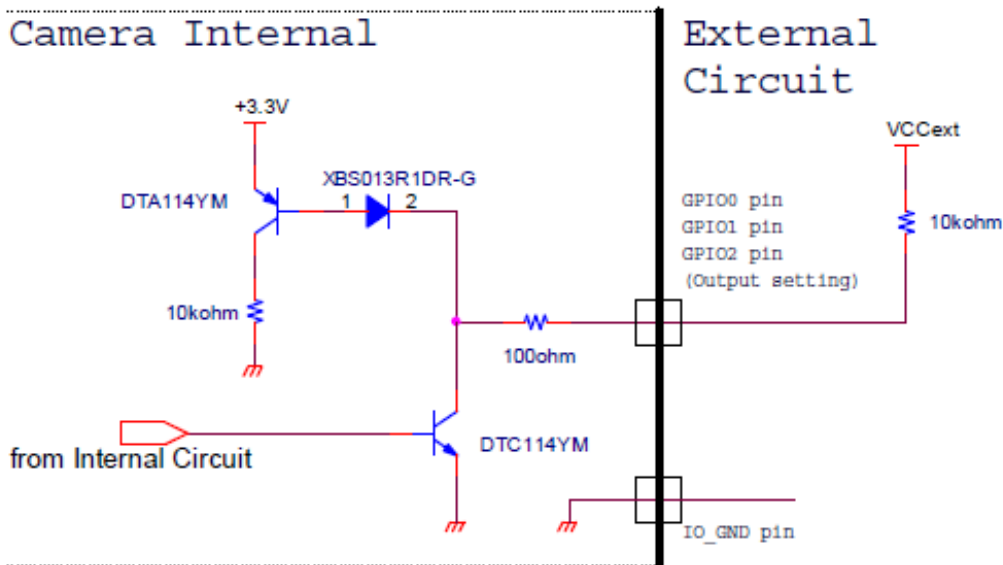
Output Response Characteristics

Response characteristics of the General Purpose output (Reference 3), and General Purpose output (Reference 4) are shown in the diagram below. Pulse width is configurable through software.

Please refer to the following response timing table.

	VCCext			
	OPEN(*1)	5V (*2)	12V (*2)	24V (*2)
tOPDHL	0.21 usec	0.25 usec	0.37 usec	0.51 usec
tOPDLH	10.40 usec	2.69 usec	2.68 usec	2.61 usec
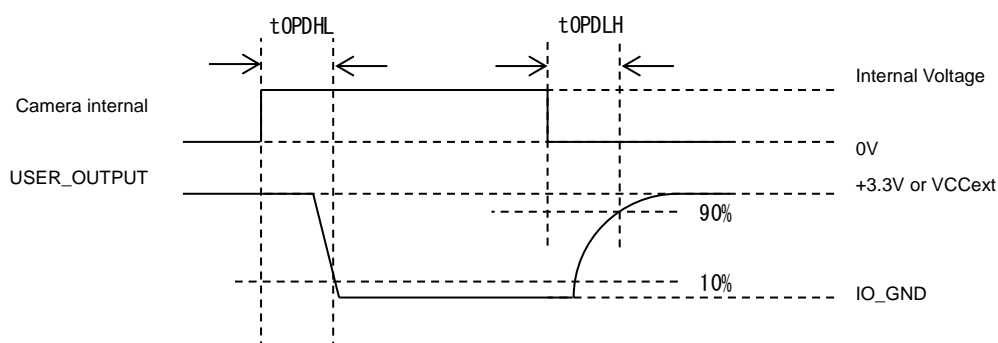
(*1) Reference 3. Measured on +3.3V internal Voltage.

(*2) Reference 4

3 Dimensions

3.1 STC-MBS510U3V / STC-MCS510U3V / STC-MBS322U3V / STC-MCS322U3V

Unit: mm
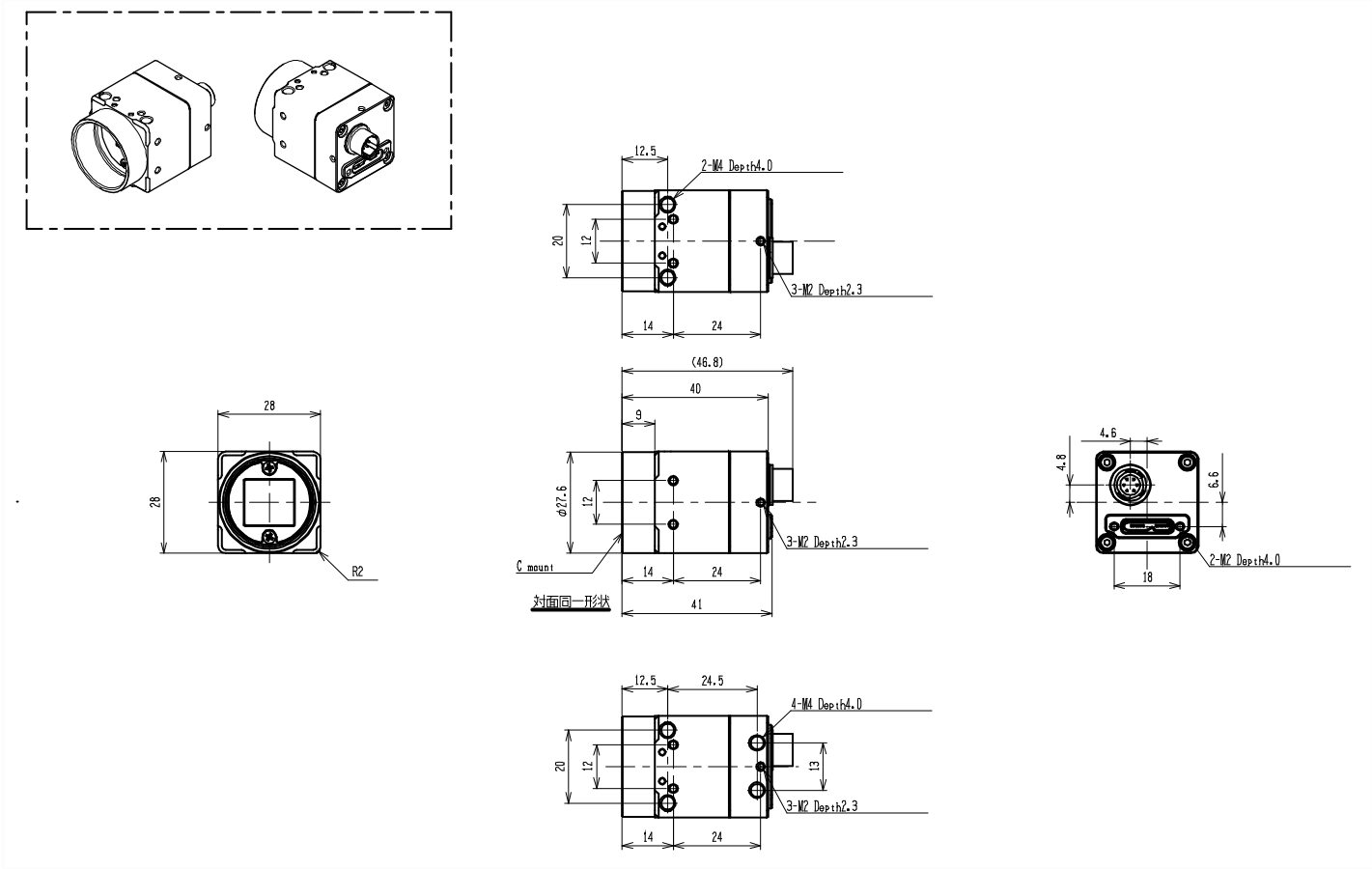
4　Sensor Information

4.1　Pixel Transferring Image

STC-MBS510U3V, STC-MBS322U3V（Monochrome）
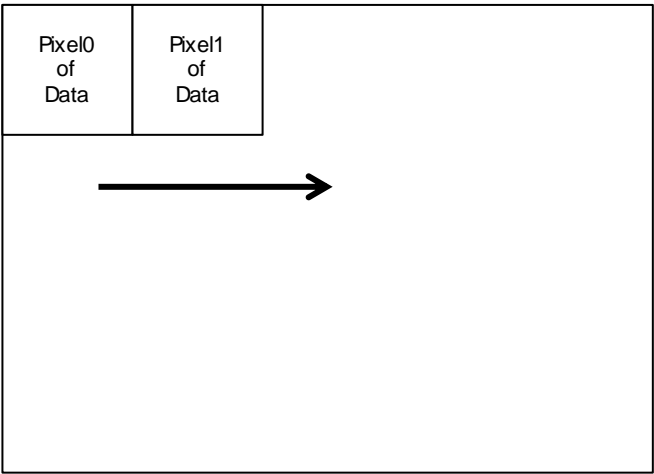
Pixel (n) of Data: nth pixel being transferred

STC-MCS510U3V, STC-MCS322U3V（Color）
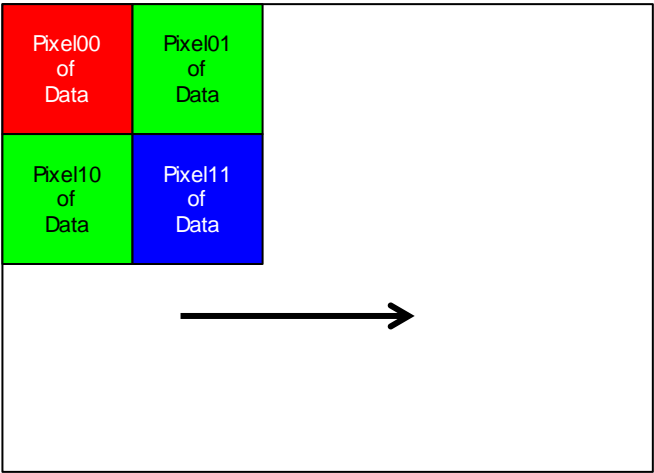
Pixel (m,n) of Data: nth pixel of the mth line being transferred

5 Image Acquisition and Camera Operational Modes

Please refer to another chapter for the method of switching Trigger.

GenICam Parameters

| TriggerSelector	IEnumeration Type	Select Trigger function
TriggerMode	IEnumeration Type	Select ON/OFF which was selected function on TriggerSelector On: Trigger function ON, Off: Trigger function Off
TriggerSource	IEnumeration Type	Set Trigger Source which was selected function on TriggerSelector Software: Trigger control through TriggerSoftware command LineN: Trigger control through hardware trigger (N: Line number)
ExposureMode	IEnumeration Type	Select Exposure mode

Please refer to IO function for the (*) Line.

5.1 Freerun

Freerun mode outputs the camera video image continuously.

In order to run Freerun Mode, all trigger functions must be set to OFF via the Trigger mode.

Exposure time determines Exposure Mode. When Exposure Mode is turned off, the frame exposure will complete. When Exposure Mode is set to Timed, the Exposure Time value will be set as the exposure time.
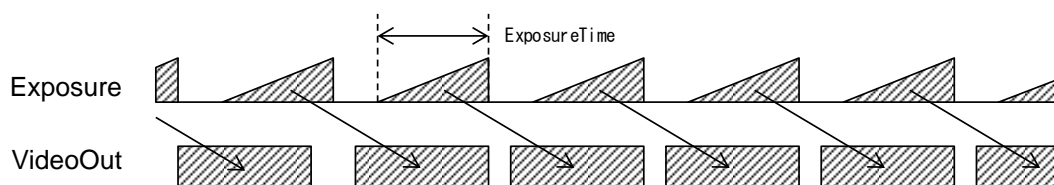
(*) The camera is set to Freerun mode as the default mode.

5.2 Trigger Mode

This trigger consists of Frame Start, Exposure Start and Exposure End.

1) Frame Start

This function has the capability to acquire an image from exposure through the trigger.

The Frame Start function can be enabled when "Frame Start" is selected on Trigger Selector and the Trigger mode is set to "On".

This function supports "Edge Preset" trigger and "Pulse Width" trigger with trigger signal. This function can control exposure through Exposure Mode.

2) Exposure Start, Exposure End

This function has the capability to acquire an image from Exposure Start to Exposure End. Exposure Start trigger is pair of Exposure End.

Exposure Start and Exposure End are selectable on Trigger Selector. Exposure Start function and Exposure End function can be enable through each Trigger Mode On.

This function is only enabled when Exposure Mode sets Trigger Controlled. If Exposure Mode did not set Triger Controlled, camera exposure and image acquisition don't work.

(*)Please do not apply the Trigger through maximum frame rate on Trigger Mode. When Trigger applies within sensor Readout as exposure end, camera interrupted Readout.

5.2.1 Frame Start Trigger (Edge Preset)

The exposure synchronizes trigger signal.
The value on Exposure Time is actual exposure time.
When the polarity on Line Inverter is positive (false), the Exposure starts on the rising edge of trigger.
When the polarity on Line Inverter is negative (true), the Exposure starts on the falling edge of trigger.

To work the camera under this mode, as following setting have to be set.
・Exposure Mode: Timed
・Trigger Selector: Frame Start
・Trigger Mode: On
(*) On Trigger Mode except Frame Start should be set Off.

Timing

5.2.2 Frame Start Trigger (Pulse Width Trigger)

When operating in this mode, the exposure synchronizes the trigger signal.

The exposure time can be controlled by the pulse width of Frame Start trigger.

When the polarity on the Line Inverter is positive (false), the exposure can be controlled at a period of High level of input trigger signal.
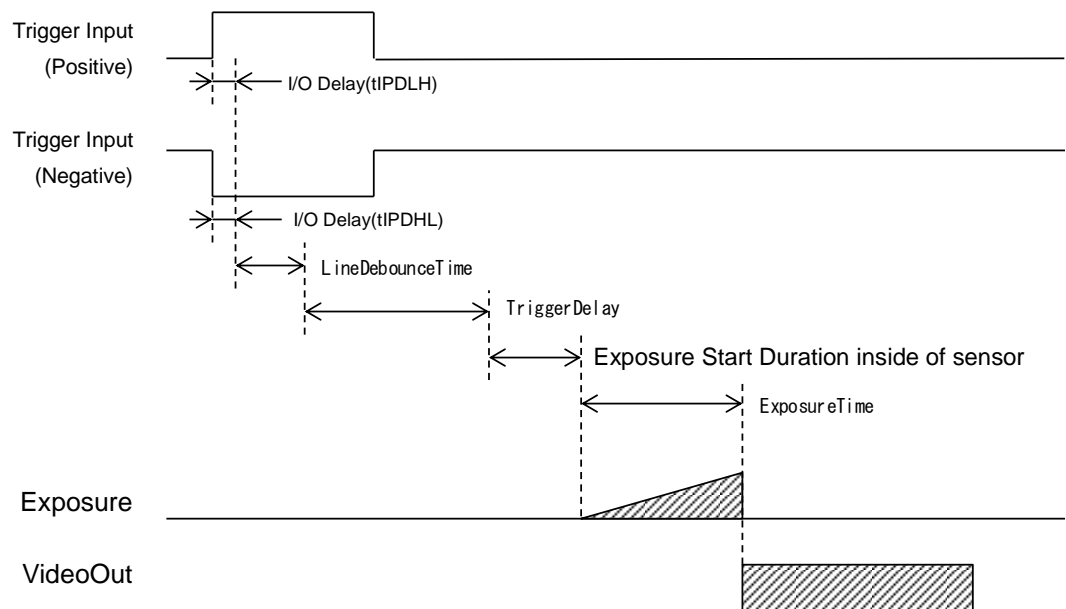
When the polarity on the Line Inverter is negative (true), the exposure can be controlled at a period of Low level of input trigger signal.

To operate the camera in this mode, the following settings have to be set.

・Exposure Mode: Trigger Width
・Trigger Selector: Frame Start
・Trigger Mode: On
 (*) On Trigger Mode except Frame Start should be set Off.

Timing

5.2.3 Exposure Start Trigger, Exposure End Trigger

Exposure Start trigger determines exposure start timing, Exposure End trigger determines exposure end timing.

To operate the camera under this mode, the following settings have to be set.

・Exposure Mode: Trigger Controlled
・Selects Trigger Selector: Exposure Start, and Trigger Mode: On
・Selects Trigger Selector: Exposure End, and Trigger Mode: On
 (*) On Trigger Mode except Frame Start should be set Off.

Timing
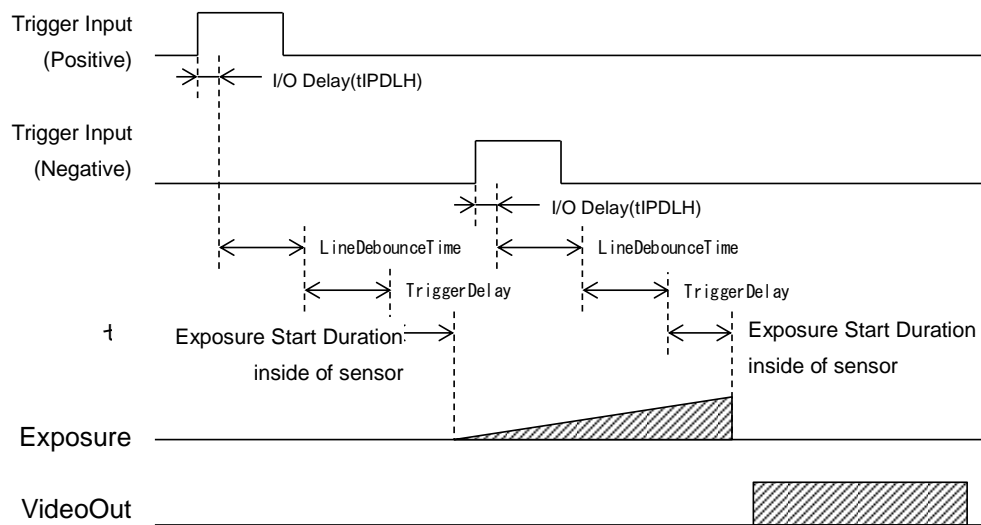
(*)When all of Trigger Mode (Frame Start trigger, Exposure Start trigger, Exposure End) are On, camera's behavior depends on Exposure Mode setting.
When the Exposure Mode sets the Trigger Control, this function works through Trigger Start/End Trigger
This function works through Frame Start trigger for the remainder of the Exposure Mode.

5.2.4 Trigger Software

This function can apply either external signal or a software command as the trigger.
The software trigger can be applied through the "execute Trigger Software" command when the trigger is selected on the Trigger Selector.

6 IO Function

This chapter describes the IO functions.

In this chapter the IO Port will be described as "Line". The follow chart details the relationship of the Line and IO Port.

IO Port Pin No.	Signal Name	Line number
2	GPIO2	Line2
3	GPIO1	Line1
4	GPIO0	Line0

GenICam Parameters

LineSelector	IEnumeration Type	Select Line
LineMode	IEnumeration Type	Switch input output direction into the Line that was selected on LineSelector. Input: set as input, Output: set as output
LineInverter	IBoolean Type	Switch polarity inversion ON/OFF into the Line that was selected on LineSelector. False: polarity inversion OFF (Active-H)、True: polarity inversion ON (Active-L)
LineStatus	IBoolean Type	Line Status (High/Low)
LineSource	IEnumeration Type	Set function into the Line that was selected on LineSelector
UserOutputSelector	IEnumeration Type	Select UserOutput
UserOutputValue	IBoolean Type	Switch voltage level of UserOutput that was selected UserOutputSelector False: Low voltage level, True: High voltage level

6.1 Input Port Function

This functions sets the input on Line Mode, then assigns Line as the input.

The following functions can be assigned as input.

6.1.1 Trigger Input

This sets the chosen port on the Trigger Source, then the input signal on the port can be assigned as Trigger.

The input signal can be switched to Active-Low(Line Inverter: true) or Active-High(Line Inverter: false) .

 (*) When the Line polarity on Line Inverter is changed, this action will deal with the trigger input's transition inside of camera.

6.1.2 Line Status

This function monitors the signal status on the input port.

The High level (Line Status: true) or Low level (Line Status false) status can be seen through the software.

6.1.3 Line Debouncer

Line Debouncer can reduce the wrong signal detection inside of camera for filtering input signal(reduce the chattering and so on).

GenICamParameters

LineDebounceTime	Integer Type	Line Debounce Time Range: 0 to 10,000usec, Default: 1usec

<u>Timing</u>
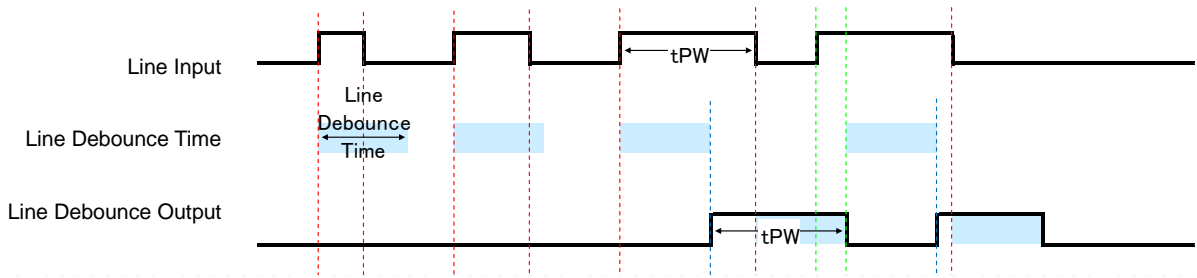
6.1.4 Trigger Delay

As was mentioned in the previous chapter, "Image acquisition and Camera Mode", each trigger can add to the duration of the input signal

This Trigger Delay can add to the duration per usec uom.

GenICam Parameters

TriggerDelay	Integer Type	Trigger Delay Range: 0 to 262,143usec, Default: 0usec

6.2 Output Port Function

This function sets the Output to Line Mode, then the Line is assigned as the input.

The following functions can be assigned when the IO port is used as the output

6.2.1 Line Source

The following list shows the configurable functions available through the Line Source.

The function that is described as "Enable" on Changeable Polarity is the configurable polarity on the Line Inverter(true, false).

No.	Function Name	Changeable Polarity
1)	Off (Default)	-
2)	User Output	-
3)	Trigger Out	Enable
4)	Exposure End Out	Enable
5)	Frame End Out	Enable
6)	Transfer End Out	Enable
7)	Strobe Out	Enable
8)	Exposure Active	Enable

1) Off (Disable)
   Disable to output the signal.

2) User Output (General Output)
   Output the High or Low level signal that was previously set on the software.

3) Trigger Out (Trigger Output)
   This function outputs the signal added by the Trigger Out Delay(Output pulse duration) and the Trigger Out on Time (Output pulse width).

4) Exposure End Out (Exposure End)
   This function outputs the signal added by the Trigger Out Delay(Output pulse duration) and the Trigger Out on Time (Output pulse width) after exposure has finished.

5) Frame End Out (Sensor Readout End)
   This function outputs the signal added by the Trigger Out Delay(Output pulse duration) and the Trigger Out on Time (Output pulse width) when sensor read out is finished.

6) Transfer End Out (Transfer End Output)
   This function outputs the signal added by the Trigger Out Delay(Output pulse duration) and the Trigger Out on Time (Output pulse width) when the single image frame transfer from camera is finished.

7) Strobe Out (Strobe Output)
   This function outputs the signal added by the Strobe Out Delay(Strobe output duration) and the Strobe Out on Time (Strobe output pulse width) when the trigger signal is received.

8) Exposure Active (In Exposure Period)
   Outputs the exposure timing.
   (*) Actual exposure period = Output signal pulse width + Minimum exposure time 13.73 usec

Line Source Timing
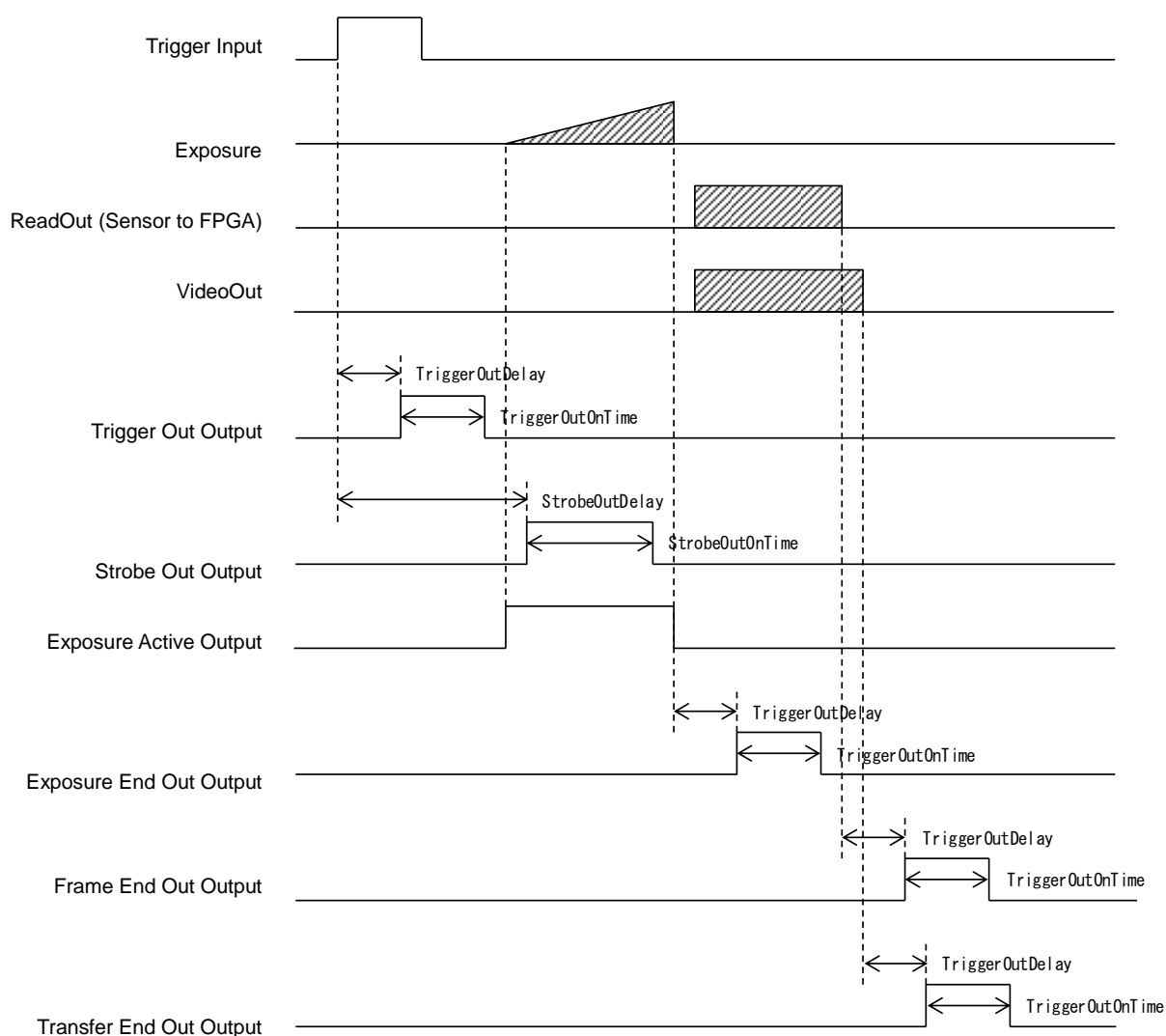
(*) This timing chart does not describe the duration on the IO circuit

(*) The trigger port in this chart describes Frame Start trigger as an example

(*) Trigger Out, Strobe Out output don't response with Exposure Start trigger, Exposure End trigger

6.2.1 User Output

The User Output outputs the High or Low level signal that was configured on the software.

Setting Procedure

Selects Line N(N: any number from 0,1,2)

1) **Sets the User Output N(N is Line number) as Line Source**
2) **Selects User Output N(N is same as selected Line number on User Output) on User Output Selector**
3) **Sets the value (**True: High level, False: Low level**) on User Output Value**

6.2.2 Line Status

Monitor the status on output port.
Monitor the output voltage level High (Line Status: true) or Low (Line Status: false) through the software.

6.2.3 Output signal duration setting and Pulse width setting

Some selectable functions can be modified in order to add to the duration or pulse width on Line Source.
The configurable parameters are shown in the chart below.
Please refer to Line Source for the applicable functions of Parameters.

GenICamParameters

TriggerOutDelay	Integer Type	Trigger Out Delay Range: 0 to 262,143usec, Default: 0usec
TriggerOutOnTime	Integer Type	Trigger Out On Time Range: 4 to 262,143usec, Default: 32usec
StrobeOutDelay	Integer Type	Strobe Out Delay Range: 0 to 262,143usec, Default: 30usec
StrobeOutOnTime	Integer Type	Strobe Out On Time Range: 4 to 262,143usec, Default: 32usec

6.3 Hardware Reset

Hardware reset can be done through CAM_RESET port.
Sets on (Default : Off) on Line Device Reset Mode, and rest the camera to apply the Low voltage in 5 sec on CAM_RESET port.

7 Camera Operation

This chapter describes camera operation.

7.1 ROI (Region of Interest)

This sets the ROI in order to output the selected image.

ROI will decrease the height of the image, while increasing the frame rate. This will also decrease the width pof the image, but that does not affect the frame rate.

7.1.1 ROI (One Region)

GenICam Parameters

Width	Integer Type	Horizontal(Pixel) size Sets the maximum value less than (Width + OffsetX)
Height	Integer Type	Vertical(Line) size Sets the maximum value less than (Height + OffsetY)
OffsetX	Integer Type	Horizontal(Pixel) offset Default: 0 Setting interval: 4 pixel unit
OffsetY	Integer Type	Vertical(Line) offset Default: 0 Setting interval: 4 line unit

The parameters defines as following chart.
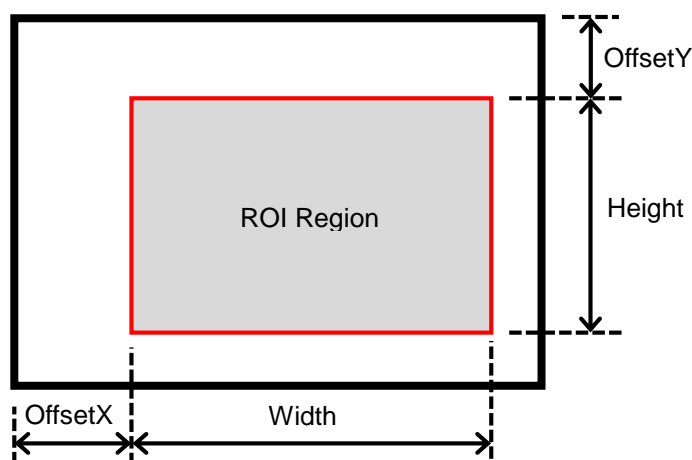
(*) Width, Height, OffsetX, OffestY's setting interval is the same in Binning and Decimation.

Range: Width / Height setting range for each model

		STC-MBS510U3V STC-MCS510U3V	STC-MBS322U3V STC-MCS322U3V
Width	Setting Range:	64to2448 (*) Maximum value is up to 2432 on Packed output	64to2048
	Default:	2448	2048
	Setting Interval	16 Pixel unit (*) 64 Pixel unit on Packed output	16 Pixel unit (*) 64 Pixel unit on Packed output
Height	Setting Range:	32to2048	32to1536
	Default:	2048	1536
	Setting Interval	4 Line unit	4 Line unit

7.1.2 Multi ROI

When utilizing the Multi-ROI function, please make note of the following:

This image format is Sentech original format, it does not comply with USB3Vision. Therefore this Multi ROI will not work on 3rd party applications that conform to USB3Vision.

To use Multi ROI, one of following application is required.
・The application that built on Sentech's SDK
・The application that built on Sentech's DirectShowFilter
・The application that built on Sentech's GenTL module (*1)
   (*1) Sentech's original format data process has to be implemented into application
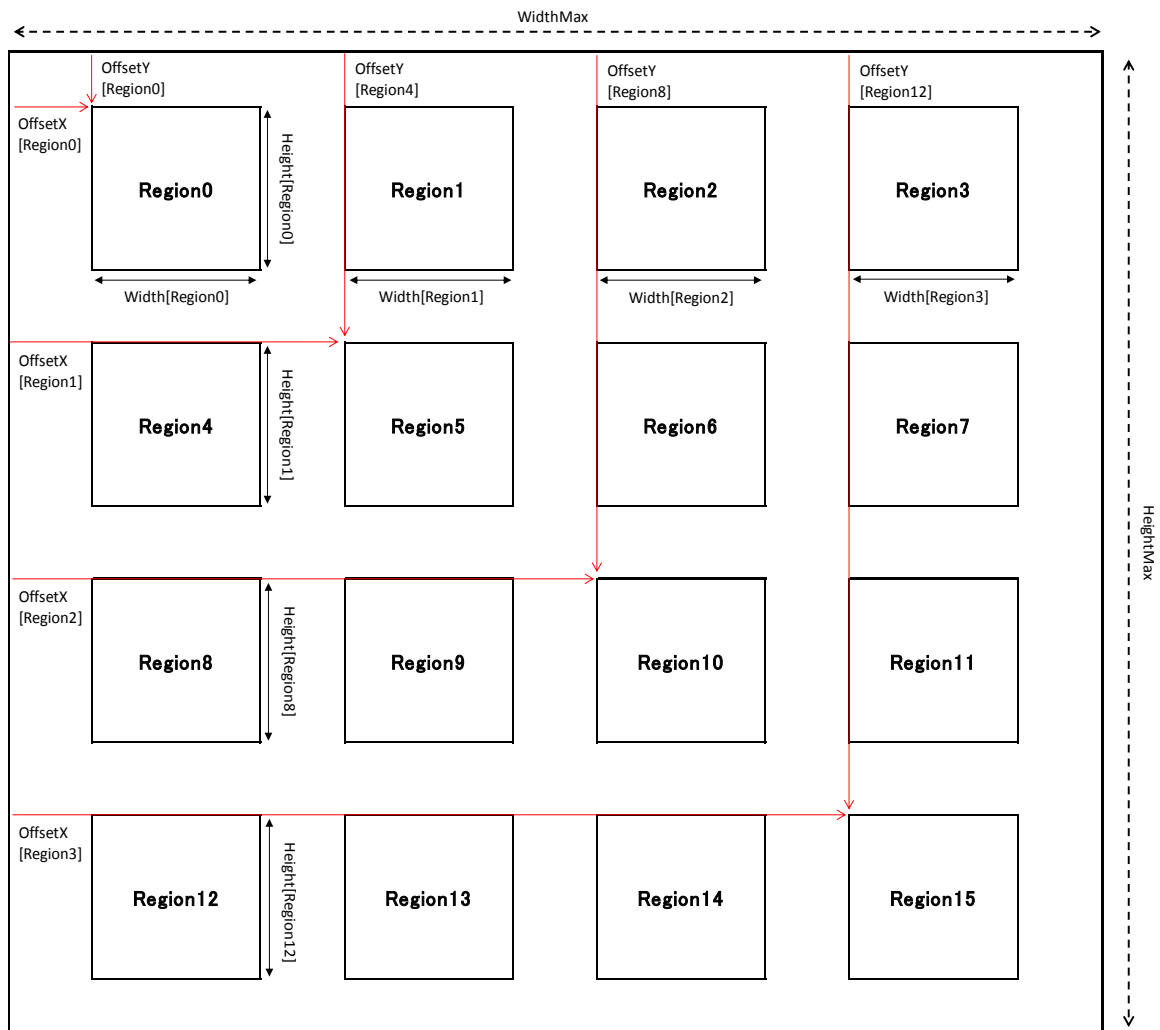
Multi ROI can be configure 16 regions as Region 0 to 15.

Restriction of ROI operation
・Region 0 is always ON
・Region(X+Y) can be enable (ON) after sets ON Region(X) and Region(Y).
(X, Y : Region number, X is any number from 1 to 3, Y is any number from 4,8,12)

・The following restriction exist to set region's Width, Height, OffsetX and OffsetY
   Width[RegionN] = Width[Region(N+4)] = Width[Region(N+8)] = Width[Region(N+12)]

Height[RegionN] = Height[Region(N+4)] = Height[Region(N+8)] = Height[Region(N+12)]
OffsetX[RegionN] = OffsetX[Region(N+4)] = OffsetX[Region(N+8)] = OffsetX[Region(N+12)]
OffsetY[RegionN] = OffsetY[Region(N+4)] = OffsetY[Region(N+8)] = OffsetY[Region(N+12)]
(N: Region Number 0to3)

・Overlapped region setting is invalid

・When setting the Horizontal flip, Vertical flip, Horizontal Vertical flip, position of region 0 to 15 are changed.
　Please refer to the drawing that follows.

・All of selected data outputs as single image data.

・If Binning / Decimation is enable, obtained Width and Height values are as "Binning/Decimation" ed value.

Region number and position setting on Horizontal Vertical flip.
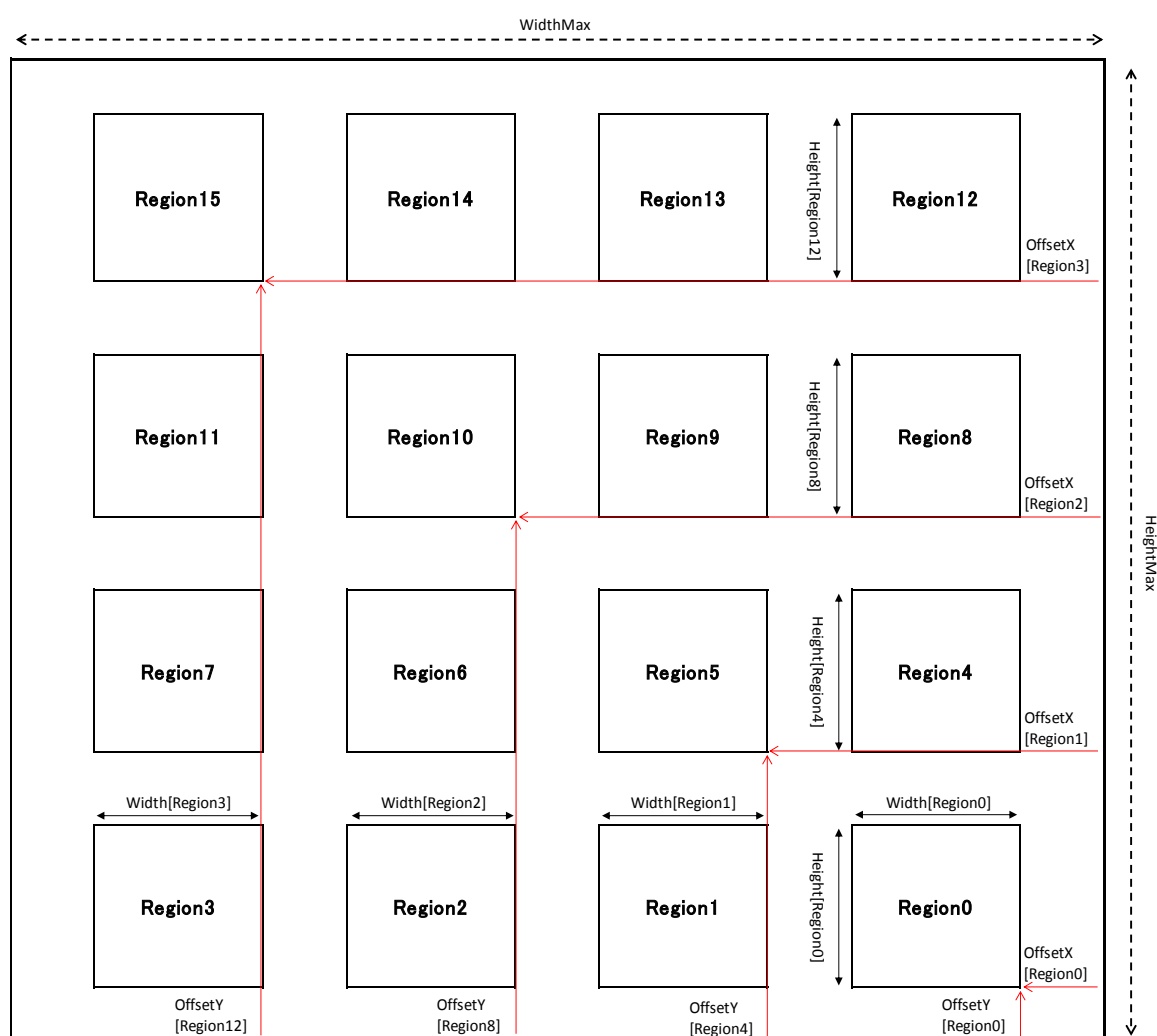
7.2 Pixel Format

The Camera output image data format can be set on the Pixel Format.

GenICam Parameters

PixelFormat	IEnumeration Type	Pixel Format

The following chart shows the available Pixel Formats on the camera:

Output Bit	Pixel Format	
	Monochrome Camera	Color Camera
8bit	Mono8	BayerRG8
10bit	Mono10	BayerRG10
10bit Packed	Mono10p	BayerRG10p
12bit	Mono12	BayerRG12
12bit Packed	Mono12p	BayerRG12p

Each format is specified on GenIcam PFNC.

7.3 Binning

Binning can add and average beside of pixel data into one pixel.
The pixel data inside of red square add or average as one pixel.
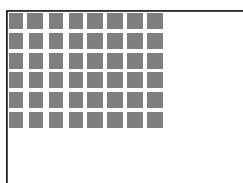
Binning X(Off), Y(Off)   Binning X(Off), Y(On)   Binning X(On), Y(Off)   Binning X(On), Y(On)
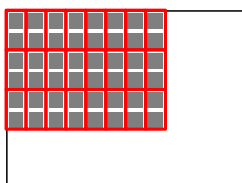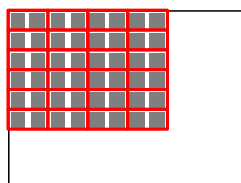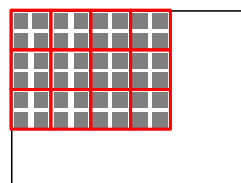
GenICamParameters

BinningHorizontal	Integer Type	Sets Binning on Horizontal direction 1: Disable Binning 2: Binning 2 Pixel
BinningVertical	Integer Type	Sets Binning on Vertical direction 1: Disable Binning 2: Binning 2 Pixel

7.4 Decimation

When using Decimation mode, the decimated image can be output.

The images below show the Decimated pixels (red squares) where they are output.

| Decimation X(Off), Y(Off) | Decimation X(Off), Y(On) | Decimation X(On), Y(Off) | Decimation X(On), Y(On) |

| Decimation X(Off), Y(Off) | Decimation X(Off), Y(On) | Decimation X(On), Y(Off) | Decimation X(On), Y(On) |
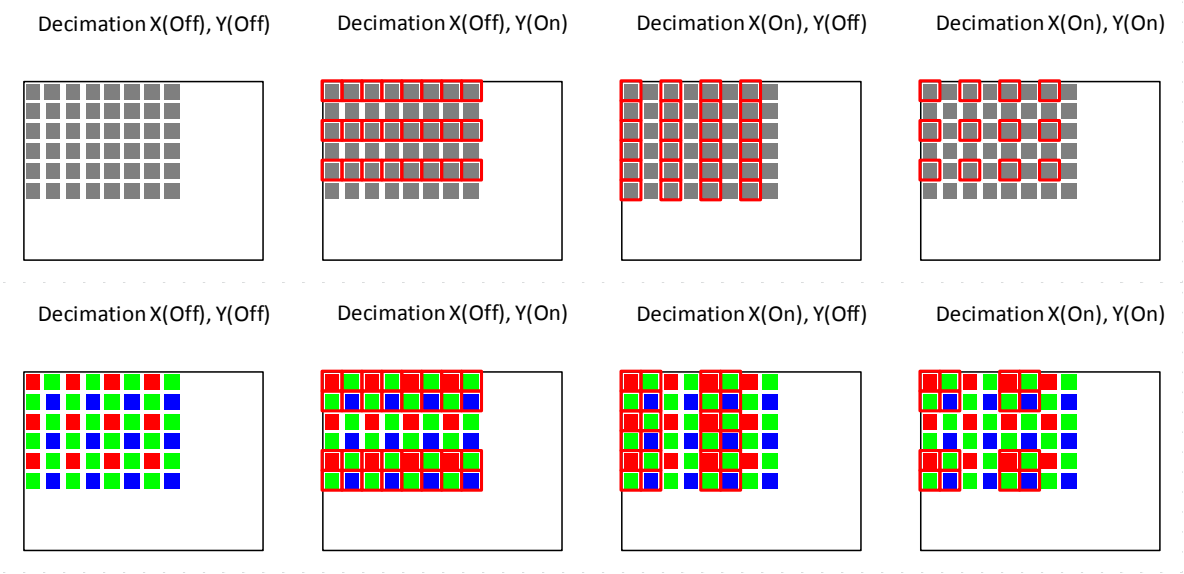
GenICam Parameters

DecimationHorizontal	Integer Type	Sets decimation on horizontal direction
		1: Decimation Off 2: 2Decimate one pixel
DecimationVertical	Integer Type	Sets decimation on vertical direction
		1: Decimation Off 2: 2Decimate one pixel

(*) Binning and Decimation cannot work simultaneously

7.5 Image Flip

Mirror flip the image through ReverseX and ReverseY.

GenICam Parameters

ReverseX	IBoolean Type	Switch ON/OFF on Horizontal False: Horizontal Flip Off, True: Horizontal Flip On. Default: False
ReverseY	IBoolean Type	Switch ON/OFF on Vertical False: Horizontal Flip Off, True: Horizontal Flip On. Default: False

Reverse X(Off), Y(Off)
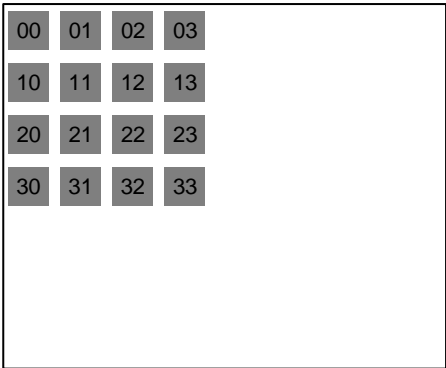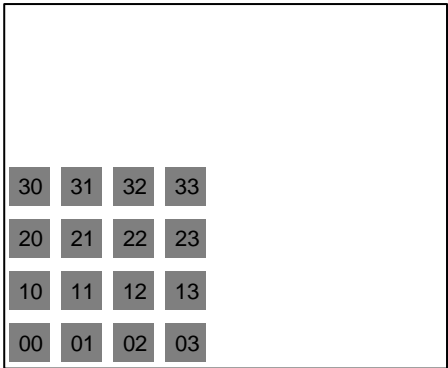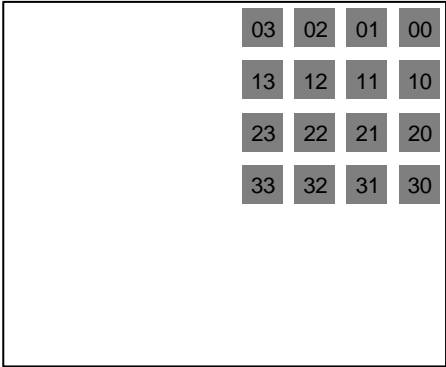
00	01	02	03
10	11	12	13
20	21	22	23
30	31	32	33

Reverse X(Off), Y(On)

30	31	32	33
20	21	22	23
10	11	12	13
00	01	02	03

Reverse X(On), Y(Off)

03	02	01	00
13	12	11	10
23	22	21	20
33	32	31	30

Reverse X(On), Y(On)

33	32	31	30
23	22	21	20
13	12	11	10
03	02	01	00

Reverse X(Off), Y(Off)

00	01	02	03
10	11	12	13
20	21	22	23
30	31	32	33

Reverse X(Off), Y(On)

30	31	32	33
20	21	22	23
10	11	12	13
00	01	02	03

Reverse X(On), Y(Off)

03	02	01	00
13	12	11	10
23	22	21	20
33	32	31	30

Reverse X(On), Y(On)

33	32	31	30
23	22	21	20
13	12	11	10
03	02	01	00
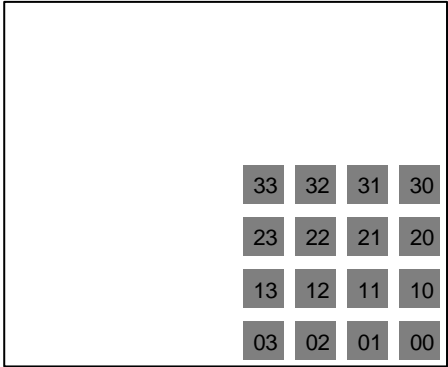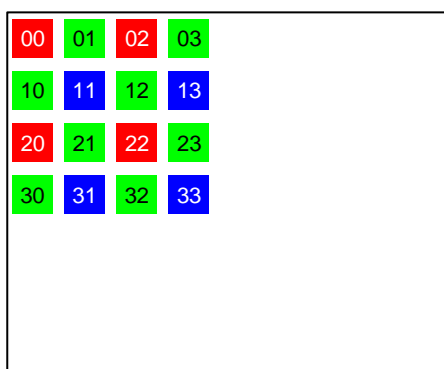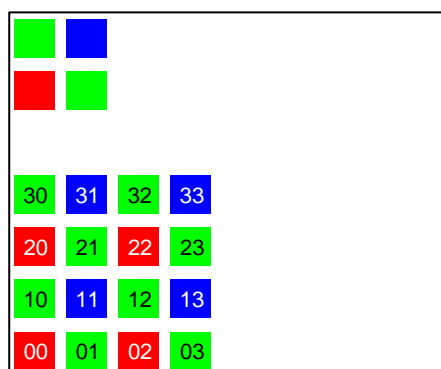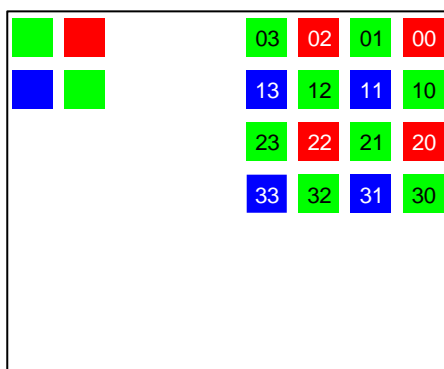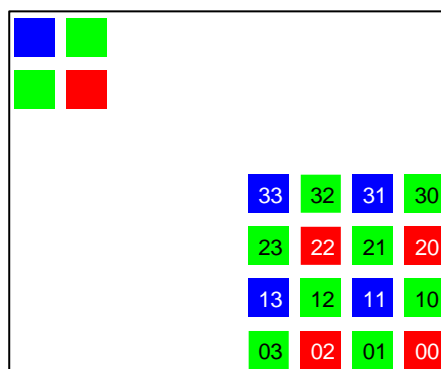
(*) When the image is flipped on the color camera, the pixel array is also inverted.

7.6 Gain

Gain has Analog Gain, Digital Gain and White Balance.

(*) Increasing the gain level may increase the noise level. Please check the actual image on the actual environment when adjusting brightness.

7.6.1 Analog Gain

This parameter sets the analog gain.
Selects Analog ALL on Gain Selector, sets gain on Gain[gain Selector].

GenICam Parameters

Gain[Analog All]	IFloat Type	Analog Gain Range: 0to240, Default: 0

Analog Gain Formula

Gain(dB) = Gain[Analog All] / 10

7.6.2 Digital Gain

This parameter sets the digital gain.
Selects Digital ALL on Gain Selector, sets gain on Gain[gain Selector].

GenICam Parameters

Gain[Digital All]	IFloat Type	Digital Gain Range: 0to64, Default: : 0

Digital Gain Formula

Gain(xtimes) = 1 + (Gain[Digital All] ／ 64)

7.6.3 White Balance Gain (Only available for the color cameras)

This parameter sets the Bayer patter color gain.
Sets gain on Balance Ratio against selected color on Balance Ratio Selector.
As for the detail of manipulation, Auto White Balance".

GenICam Parameters

BalanceRatio[BalanceRatioSelector]	IFloat Type	White Balance Gain Range: 0 to 511, Default: Red: 229, Green: 128, Blue: 272

White Balance Gain Formula

Gain(xtimes) = BalanceRatio[BalanceRatioSelector] ／ 128

7.7 Black Level

This parameter sets the black level (the clamp level for the black signal).

Sets the black level on Black Level[Black Leel Selector] against Node on Black Level Selector.

The bottom of the signal is clamped at this setting level. The signal does not become below this level.

(*) Black Level Selector support for Analog All

GenICam Parameters

BlackLevel[Black Level Selector]	IFloat Type	Black Level Default: 7 (on 8bit output)
		Range:
		  8bit output 0 to 31
		  10bit output 0 to 127 (10bit Packed outputs same as this mode)
		  12bit output 0 to 511 (12bit Packed outputs same as this mode)

7.8 ALC (Auto Light Control)

ALC has AGC and Auto Exposure function, it can be set individually.

ALC sets the camera parameters to adjust the brightness automatically.

GenICam Parameters (for AGC and Auto Exposure)

AutoLightTarget	Integer Type	Target Brightness Range: 0 to 255, Default: 127

Target Brightness Formula (Auto Light Target)

8bit output   :   Target Brightness(Gradient)   =   Auto Light Target

10bit output :   Target Brightness(Gradient)   =   Auto Light Target $\times$ 4

12bit output :   Target Brightness(Gradient)   =   Auto Light Target $\times$ 16

7.8.1 ALC Control Method

AGC and Auto Exposure contribute to achieve Auto Light Target.

When AGC and Auto Exposure are ON, at first, Auto Exposure control have to be done, If AGC can not achieve Auto Light Target, AGC control take over the brightness control.

7.8.2 AGC (Auto Gain Control)

Adjust the gain to accommodate target brightness automatically.

When it was darker than target value, increase the gain up to Gain Auto Limit Max.

When it was brighter than target value, decrease the gain up to Gain Auto Limit Min.

GenICam Parameters

GainAuto	IEnumeration Type	Switch ON/OFF on AGC Continuous: AGC ON, Off: AGC OFF. Default: Off
GainAutoLimitMax	IFloat Type	Sets the maximum gain on AGC Range: 0 to 240, Default: 127 This value sets as maximum value on AGC.
GainAutoLimitMin	IFloat Type	Sets the minimum gain on AGC Range: 0to240, Default: 0 This value sets as minimum value on AGC.

7.8.3 Auto Exposure

Adjust the gain to accommodate target brightness automatically.

When it was darker than target value, extend exposure time up to Exposure Auto Limit Max.

When it was darker than target value, reduce exposure time up to Exposure Auto Limit Min.

GenICamParameters

ExposureAuto	IEnumeration Type	Switch ON/OFF on Auto Exposure Continuous: Auto Exposure ON, Off: Auto Exposure OFF. Default: Off
ExposureAutoLimitMax	IFloat Type	Sets the maximum exposure time on μ second unit Range: Same as Exposure Time Range for each PixelFormat
ExposureAutoLimitMin	IFloat Type	Sets the minimum exposure time on μ second unit Range: Same as Exposure Time Range for each PixelFormat

7.8.4 The procedure of ALC
Please follow the procedure shown below.

Setting Procedure
1. Sets Timed on Exposure Mode (When Auto Exposure is applicable)
2. Sets Continuous on Exposure Auto (When Auto Exposure is applicable)
3. Sets Exposure Auto Limit Max (When Auto Exposure is applicable)
4. Sets Exposure Auto Limit Min (When Auto Exposure is applicable)
5. Sets Continuous on Gain Auto (When AGC is applicable)
6. Sets Gain Auto Limit Max (When AGC is applicable)
7. Sets Gain Auto Limit Min (When AGC is applicable

7.9 White Balance (Only available for the color cameras)

The color compensates the gain adjustment for each individual color.

The gain for each color has to adjust with the flat white target to the each color has the same brightness.

The white balance control methods are the listed in the below:

・Disable
・Manual (Off)
・Auto White Balance (Continuous)
・Push to set white balance (Once)

7.9.1 White balance control methods

GenICam Parameters

BalanceWhiteAuto	IEnumeration Type	White balance control method selection. Default: : Off(Manual)
BalanceRatioSelector	IEnumeration Type	White balance control target color selection.
BalanceRatio	IFloat Type	Color gain setting for the color selects at BalanceRatioSelector

7.9.2 Disable

Sets disable on White Balance Gain, each color gain set as x1.

Setting Procedure
1.	Sets Disable on Balance White Auto

7.9.3 Manual (Off)

The optimized Balance Ratio(Red, Green, Blue) for the white balance.

Setting Procedure
1.	Sets Red (when Red gain set) on Balance White Selector
2.	Sets value on Balance Ratio
3.	Sets Green on Balance White Selector
4.	Sets value on Balance Ratio
5.	Sets Blue (when Blue gain set) on Balance White Selector
6.	Sets value on Balance Ratio
7.	Sets Off on Balance White Auto

7.9.4 Auto White Balance (Continuous)

The optimized white balance gain calculates each frame for the auto white balance

Setting Procedure
1.	Sets Continuous on Balance White Auto

7.9.5 Push to Set White Balance (Once)

The white balance gain adjusts once after selecting white balance then set to Balance White (Red, Green, Blue)
Sets OFF at Balance White Auto automatically after set White Balance Gain.

Setting Procedure
1. Sets the flat white target (To set right white balance)
2. Sets Once on Balance White Auto

7.10 Gamma Table

The gamma table inside of the camera corrects the gradient linearity.

GenICam Parameters

Gamma	IFloat	Gamma
	Type	Range: 0.1 to 4.0, Default: 1.0

Gamma Formula

Output Data   =   Input data $^{Gamma\ Value}$

7.11 Save and load the camera setting data

The camera has the camera setting including the factory default, load function.
The camera has below two camera settings.

Default: The factory default data (This data cannot change)
User Set X: Changeable data (X: 0 to 7 any integer)

These camera settings load to the register in the RAM on the camera.
The camera settings saving and loading is controllable with Parameters (User Set Selector, User Set Default), and commands (UserSetLoad, UserSetSave) in UserSetControl category of GenICam.

The details of the parameters and the functions are in the table below:

GenICam Parameters

UserSetSelector	IEnumeration Type	Select "Default" or "UserSet1" UserSetLoad or UserSetSave process for the selected data.
UserSetLoad	ICommand Type	The camera settings load from ROM to the register in RAM.
UserSetSave	ICommand Type	The camera settings at the register in RAM save to ROM.
UserSetDefault	IEnumeration Type	Select which settings ("Default or UserSet X) load automatically when the camera power is on.Selection saves automatically.

7.11.1 Saving the Camera Settings
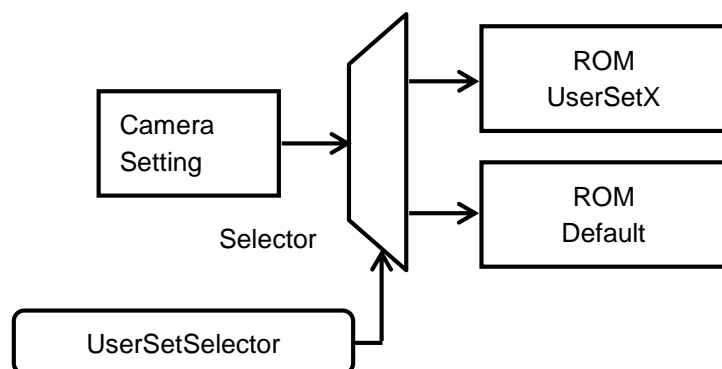
When UserSetSave is executing,
the camera settings in the RAM
register are saved to the ROM that is
selected at UserSetSelector.
Caution:
User Set Save can't be executed
when Default was selected on User
Set Selector

Setting Procedure
1. Selects "UserSetX" at UserSetSelector
2. Execute User Set Save

7.11.2 The Camera Settings Loading
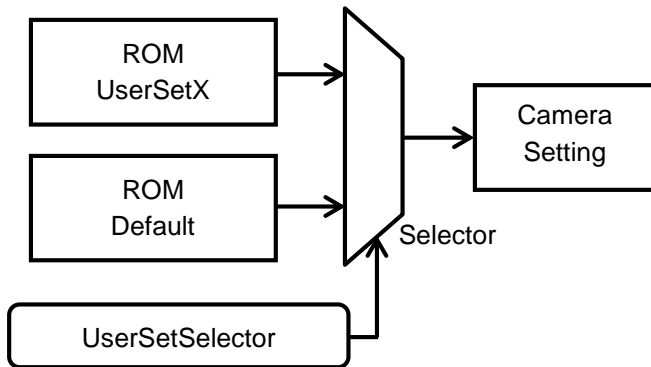
When UserSetLoad is executing, the camera settings load from the selected ROM that was assigned on User Set Selector to the register at RAM.

Setting Procedure
1. Select User Set X (or Default) at User Set Selector
2. Execute User Set Load

7.11.3 The Camera Settings Loading When the Camera Power is on
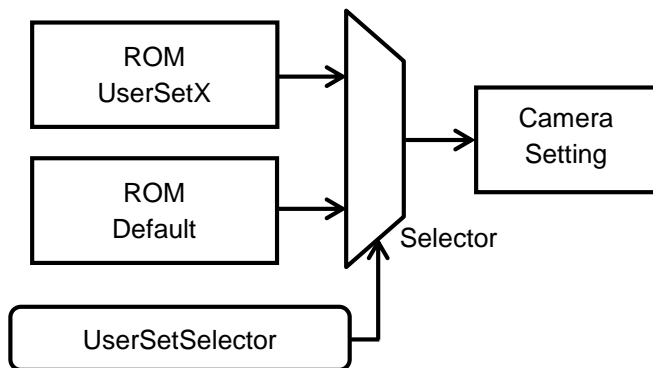
When the camera power is on, the camera settings load from the selected ROM that was assigned on User Set Default to the register at RAM.

Setting Procedure
1. Set User Set X or Default on User Set Default

7.11.4 The Camera Settings Initialization
Please follow the below procedure for the camera settings put back to the factory default.

Setting Procedure
1. Selects "Default" at UserSetSelector.
2. Executes UserSetLoad.

7.12 Pixel Defect Correction

Corrects the defect pixel, refer from horizontally beside pixel.
In the color camera, correct the defect pixel refer from horizontally beside same color pixel.

When consecutive defect pixels are selected, corrects up to 2pixels.

GenICamParameters

PixelCorrectionAllEnabled	IBoolean Type	Switch ON/OFF on Pixel Defect Correction True: ON, False: OFF
PixelCorrectionIndex	Integer Type	PixelCorrectionIndex
PixelCorrectionX	Integer Type	Defect position on X coordinate against Index was selected on PixelCorrectionIndex
PixelCorrectionY	Integer Type	Defect position on Y coordinate against Index was selected on PixelCorrectionIndex
PixellCorrectionEnabled	IBoolean Type	Switch ON/OFF on pixel defect correction against Index was selected on PixelCorrectionIndex True: ON, False: OFF

7.13 Trigger

As for the decryption of Trigger Type and Characteristic, please refer to the chapter Image acquisition and Camera Mode.

7.13.1 Trigger Signal Process

When the external hardware or software signal is input, the following process should be done.
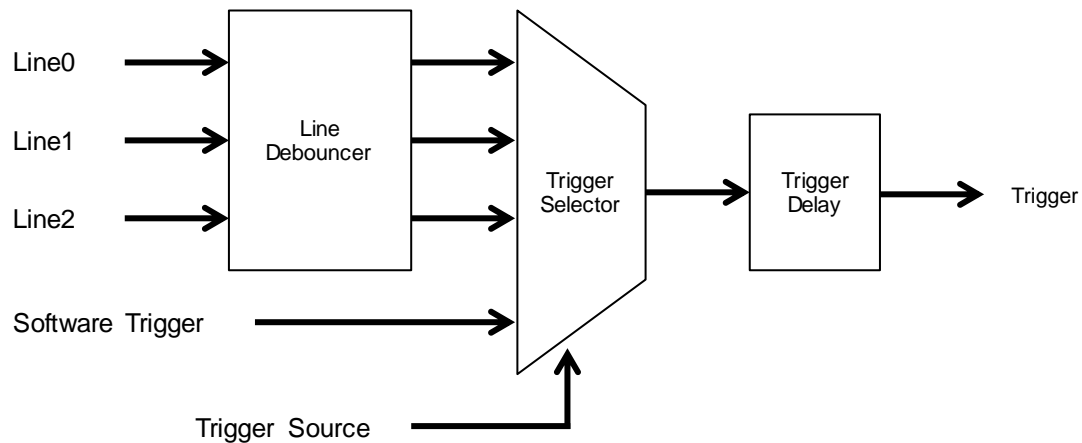
7.14 Device User ID

Device User ID provides the user access to the writable memory area.

Up to 64bytes data can be stored (The data still remains, even turned off the camera)

When the data is less than 64bytes, please add 0x00 at the end of character.

7.15 Event Control (Only USB3 Vision protocol)

The camera can inform the event inside of the camera to host.

GenICamParameters

EventSelector	IEnumeration Type	Select EventFunction
EventNotification	IEnumeration Type	Switch ON/OFF on Event function that was selected EventSelector. On: Event function ON, Off: Event function OFF

7.15.1 The way to use Event

To be enable the Event Selector, please select to be available Event on Event Selector.

7.15.2 Event Function

The camera event functions are as follows.

1) Event Exposure Start

Inform exposure start timing inside of camera as Event.

Event ID is 0x9002.

2) Event Exposure End

Inform exposure end timing inside of camera as Event.

Event ID is 0x9001.

(*) Since Event and Stream (image data) share USB bus, when the Event came up frequently, Stream's data transfer rate would be decreased.

7.16 Chunk Control (Only USB3 Vision protocol)

This function has transferring additional data with image data.

For example, the exposure time and gain information aren't included in image data itself. However Chunk data transfers parameters when image was obtained with.

GenICam Parameters

ChunkModeActive	IBoolean Type	Enable transfer Chunk data on Payload
		True: Enable Chunk data transfer, False: Disable Chunk data transfer,
ChunkSelector	IEnumeration Type	Select the transfer Chunk data
ChunkEnable	IBoolean Type	Enable Chunk data that was selected ChunkSelector
		True: Enable Chunk data, False: Disable Chunk data

7.16.1 The way to use Chunk

To enable Chunk, please Enable Chunk data after Chunk mode active.

Setting Procedure
1. To enable Chunk, set Ture on Chunk Mode Active
2. Select on Chunk data type (later) Chunk Selector
3. To enable Chunk Set True on Chunk Enable

7.16.2 Chunk Data

1) Chunk Counter Value
   Transfer the value of Counter0 inside of camera as Chunk data.
   Chunk ID is 0x00000001.

   Frame Start, Frame End, Frame Trigger can be set as Counter Event Source. Execute Counter Reset to reset Counter.

2) Chunk Gain
   Transfer the Gain when image was obtained as Chunk data.

   Chunk Gain contains Analog All, Digital All, Red, Blue, and Green
   Chunk ID is 0x00000002.

3) Chunk Black Level
   Transfer the Black Level when image was obtained as Chunk data.

   Chunk Black Level contains Analog All and Digital All.
   Chunk ID is 0x00000003.

4) Chunk Exposure Time
   Transfer the exposure time when image was obtained as Chunk data.
   Chunk ID is 0x00000004.

5) Chunk Gamma
   Transfer the Gamma when image was obtained as Chunk data.
   Chunk ID is 0x00000005.

7.17 GenICam command list
7.17.1 DeviceControl

Name	Description
DeviceType	Returns the device type.
DeviceScanType	Scan type of the sensor of the device.
DeviceVendorName	Name of the manufacturer of the device.
DeviceModelName	Model of the device.
DeviceFamilyName	Identifier of the product family of the device.
DeviceManufacturerInfo	Manufacturer information about the device.
DeviceVersion	Version of the device.
DeviceFirmwareVersion	Version of the firmware in the device.
DeviceSerialNumber	Device's serial number. This string is a unique identifier of the device.
DeviceUserID	User-programmable device identifier.
DeviceSFNCVersionMajor	Major version of the Standard Features Naming Convention that was used to create the device`s GenICam XML.
DeviceSFNCVersionMinor	Minor version of the Standard Features Naming Convention that was used to create the device`s GenICam XML.
DeviceSFNCVersionSubMinor	Sub minor version of Standard Features Naming Convention that was used to create the device`s GenICam XML.
DeviceManifestEntrySelector	Selects the manifest entry to reference.
DeviceManifestXMLMajorVersion	Indicates the major version number of the GenICam XML file of the selected manifest entry.
DeviceManifestXMLMinorVersion	Indicates the minor version number of the GenICam XML file of the selected manifest entry.
DeviceManifestXMLSubMinorVersion	Indicates the subminor version number of the GenICam XML file of the selected manifest entry.
DeviceManifestSchemaMajorVersion	Indicates the major version number of the schema file of the selected manifest entry.
DeviceManifestSchemaMinorVersion	Indicates the minor version number of the schema file of the selected manifest entry.
DeviceTLType	Transport Layer type of the device.
DeviceTLVersionMajor	Major version of the Transport Layer of the device.
DeviceTLVersionMinor	Minor version of the Transport Layer of the device.
DeviceTLVersionSubMinor	Sub minor version of the Transport Layer of the device.
DeviceGenCPVersionMajor	Major version of the GenCP protocol supported by the device.
DeviceGenCPVersionMinor	Minor version of the GenCP protocol supported by the device.
DeviceMaxThroughput	Maximum bandwidth of the data that can be streamed out of the device. This can be used to estimate if the connection can sustain transfer of free-running images from the camera at its maximum speed.
DeviceLinkSelector	Selects which Link of the device to control.
DeviceLinkThroughputLimitMode	Controls if the DeviceLinkThroughputLimit is active. When disabled, lower level TL specific features are expected to control the throughput. When enabled, DeviceLinkThroughputLimit controls the overall throughput.
DeviceLinkThroughputLimit	Limits the maximum bandwidth of the data that will be streamed out by the device on the selected Link. If necessary, delays will be uniformly inserted between transport layer packets in order to control the peak bandwidth.
DeviceLinkCommandTimeout	Indicates the command timeout of the specified Link. This corresponds to the maximum response time of the device for a command sent on that link.
DeviceCharacterSet	Character set used by the strings of the device`s bootstrap registers.
DeviceReset	Resets the device to its power up state.
DeviceRegistersStreamingStart	Prepare the device for registers streaming without checking for consistency.

DeviceRegistersStreamingEnd	Announce the end of registers streaming. This will do a register set validation for consistency and activate it.
DeviceTemperatureSelector	Selects the location within the device, where the temperature will be measured.
DeviceTemperature	Device temperature in degrees Celsius (C). It is measured at the location selected by DeviceTemperatureSelector.
TimestampLatch	Latches the current timestamp counter into TimestampLatchValue.
TimestampLatchValue	Returns the latched value of the timestamp counter.

7.17.2 ImageFormatControl

Name	Description
SensorWidth	Effective width of the sensor in pixels.
SensorHeight	Effective height of the sensor in pixels.
SensorShutterMode	Sets the shutter mode of the device.
WidthMax	Maximum width of the image (in pixels). The dimension is calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image.
HeightMax	Maximum height of the image (in pixels). This dimension is calculated after vertical binning, decimation or any other function changing the vertical dimension of the image
BinningSelector	Selects which binning engine is controlled by the BinningHorizontal and BinningVertical features.
BinningHorizontalMode	Sets the mode to use to combine horizontal photo-sensitive cells together when BinningHorizontal is used.
BinningHorizontal	Number of horizontal photo-sensitive cells to combine together. This increases the intensity (or signal to noise ratio) of the pixels and reduces the horizontal resolution (width) of the image.
BinningVerticalMode	Sets the mode used to combine vertical photo-sensitive cells together when BinningVertical is used.
BinningVertical	Number of vertical photo-sensitive cells to combine together. This increases the intensity (or signal to noise ratio) of the pixels and reduces the vertical resolution (height) of the image.
DecimationHorizontal	Horizontal sub-sampling of the image. This reduces the horizontal resolution (width) of the image by the specified horizontal decimation factor.
DecimationVertical	Vertical sub-sampling of the image. This reduces the vertical resolution (height) of the image by the specified vertical decimation factor.
RegionSelector	Selects the Region of interest to control. The RegionSelector feature allows devices that are able to extract multiple regions out of an image, to configure the features of those individual regions independently.
RegionMode	Controls if the selected Region of interest is active and streaming.
ImageComponentSelector	Selects a component to activate data streaming from.
ImageComponentEnable	Controls if the selected component streaming is active.
Width	Width of the image provided by the device (in pixels).
Height	Height of the image provided by the device (in pixels).
OffsetX	Horizontal offset from the origin to the region of interest (in pixels).
OffsetY	Vertical offset from the origin to the region of interest (in pixels).
PixelFormat	Format of the pixels provided by the device. It represents all the information provided by PixelCoding, PixelSize, PixelColorFilter combined in a single feature.
PixelFormatInfoSelector	Select the pixel format for which the information will be returned.
PixelFormatInfoID	Returns the value used by the streaming channels to identify the selected pixel format.
PixelSize	Total size in bits of a pixel of the image.
PixelColorFilter	Type of color filter that is applied to the image.
ReverseX	This feature is used to flip horizontally the image sent by the device. The AOI is applied after the flipping.
ReverseY	This feature is used to flip vertically the image sent by the device. The AOI is applied after the flipping.

MultiROIsInMultiPayloads	MultiROIs In MultiPayloads.
MultiROIRegistersValid	Returns if the current ROI register set is valid and consistent.

7.17.3 AcquisitionControl

Name	Description
AcquisitionMode	Sets the acquisition mode of the device. It defines mainly the number of frames to capture during an acquisition and the way the acquisition stops.
AcquisitionStart	Starts the Acquisition of the device. The number of frames captured is specified by AcquisitionMode.
AcquisitionStop	Stops the Acquisition of the device at the end of the current Frame. It is mainly used when AcquisitionMode is Continuous but can be used in any acquisition mode.
AcquisitionArm	Arms the device before an AcquisitionStart command. This optional command validates all the current features for consistency and prepares the device for a fast start of the Acquisition.
AcquisitionFrameRate	Controls the acquisition rate (in Hertz) at which the frames are captured.
TriggerSelector	Selects the type of trigger to configure.
TriggerMode	Controls if the selected trigger is active.
TriggerSoftware	Generates an internal trigger. TriggerSource must be set to Software.
TriggerSource	Specifies the internal signal or physical input Line to use as the trigger source. The selected trigger must have its TriggerMode set to On.
TriggerDelay	Specifies the delay in microseconds (us) to apply after the trigger reception before activating it.
ExposureMode	Sets the operation mode of the Exposure (or shutter).
ExposureTimeSelector	Selects which exposure time is controlled by the ExposureTime feature. This allows for independent control over the exposure components.
ExposureTime	Sets the Exposure time when ExposureMode is Timed and ExposureAuto is Off. This controls the duration where the photosensitive cells are exposed to light.
ExposureTimeAbs	Sets the Exposure time when ExposureMode is Timed and ExposureAuto is Off. This controls the duration where the photosensitive cells are exposed to light.
ExposureTimeRaw	Sets the Exposure time when ExposureMode is Timed and ExposureAuto is Off. This controls the duration where the photosensitive cells are exposed to light.
ExposureAuto	Sets the automatic exposure mode when ExposureMode is Timed. The exact algorithm used to implement this control is device-specific.
ExposureAutoLimitMax	Determine the upper limit of exposure time when ExposureAuto is set to Continuous.
ExposureAutoLimitMin	Determine the lower limit of exposure time when ExposureAuto is set to Continuous.

7.17.4 TransportLayerControl

Name	Description
PayloadSize	Provides the number of bytes transferred for each image or chunk on the stream channel. This includes any end-of-line, end-of-frame statistics or other stamp data. This is the total size of data payload for a data block.

7.17.5 DigitalIOControl

Name	Description
LineSelector	Selects the physical line (or pin) of the external device connector to configure.
LineMode	Controls if the physical Line is used to Input or Output a signal.
LineInverter	Controls the inversion of the signal of the selected input or output Line.
LineStatus	Returns the current status of the selected input or output Line.
LineSource	Selects which internal acquisition or I/O source signal to output on the selected Line. LineMode must be Output.
UserOutputSelector	Selects which bit of the User Output register will be set by UserOutputValue.

UserOutputValue	Sets the value of the bit selected by UserOutputSelector.
StrobeOutDelay	Delay of StrobeOut signal when LineSource is set to StrobeOut(us).
StrobeOutOnTime	Duration of StrobeOut signal when LineSource is set to StrobeOut(us).
TriggerOutDelay	Delay of TriggerOut signal when LineSource is set to TriggerOut(us).
TriggerOutOnTime	Duration of TriggerOut signal when LineSource is set to TriggerOut(us).
LineDeviceResetMode	Sets the Line device reset mode.
LineDebounceTime	Sets the value of the input line debouncer time.

7.17.6 CounterAndTimerControl

Name	Description
CounterSelector	Selects which Counter to configure.
CounterEventSource	Select the events that will be the source to increment the Counter.
CounterEventActivation	Selects the Activation mode Event Source signal.
CounterResetSource	Selects the signals that will be the source to reset the Counter.
CounterResetActivation	Selects the Activation mode of the Counter Reset Source signal.
CounterReset	Does a software reset of the selected Counter and starts it. The counter starts counting events immediately after the reset unless a Counter trigger is active. CounterReset can be used to reset the Counter independently from the CounterResetSource. To disable the counter temporarily, set CounterEventSource to Off.
CounterValue	Reads or writes the current value of the selected Counter.
CounterValueAtReset	Reads the value of the selected Counter when it was reset by a trigger or by an explicit CounterReset command.
CounterDuration	Sets the duration (or number of events) before the CounterEnd event is generated.
CounterStatus	Returns the current status of the Counter.
CounterTriggerSource	Selects the source to start the Counter.
CounterTriggerActivation	Selects the activation mode of the trigger to start the Counter.

7.17.7 EventControl

Name	Description
EventSelector	Selects which Event to signal to the host application.
EventNotification	Activate or deactivate the notification to the host application of the occurrence of the selected Event.

7.17.8 EventExposureEndData

Name	Description
EventExposureEnd	Returns the unique identifier of the ExposureEnd type of Event. This feature can be used to register a callback function to be notified of the event occurrence. Its value uniquely identifies the type of event that will be received.
EventExposureEndTimestamp	Returns the Timestamp of the ExposureEnd Event. It can be used to determine precisely when the event occured.

7.17.9 EventExposureStartData

Name	Description
EventExposureStart	Returns the unique Identifier of the Exposure Start type of Event.
EventExposureStartTimestamp	Returns the Timestamp of the Exposure Start Event.

7.17.10   EventTestData

Name	Description
EventTest	Returns the unique identifier of the Test type of Event. This feature can be used to register a callback function to be notified of the event occurrence. Its value uniquely identifies the type of event that will be received.
EventTestTimestamp	Returns the timestamp of the Test event.

7.17.11   AnalogControl

Name	Description
GainSelector	Selects which Gain is controlled by the various Gain features.
Gain	Controls the selected gain as an absolute physical value. This is an amplification factor applied to the video signal.
GainAuto	Sets the automatic gain control (AGC) mode. The exact algorithm used to implement AGC is device-specific.
GainAutoLimitMax	Determine the upper limit of gain when GainAuto is set to Continuous.
GainAutoLimitMin	Determine the lower limit of gain when GainAuto is set to Continuous.
AutoLightTarget	Determine the brightness target for GainAuto.
BlackLevelSelector	Selects which Black Level is controlled by the various Black Level features.
BlackLevel	Controls the black level as an absolute physical value. This represents a DC offset applied to the video signal.
BalanceRatioSelector	Selects which Balance ratio to control.
BalanceRatio	Controls ratio of the selected color component to a reference color component. It is used for white balancing.
BalanceWhiteAuto	Controls the mode for automatic white balancing between the color channels. The white balancing ratios are automatically adjusted.

7.17.12   LUTControl

Name	Description
PixelCorrectionAllEnabled	Enable pixel correction for all pixels.
PixelCorrectionIndex	Determine index of targeted pixel for pixel correction.
PixelCorrectionEnabled	Determine if targeted pixel is enabled for pixel correction.
PixelCorrectionX	Determine x-coordinate of targeted pixel for pixel correction.
PixelCorrectionY	Determine y-coordinate of targeted pixel for pixel correction.

7.17.13   UserSetControl

Name	Description
UserSetSelector	Selects the feature User Set to load, save or configure.
UserSetLoad	Loads the User Set specified by UserSetSelector to the device and makes it active.
UserSetSave	Save the User Set specified by UserSetSelector to the non-volatile memory of the device.
UserSetDefault	Selects the feature User Set to load and make active by default when the device is reset.

7.17.14   ChunkDataControl

Name	Description
ChunkModeActive	Activates the inclusion of Chunk data in the payload of the image.
ChunkSelector	Selects which Chunk to enable or control.
ChunkEnable	Enables the inclusion of the selected Chunk data in the payload of the image.
ChunkCounterSelector	Selects which counter to retrieve data from.
ChunkCounterValue	Returns the value of the selected Chunk counter at the time of the FrameStart event.

ChunkGainSelector	Selects which Gain to return.
ChunkGain	Returns the gain used to capture the image.
ChunkBlackLevelSelector	Selects which Black Level to return.
ChunkBlackLevel	Returns the black level used to capture the image included in the payload.
ChunkExposureTimeSelector	Selects which exposure time is read by the ChunkExposureTime feature.
ChunkExposureTime	Returns the exposure time used to capture the image.
ChunkGamma	Returns the gamma used to capture the image.

7.17.15   TestControl

Name	Description
TestPendingAck	Tests the device's pending acknowledge feature. When this feature is written, the device waits a time period corresponding to the value of TestPendingAck before acknowledging the write.
TestEventGenerate	Generates a Test Event.

8 Revision History

Rev	Date	Changes	Note
00	2015/09/29	● New Document	
01	2015/11/05	● Revised ChunkExposureTime, ChunkGamma, ChunkBlackLevelSelector on GenICam Command List Noise Level Power Consumption Maximum Operational Temperature	