OMRON

GigE Vision

Monochrome Single Line CMOS Line Scanning PoE Camera

FS-B8KU35GES-x (8k / 3.5 µm)
FS-B4KU35GES-x (4k / 3.5 µm)
FS-B4KU7GES-x (4k / 7.0 µm)
FS-B2KU7GES-x (2k / 7.0 µm)

Product Specifications and User's Guide

OMRON SENTECH CO., LTD.

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Precautions for safe use

Please read carefully this “Precautions for safe use” before use the camera. Then the camera uses correctly with agreeing with below notes.

In this “Precautions for safe use”, notes divides into “Warning” and “Caution” to use the camera safety and prevent to harm and damage.

⚠ Warning	This shows, assumption for possibility of serious accident leading death or serious injury if ignore this note and camera uses incorrectly.
⚠ Caution	This shows, assumption for possibility of bear the damage or physical damage if ignore this note and camera uses incorrectly.

About Graphic symbols


This symbol shows general prohibition.


This symbol shows completion or instruction.

[Environment / condition]

⚠ Warning	
Do not use flammable or explosiveness atmospheres. This will cause of personal injury or fire.	Do not use for “safety for human body” related usage. This camera is designed for use “do not harm human body immediately” if by any chance the camera has malfunction.
⚠ Caution	
Use and store under specified environmental conditions (Vibration, shock, temperature, humidity) in the specifications for this camera. This will cause of fire or damage the camera.	

[Installation and cable wiring]

⚠ Warning	
Do not use with out of power voltage range that is specified in the specifications for this camera. This will cause of fire, electrification or malfunction.	Do not wrong wiring. This will cause of fire or malfunction.

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⚠ Caution	
The camera housing is not connecting to 0 V line of camera inside circuit. There is a risk of short circuit between camera inside ciurcuit and frame ground through other devices. This will cause of malfunction.	It is necessary to wiring and mounting that is specified in the specifications for this camera. This will cause of fire or malfunction.
It is necessary to wiring with turn off the camera. This will cause of electrification or malfunction.	It is necessary to mounting the camera without stress for the cable. This will case of electrification or fire.

[Usage instruction]

⚠ Warning	
Do not touch the terminal and PCB board while turn on the camera. This will cause of electrification or accident caused by malfunction.	Do not put combustibles near the camera. This will cause of fire.
Do not use without usage that is specified in the specifications for this camera. This will cause of personal injury or malfunction.	Do not push metals including screw driver into radiation holes. This will cause of electrification or malfunction.
⚠ Caution	
Do not push contamination into opening of the camera. This will cause of electrification or malfunction.	Do not block the radiation holes. This will cause of fire due to increase the camera inside temperature.

[Maintenance]

⚠ Caution	
Do not disassemble or repair the camera. This will cause of fire, electrification or malfunction.	It is turn off the camera when maintaining or inspecting the camera. This will cause of electrification.

[Disposal]

⚠ Caution	
 It is necessary to dispose as industrial waste.	

1 Product Precautions

- Do not give shock to the camera.
- Do not haul or damage the camera cable.
- Do not wrap the camera with any material while using the camera. This will cause the internal camera temperature to increase.
- When the camera moving or using the place that temperature difference is extreme, countermeasure for dew condensation (heat removal / cold removal) is necessary.
- While the camera is not using, keep the lens cap on the camera to prevent dust or contamination from getting in the sensor or filter and scratching or damaging it.
  Do not keep the camera under the following conditions.
  - In wet, moist, high humidity or dusty place
  - Under direct sunlight
  - In extreme high or low temperature place
  - Near an object that releases a strong magnetic or electric filed
  - Place with strong vibrations
- Apply the power that satisfies the specified in specifications for the camera.
- The defective pixels may appear due to the sensor characteristics.
- Use below recommend materials (or equivalent materials) to clean the surface of glass.
  - Air dust: Non Freon air duster (NAKABAYASHI Co., LTD.)
  - Alcohol: Propan-2-ol (SAN'EI KAKO Co., LTD.)
  - Non-woven: nikowipe clean room (NKB)
- Use a soft cloth to clean the camera.

2 Warranty

■Warranty period

One year after delivery (However, the camera had malfunction with camera uses correctly)
In below case for a fee even within warranty period.

- The malfunction caused by incorrect usage, incorrect modify or repair.
- The malfunction caused by external shock including the camera dropping after delivery the camera.
- The malfunction caused by fire, earthquake, flood disaster, thunderbolt struck, other natural disaster or wrong voltage.

■Warranty coverage

Exchange or repair the malfunction camera if the malfunction is occurred by our responsibility.
"Warranty" mean is warranty for the delivered camera itself. Please accept the induction damage by the camera malfunction is not included.

3 Software Licensing

3.1 LWIP TCP/IP Licensing

The software in this camera includes LWIP TCP/IP implementation.
The copyright information is

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4 Introduction

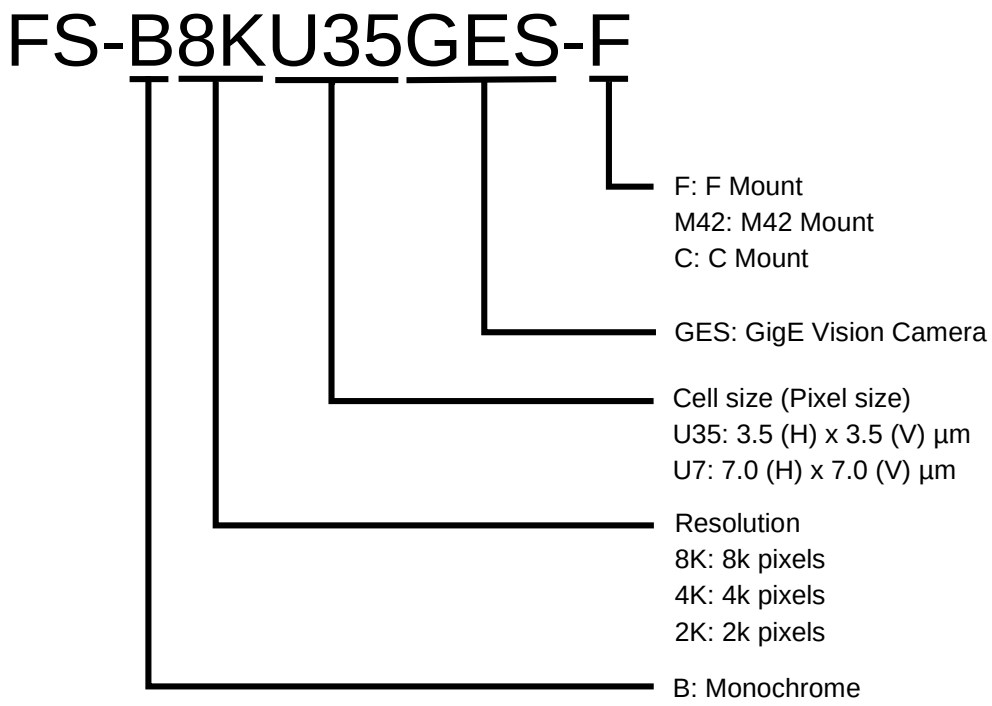
This document describes the specification of the following cameras:

FS-B8KU35GES-F	(8k Monochrome 3.5µm pixel size, F Mount)
FS-B8KU35GES-M42	(8k Monochrome 3.5µm pixel size, M42 Mount)
FS-B4KU35GES-F	(4k Monochrome 3.5µm pixel size, F Mount)
FS-B4KU35GES-M42	(4k Monochrome 3.5µm pixel size, M42 Mount)
FS-B4KU35GES-C	(4k Monochrome 3.5µm pixel size, C Mount)
FS-B4KU7GES-F	(4k Monochrome 7.0µm pixel size, F Mount)
FS-B4KU7GES-M42	(4k Monochrome 7.0µm pixel size, M42 Mount)
FS-B2KU7GES-F	(2k Monochrome 7.0µm pixel size, F Mount)
FS-B2KU7GES-M42	(2k Monochrome 7.0µm pixel size, M42 Mount)
FS-B2KU7GES-C	(2k Monochrome 7.0µm pixel size, C Mount)

4.1 Features

- Support PoE (Power Over Ethernet)
- Maximum Line Rate: 13.3 kHz @ 8k 8bits, 26 kHz @ 4k 8bits, 51 kHz @ 2k 8bits
- FFC (Flat Filed Correction) function
- 8bits, 10bits or 12bits output
- F Mount, M42 Mount and C Mount models are available
  (C Mount model only available for 2k 7.0µm and 4k 3.5µm models)

4.2 Product Number Naming Method



5 Specifications

5.1 Electronic Specifications

5.1.1 FS-B8KU35GES-x / FS-B4KU35GES-x

Model Number		**FS-B8KU35GES-x**	**FS-B4KU35GES-x**
Image Sensor		8k Monochrome CMOS (ams: DR-8K-3.5)	4k Monochrome CMOS (ams: DR-4K-3.5)
Active Picture Elements		8,192 x 1 pixels	4,096 x 1 pixels
Cell size		3.5 (H) x 3.5 (V) µm	3.5 (H) x 3.5 (V) µm
Active Sensor Size		28.672 mm	14.336 mm
Shutter Type		Global Shutter	
Scanning Mode		Full scanning / ROI	
Maximum Line Rate		13 kHz	26 kHz
ADC bit depth		12bits	
Image Output Format		**Mono8** / Mono10 / Mono10Packed / Mono12 / Mono12Packed	
Noise Level	8bits output	Less than 2.0 digits (Gain 0 dB)	
	10bits / 10bits Packed output	Less than 8.0 digits (Gain 0 dB)	
	12bits / 12bits Packed output	Less than 32.0 digits (Gain 0 dB)	
Exposure Time (*1)		2 µseconds to 13,271.4 µseconds **(Default: 26.4 µseconds)**	2 µseconds to 13,181.6 µseconds **(Default: 26.4 µseconds)**
Gain	Analog Gain	**x1** / x4	
	Digital Gain (*2)	x1 to x5 **(Default: x1)**	
ROI (*3)		Horizontal: 8 to 8,192 pixels **(Default: 8,192)** Adjustable steps for size: Horizontal 8 pixels Adjustable steps for offset: Horizontal 8 pixels	Horizontal: 8 to 4,096 pixels **(Default: 4,096)** Adjustable steps for size: Horizontal 8 pixels Adjustable steps for offset: Horizontal 8 pixels
Binning		Horizontal: 1/2, **Off / Vertical**: 1/2, **Off**	
Decimation		N/A	
Image Flip		Horizontal / **Off**	
Operational Mode		Edge preset trigger (Hardware / Software) / Pulse width trigger (Hardware) / Free run	
Interface		PoE: IEEE802.3af CLASS1 (1000BASE-T)	
Protocol		GigE Vision 2.1 and GenICam SFNC 2.4, IEEE1588 (PTP) (supported by SentechSDK_Version1.1.1 or newer)	
IO		3 inputs / 2 outputs	
Power	Input Voltage (*4)	+10.8 to +26.4Vdc External power (Via Power/IO connector) / Power Over Ethernet (IEEE802.3af)	
	Consumption	+12 V / +24 V: 5.9 W, PoE: 6.5 W	+12 V / +24 V: 4.8 W, PoE: 5.3 W

Default: **Bold**

5.1.2 FS-B4KU7GES-x / FS-B2KU7GES-x

Model Number		**FS-B4KU7GES-x**	**FS-B2KU7GES-x**
Image Sensor		4k Monochrome CMOS (ams: DR-4K-7)	2k Monochrome CMOS (ams: DR-2K-7)
Active Picture Elements		4,096 x 1 pixels	2,048 x 1 pixels
Cell size		7.0 (H) x 7.0 (V) µm	7.0 (H) x 7.0 (V) µm
Active Sensor Size		28.672 mm	14.336 mm
Shutter Type		Global Shutter	
Scanning Mode		Full scanning / ROI	
Maximum Line Rate		26 kHz	51 kHz
ADC bit depth		12bits	
Image Output Format		**Mono8** / Mono10 / Mono10Packed / Mono12 / Mono12Packed	
Noise Level	8bits output	Less than 2.0 digits (Gain 0 dB)	
	10bits / 10bits Packed output	Less than 8.0 digits (Gain 0 dB)	
	12bits / 12bits Packed output	Less than 32.0 digits (Gain 0 dB)	
Exposure Time (*1)		2 µseconds to 13,181.6 µseconds **(Default: 26.4 µseconds)**	2 µseconds to 13,143.2 µseconds **(Default: 17.4 µseconds)**
Gain	Analog Gain	**x1** / x4	
	Digital Gain (*2)	x1 to x5 **(Default: x1)**	
ROI (*3)		Horizontal: 8 to 4,096 pixels **(Default: 4,096)** Adjustable steps for size: Horizontal 8 pixels Adjustable steps for offset: Horizontal 8 pixels	Horizontal: 8 to 2,048 pixels **(Default: 2,048)** Adjustable steps for size: Horizontal 8 pixels Adjustable steps for offset: Horizontal 8 pixels
Binning		Horizontal: 1/2, **Off / Vertical**: 1/2, **Off**	
Decimation		N/A	
Image Flip		Horizontal / **Off**	
Operational Mode		Edge preset trigger (Hardware / Software) / Pulse width trigger (Hardware) / Free run	
Interface		PoE: IEEE802.3af CLASS1 (1000BASE-T)	
Protocol		GigE Vision 2.1 and GenICam SFNC 2.4, IEEE1588 (PTP) (supported by SentechSDK_Version1.1.1 or newer)	
IO		3 inputs / 2 outputs	
Power	Input Voltage (*4)	+10.8 to +26.4Vdc External power (Via Power connector) / Power Over Ethernet (IEEE802.3af)	
	Consumption	+12 V / +24 V: 4.8 W, PoE: 5.3 W	+12 V / +24 V: 4.3 W, PoE: 4.7 W

Default: **Bold**

Precautions

(*1) The maximum exposure time will be change with selecting “Acquisition Line Rate” and “Pixel Format”.

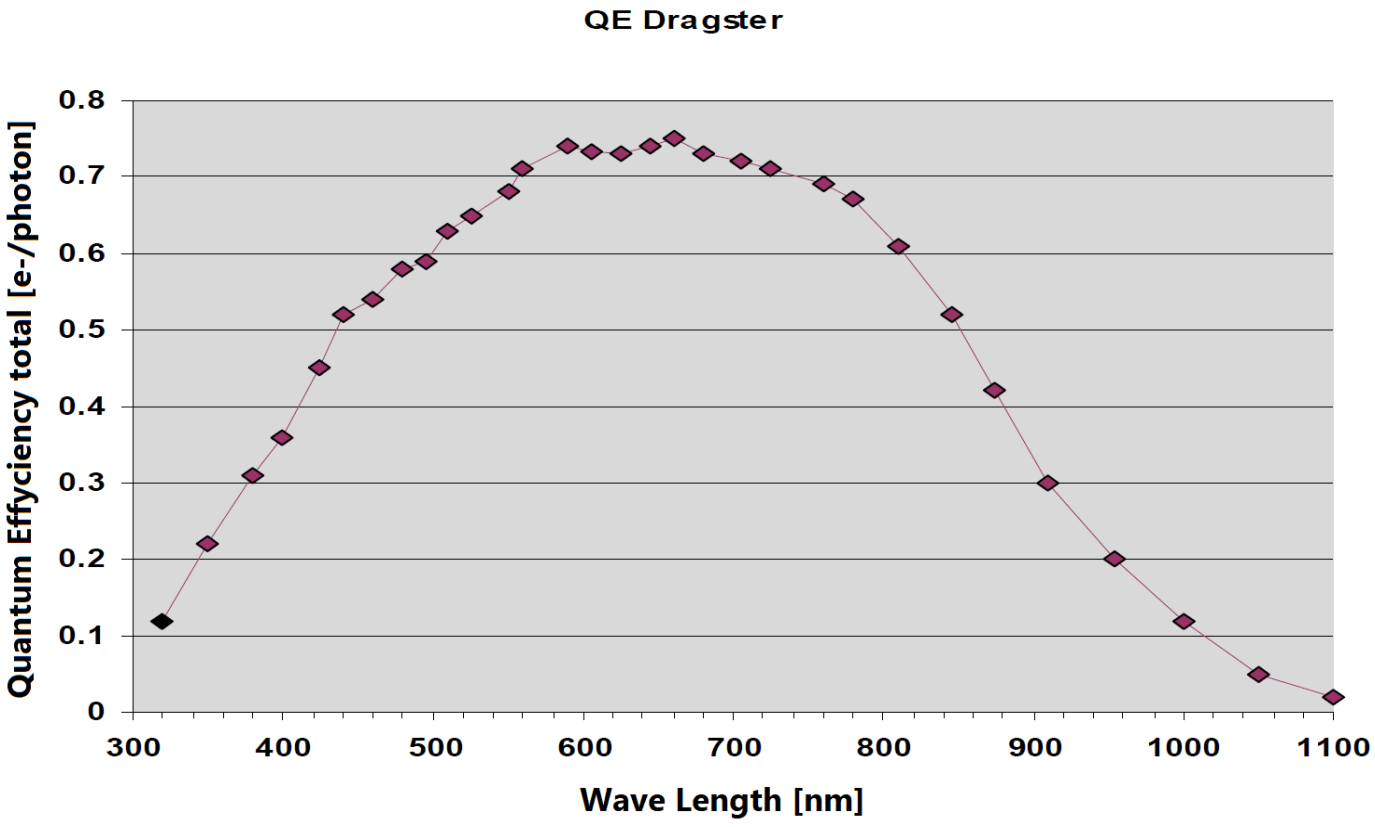
(*2) The pixel level (brightness) of image will be change with digital gain function when using FFC function (FFCOffsetTarget).
Please refers more details for “Digital Gain”.

(*3) The maximum number of lines will be change with selecting “Width” of image and “Pixel Format”.

(*4) The camera operates with external power when power suppling by external power supply and PoE to camera at same time.

5.2 Quantum Efficiency

5.2.1 FS-B8KU35GES-x / FS-B4KU35GES-x / FS-B4KU7GES-x / FS-B2KU7GES-x



5.3 Mechanical Specifications

Model Number	**FS-B8KU35GES-F** **FS-B4KU35GES-F** **FS-B4KU7GES-F** **FS-B2KU7GES-F**	**FS-B8KU35GES-M42** **FS-B4KU35GES-M42** **FS-B4KU7GES-M42** **FS-B2KU7GES-M42**	**FS-B4KU35GES-C** **FS-B2KU7GES-C**
Dimensions (*1)	56 (W) x 58 (H) x 73.6 (D) mm	56 (W) x 58 (H) x 35.1 (D) mm	56 (W) x 58 (H) x 44.6 (D) mm
Optical Filter	No Optical Filter		
Material	Aluminum Alloy (AC)		
Lens Mount	F Mount	M42 Mount	C mount
Interface Connectors	Ethernet connector: RJ45 connector Power connector: HR10A-7R-6PB (Hirose) or equivalent IO signal connector: HR10A-10R-12PB (Hirose) or equivalent		
Camera Mounting	Twenty M4 screw holes (Four on front, top, bottom and both side plates)		
Weight	290 g	210 g	240 g

(*1) Excluding the connectors

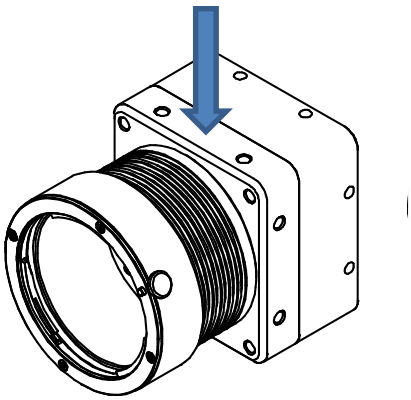
5.4 Environmental specifications

Product		FS-B8KU35GE	FS-B4KU7GE	FS-B2KU7GE	FS-B4KU7DGE
Operational Temperature / Humidity	Minimum	Environmental Temperature: 0 deg. C, Environmental Humidity: 0 to 85 %RH (No condensation)			
	Maximum	Environment Temperature: +40 deg. C or Camera housing temperature (top plate) not exceeded +60 deg. C (*1), Environmental Humidity: 0 to 85 %RH (No condensation)			
Storage Temperature / Humidity		Environmental Temperature: -20 to +80 deg. C, Environmental Humidity: 0 to 85 %RH (No condensation)			
Vibration		20 Hz to 200 Hz to 20 Hz (5 min. / cycle), acceleration 10 G, XYZ 3 directions, 30 min. each			
Shock		Acceleration 38 G, half amplitude 6 ms, XYZ 3 directions, 3 times each			
Standard Compliancy		EMS: EN61000-6-2, EMI: EN55011			
RoHS		RoHS Compliance			

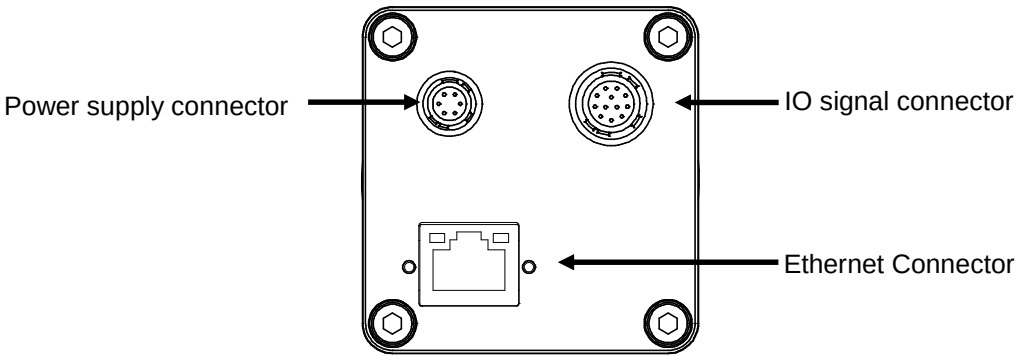
(*1) Please insure the camera is installed with the appropriate heat dissipation to keep the camera housing temperature (top plate) is less than 60 deg. C when the camera using the environmental temperature is exceeded 40 deg. C. When the internal temperature sensor on the camera shows less than 70 deg. C, the camera housing temperature (top plate) will be less than 60 deg. C.

If the camera has a mounted lens and a tripod with an aluminum plate, this could decrease the camera housing temperature for the heat dissipation.

Temperature measuring point



6 Connector specifications



6.1 Ethernet connector

RJ45 connector x 1

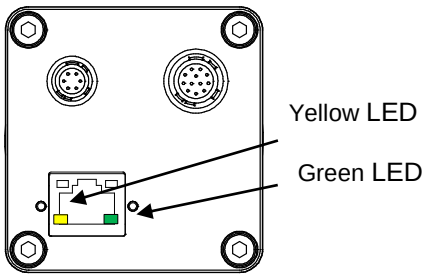
This camera is PoE supported GigE Vision camera.
Please supply the power (+10.8 to +26.4 Vdc) from power supply connector if network card (NIC) is not applicable for the PoE.

RJ45 connector

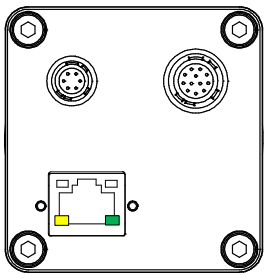
Pin No.	Signal Name
1	TA+
2	TA-
3	TB+
4	TC+
5	TC-
6	TB-
7	TD+
8	TD-

LED

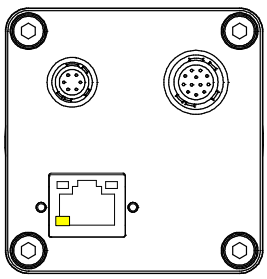
Green LED	Yellow LED	Status
Green Light ON	Yellow Light ON	Power ON
Green Light ON	Yellow Light Blinking	1Gbps Transferring
Green Light OFF	Yellow Light Blinking	100 Mbps Transferring



The camera is powered-on



Green light: ON
Yellow light: Blinking
1 Gbps Transferring



Green light: OFF
Yellow light: Blinking
100 Mbps Transferring

Please use 1Gbps supported Network card (NIC), Network Switcher and LAN cable.
Check the setting of NIC and Network Switcher being used is "1 Gbps transferring".

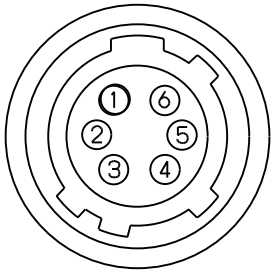
6.2 Power supply connector

HR10A-7R-6PB (Hirose) or equivalent connector x 1

This connector is for power supply only.
Please use the control signal control for control signals.
Please use HR10A-7P-6S (Hirose) or equivalent connector for connecting cable.

Power supply connector pin assignment

Pin No.	Signal Name	IN / OUT	Voltage
1	POWER IN	IN	+10.8 to +26.4 Vdc
2			
3			
4	GND	IN	0 V
5			
6			



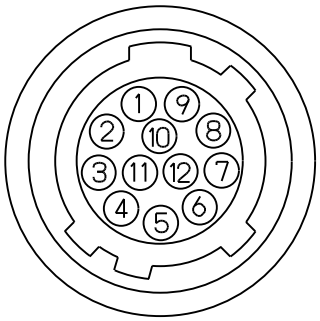
6.3 IO signal connector

HR10A-10R-12PB (Hirose) or equivalent connector x 1

This connector is for control input and output signals
Please use HR10A-10P-2S (Hirose) or equivalent connector for connecting cable.

IO signal connector pin assignment

Pin No.	Signal Name	IN / OUT	Voltage
1	INPUT 1- (Line0)	IN	TTL / RS-422
2	INPUT 1+ (Line0)	IN	TTL / RS-422
3	INPUT 2- (Line1)	IN	TTL / RS-422
4	INPUT 2+ (Line1)	IN	TTL / RS-422
5	GND	IN	0 V
6	OUTPUT 1- (Line3)	OUT	TTL / RS-422
7	OUTPUT 1+ (Line3)	OUT	TTL / RS-422
8	INPUT 3- (Line2)	IN	TTL / RS-422
9	INPUT 3+ (Line2)	IN	TTL / RS-422
10	POWER	IN	+10.8 to +26.4 Vdc
11	OUTPUT 2- (Line4)	OUT	TTL / RS-422
12	OUTPUT 2+ (Line4)	OUT	TTL / RS-422



Configuration of Line3 (Pin No.6 and 7) and Line4 (Pin No.11 and 12)
Output signal can be assign by GenICam command.

GenICam
1) User Output 3
2) User Output 4
3) Frame Trigger Wait **(Default for Line3 andLine4)**
4) Frame Trigger
5) Line Trigger Wait
6) Line Trigger
7) Sensor Read Out
8) Acquisition Trigger Wait
9) Acquisition Trigger
10) Exposure Active
11) Timer 0 Active
12) Timer 1 Active
13) Software Signal 0
14) Software Signal 1
15) Logic Block 0
16) Pulse Per Second
17) Line 0
18) Line 1
19) Line 2
20) Frame Timeout
21) Action 0

1) User Output 3 (User Output signal through Line 3)
Selected “HIGH” or “LOW” state of signal is out.

2) User Output 4 (User Output signal through Line 4)
Selected “HIGH” or “LOW” state of signal is out.

3) Frame Trigger Wait
The condition of camera operation with frame trigger signal can be check.
“LOW” state of signal is out between “start exposing” to “image out”.

4) Frame Trigger
The input frame trigger signal with trigger delay (camera internal process delay).

5) Line Trigger Wait
The condition of camera operation with line trigger signal can be check.
“High” state of signal is out when camera is line trigger wait condition.

6) Line Trigger
The input line trigger signal with trigger delay (camera internal process delay).

7) Sensor Read Out
FVAL (Frame valid, which is image output period, HIGH state) signal is out.

8) Acquisition Trigger Wait
While image transferring from camera to PC, “Low” state of signal is out. The signal state will be “High” after finish image transferring.

9) Acquisition Trigger Internal
The image transferring starts signal is out.

10) Exposure Active
While camera exposing, “HIGH” state of signal is out. The signal state will be “LOW” after finish exposing.

11) Timer 0 Active
Selected signal at “Timer0 Counter” is out.
When signal synchronizing with “Exposure Active” signal, signal can use for strobe control.

12) Timer 1 Active
Selected signal at “Timer1 Counter” is out.
When signal synchronizing with “Exposure Active” signal, signal can use for strobe control.

13) Software Signal 0
Selected signal for “Software Signal 0” at “Software Signal Control” is out.

14) Software Signal 1
Selected signal for “Software Signal 1” at “Software Signal Control” is out.

15) Logic Block 0
“Logic Block 0” signal is out.

16) Pulse Per Second
“Pulse / second” signal (50% Duty, 1 Hz interval) is out.

17) Line0
Debounced Line0 signal is out.

18) Line1
Debounced Line1 signal is out.

19) Line2
Debounced Line2 signal is out.

20) Frame Timeout
“HIGH” state signal is output when frame does not finish after Frame Timeout is passed.

21) Action 0
Selected signal at “Action Control” is out.

6.3.1 Input Signal Circuit

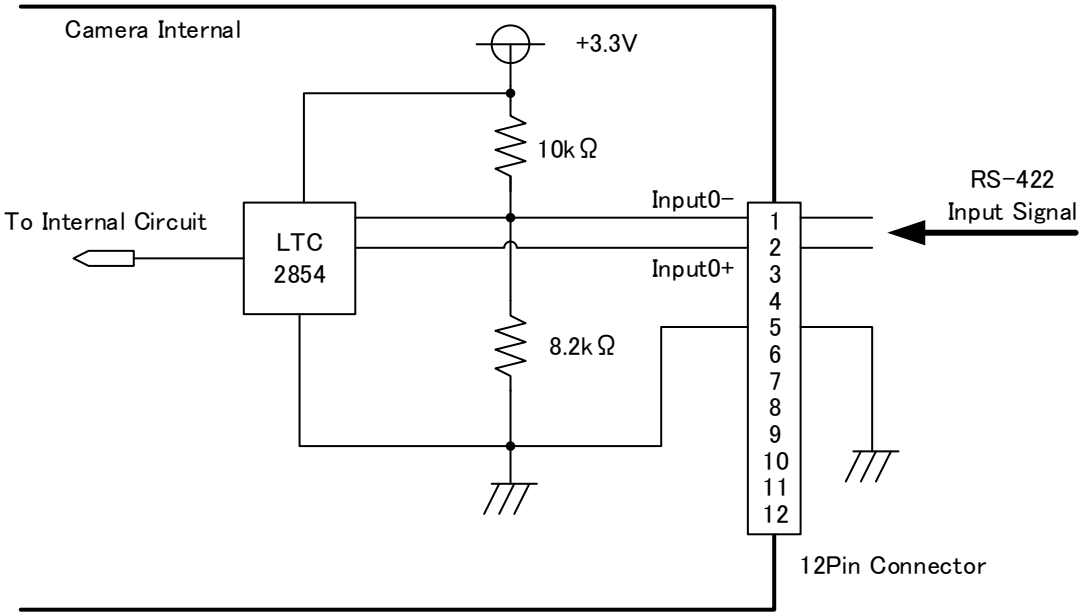
The signal can be input from below three IO pin on 12pin connector:

Line0 (Pin1: Input0-, Pin2: Input0+)
Line1 (Pin3: Input1-, Pin4: Input1+)
Line2 (Pin8: Input2-, Pin9: Input2+)

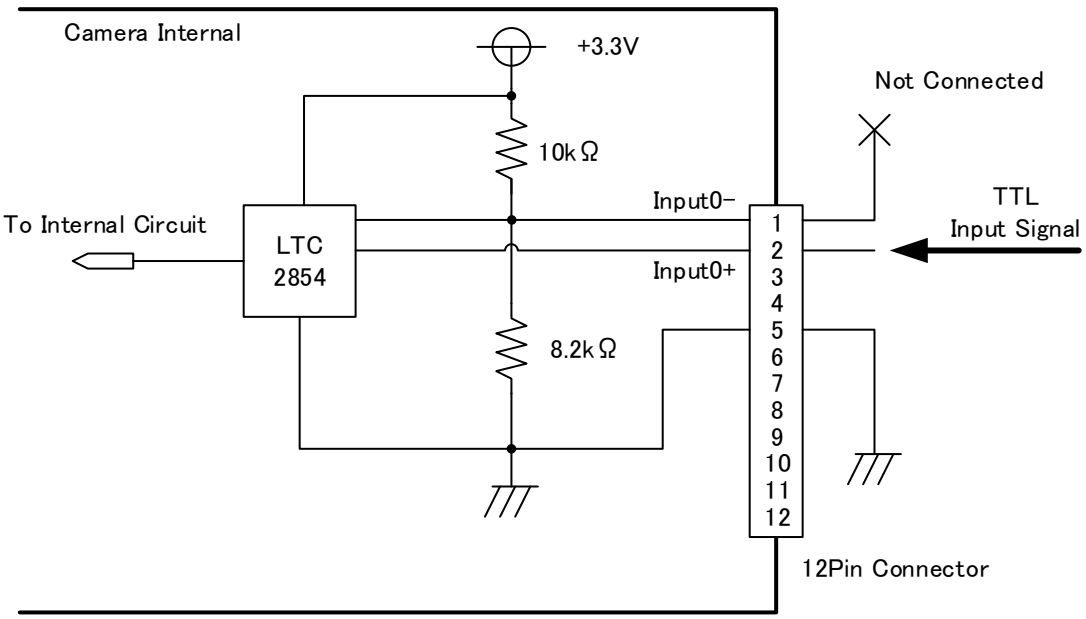
* Input signal circuit for Line0, Line1 and Line3 is same circuit.

RS-422 signal or TTL signal can be input to these IO pin, but It is necessary to change “LineFormat” for IO port. Please refers “Digital IO Control” section for more details.

- **Input RS-422 signal**



- **Input TTL signal**



6.3.2 Output Signal Circuit

The signal can be output from below two IO pin on 12pin connector:

Line3 (Pin5: Output0-, Pin6: Output0+)

Line4 (Pin11: Output1-, Pin12: Output1+)

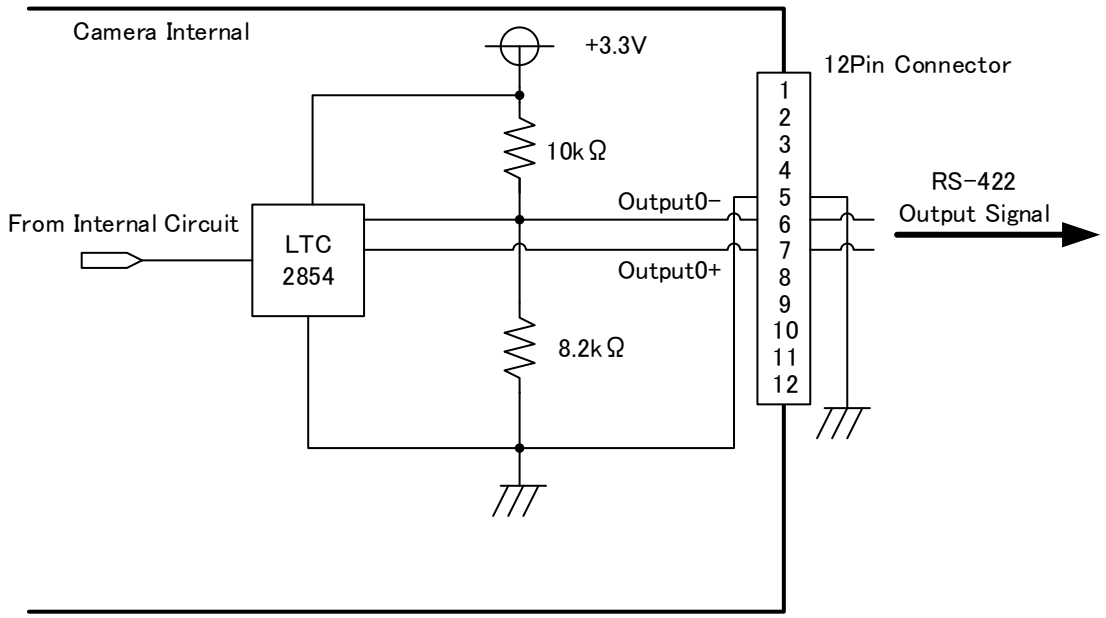
* Output signal circuit for Line0, Line1 and Line3 is same circuit.

RS-422 signal or TTL signal can be input to these IO pin, but It is necessary to change “LineFormat” for IO pin.

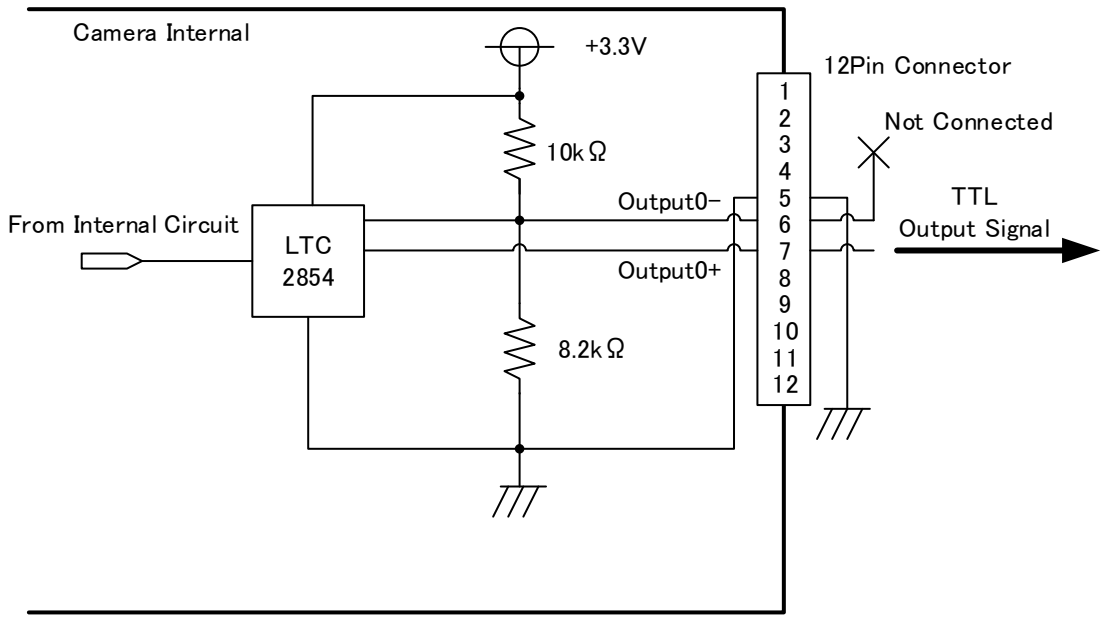
The output signal can be selectable at “LineSource” for IO pin.

Please refers “Digital IO Control” section for more details.

- **Output RS-422 signal**



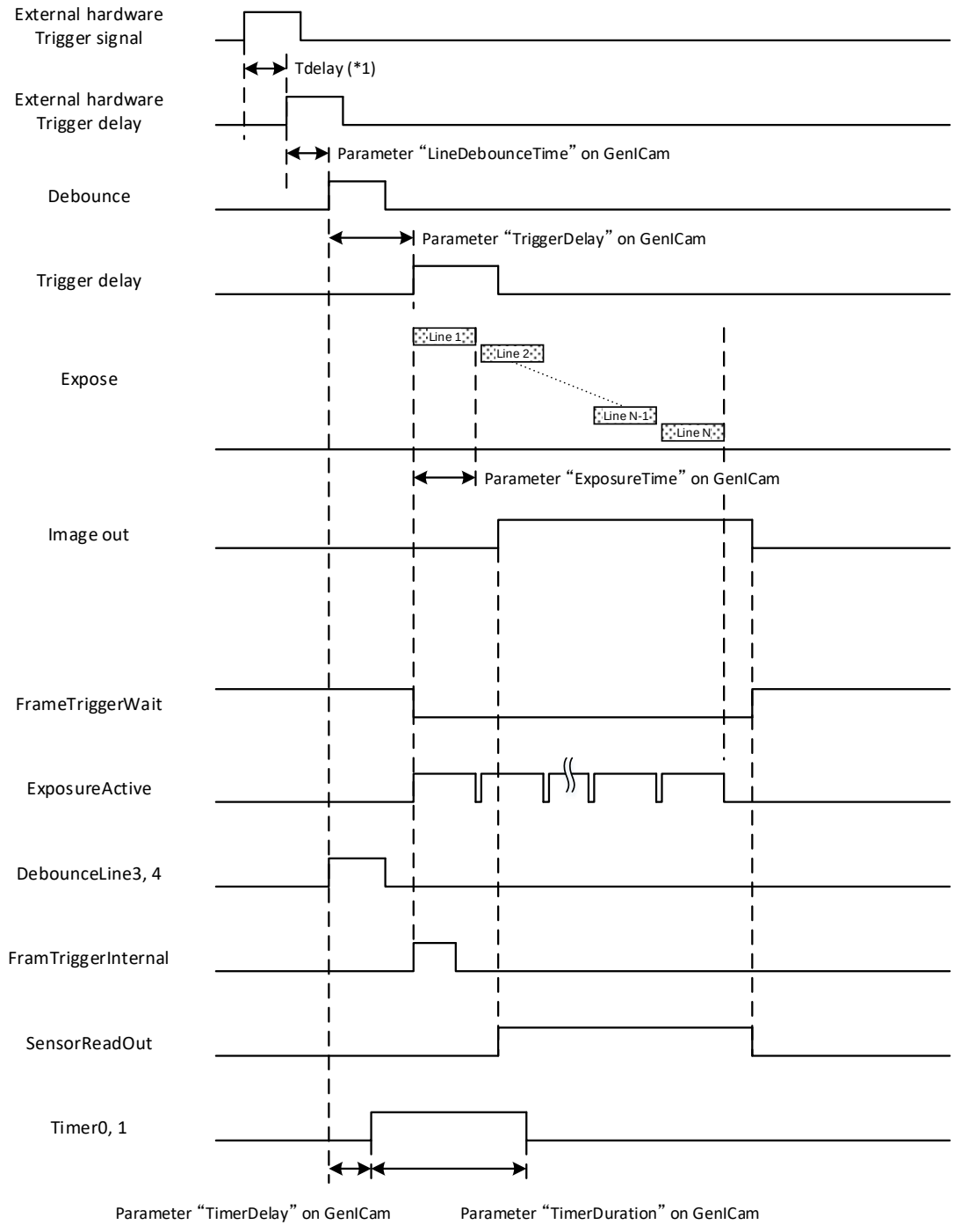
- **Output TTL signal**



6.3.3 Input and Output Signal Timing (Hardware Trigger)

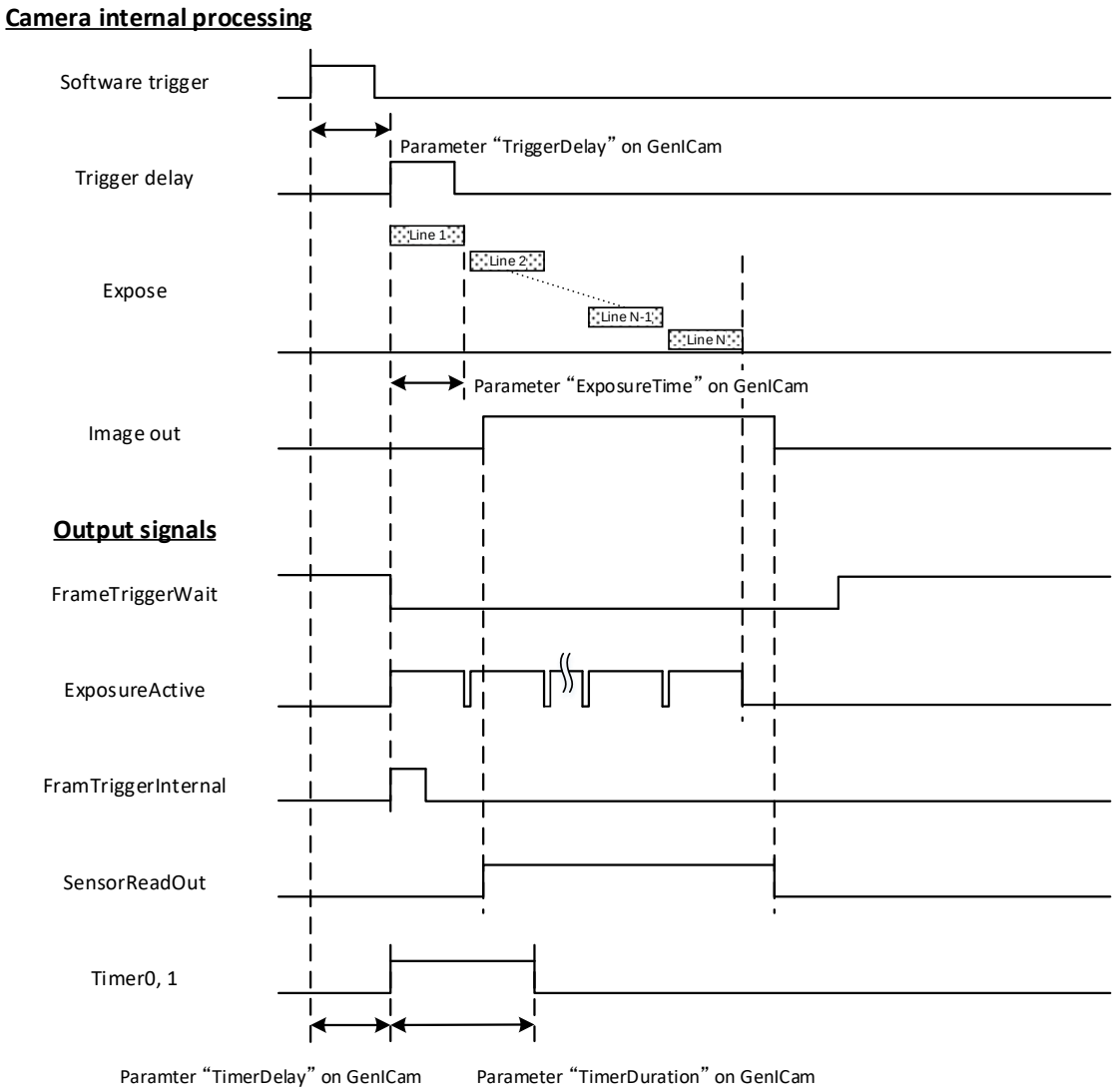
Case of “External Hardware Trigger”, “Timed Exposure Mode” and “Positive Edge Trigger”

Camera internal processing



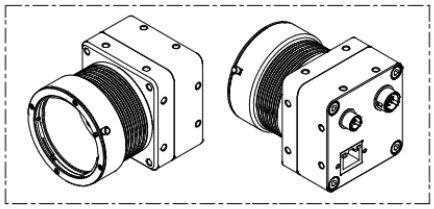
6.3.4 Input and Output Signal Timing (Software Trigger)

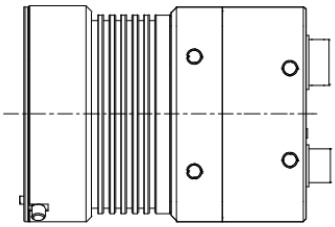
Case of “Software Trigger”, “Timed Exposure Mode” and “Positive Edge Trigger”

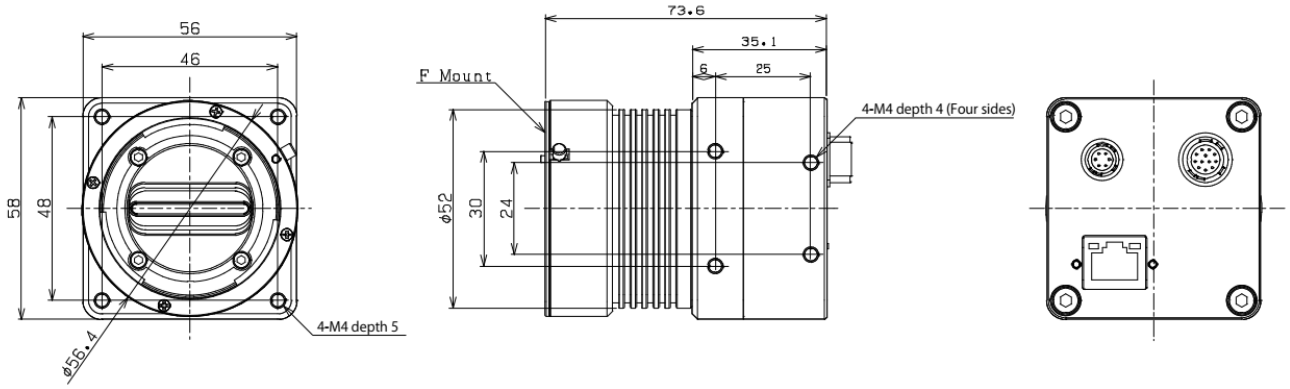


7 Dimensions

7.1 FS-B8KU35GES-F / FS-B4KU35GES-F / FS-B4KU7GES-F / FS-B2KU7GES-F

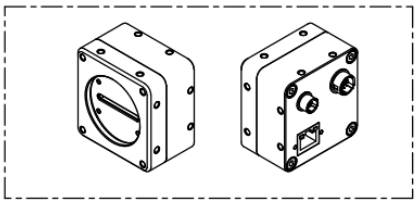


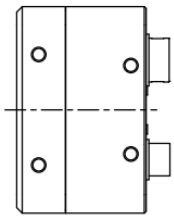


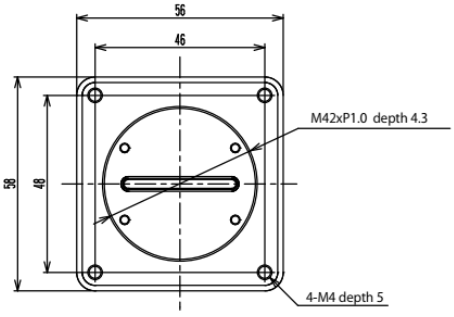


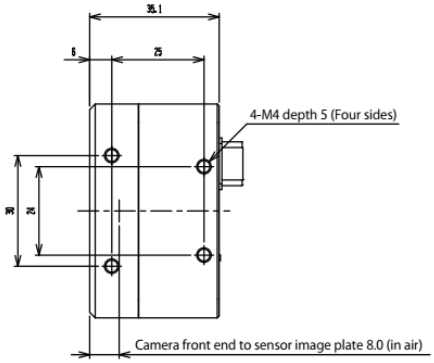
Unit: mm

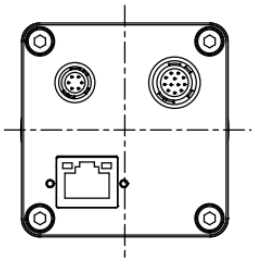
7.2 FS-B8KU35GES-M42 / FS-B4KU35GES-M42 / FS-B4KU7GES-M42 / FS-B2KU7GES-M42





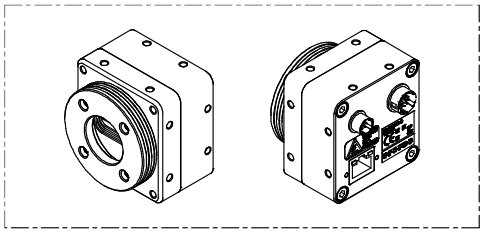


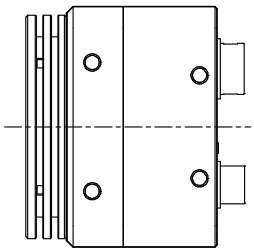


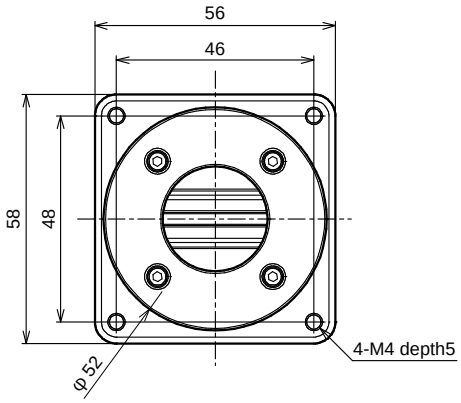


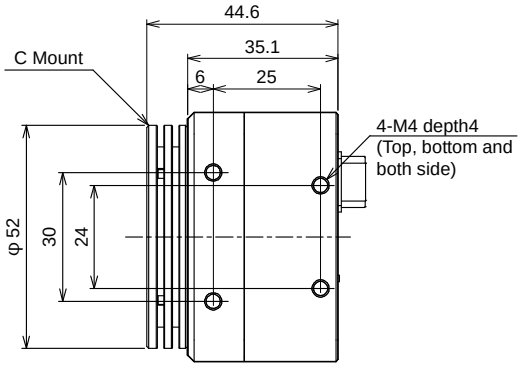
Unit: mm

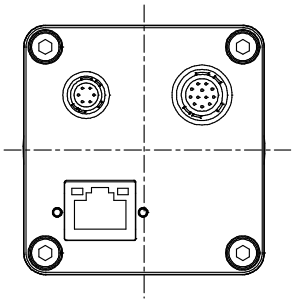
7.3 FS-B4KU35GES-C / FS-B2KU7GES-C







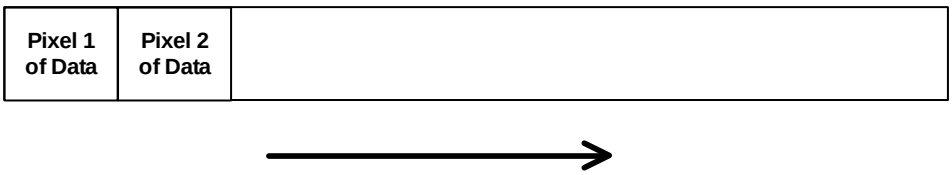




Unit: mm

8 Sensor Information

8.1 Pixel Transferring Image



Pixel (m) of Data: mth pixel being transferred

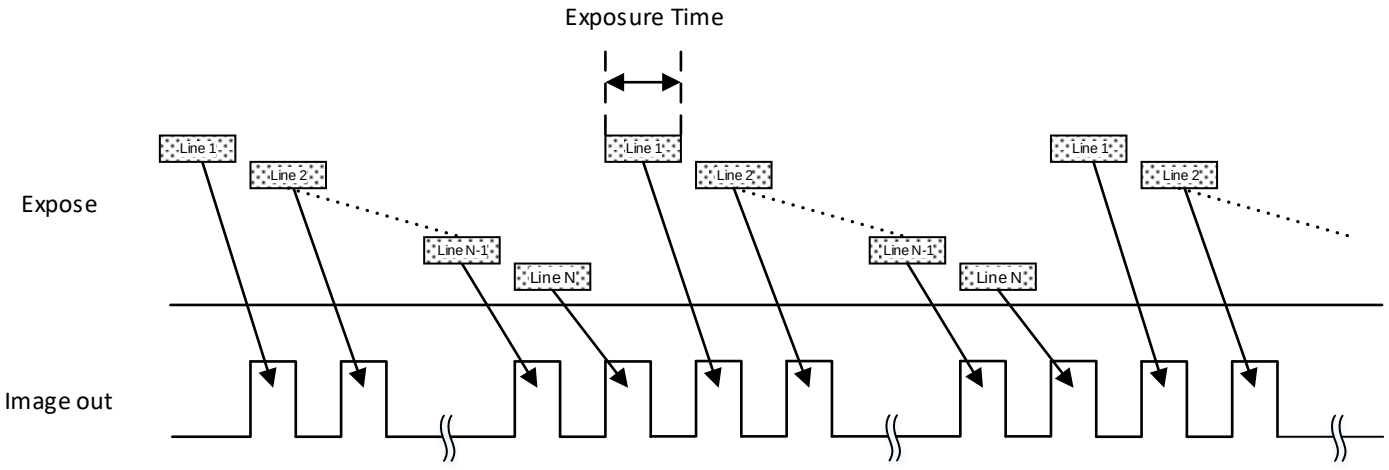
9 Camera Operational Modes

9.1 Free run

In this mode, image is out continuously.
When selecting “Off” at TriggerMode, camera operates free run.

The exposure time is specified by ExposureMode.
When selecting “Off” at ExposureMode, exposure time sets automatically based on LineRate.
When selecting “Timed” at ExposureMode, sets exposure time at ExposureTime.

9.1.1 Timing of Free run



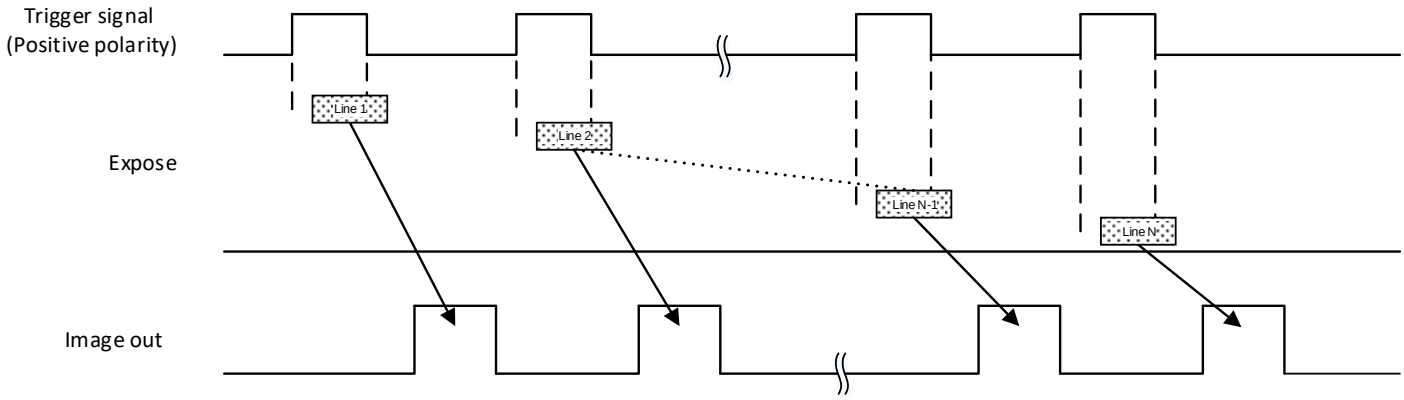
* The exposure time for each line is same.
* Number of line is “Height” on GenICam setting.

9.2 Pulse width trigger mode

In this trigger mode with positive polarity, the expose starts at rising edge of trigger signal and stops at falling edge of trigger signal. The expose period is high states of trigger signal.
In this trigger mode with negative polarity, the expose starts at falling edge of trigger signal and stops at rising edge of trigger signal. The expose period is low states of trigger signal.

When selecting “FrameStart” at TiggerSelector, exposure time of each line is same for one frame (lines of height setting)

9.2.1 Timing of pulse width trigger mode

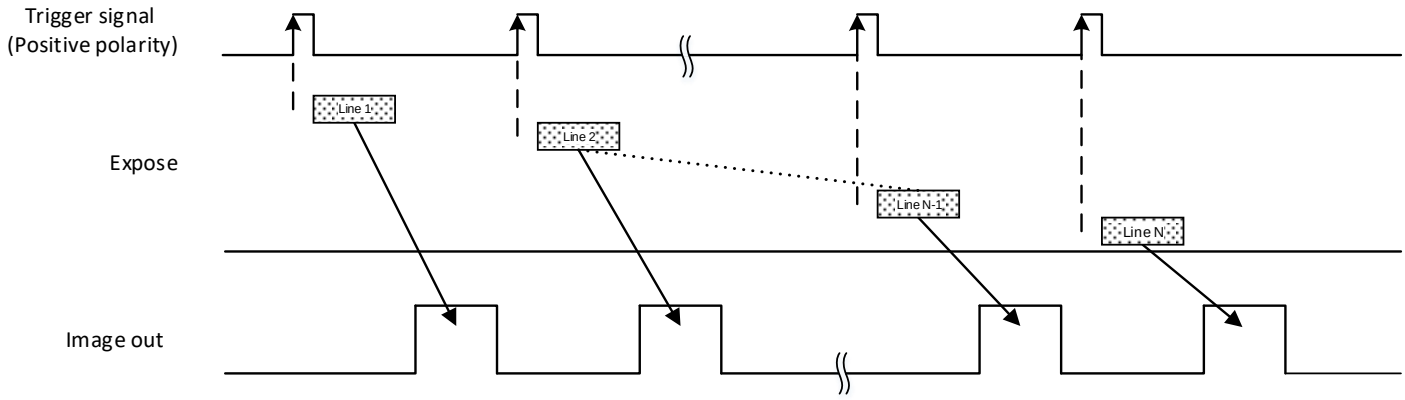


9.3 Edge preset trigger mode

In this trigger mode with positive polarity, the expose starts at rising edge of trigger signal.
The exposure duration time is based on preset exposure setting stored by camera setting communication.
In this trigger mode with negative polarity, the expose starts at falling edge of trigger signal.
The exposure duration time is based on preset exposure setting stored by camera setting communication.

When selecting “FrameStart” at TiggerSelector, exposure time of each line is same for one frame (lines of height setting)

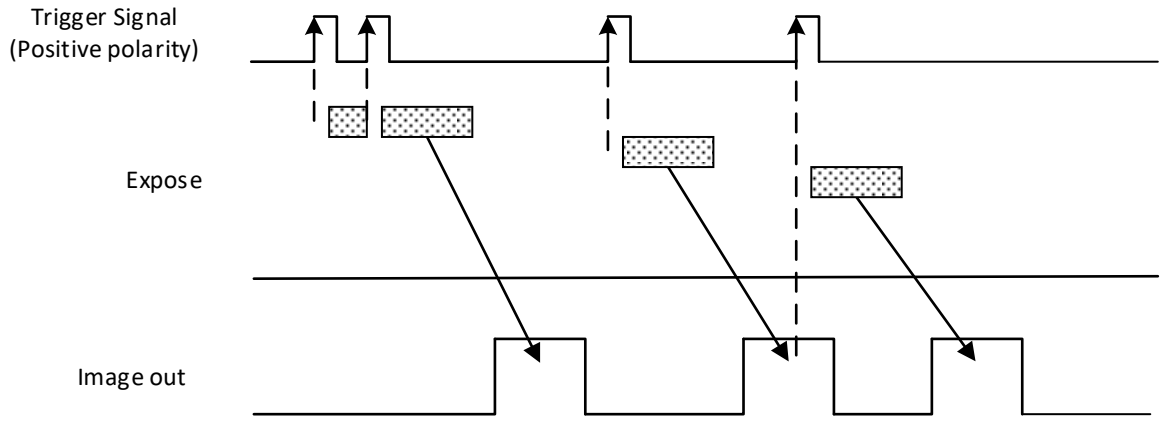
9.3.1 Timing of edge preset trigger mode



9.4 Edge preset trigger mode (Trigger input while exposing or image is out)

In this trigger mode with positive polarity, the expose starts at rising edge of trigger signal.
The exposure duration time is based on the preset exposure setting stored by camera setting communication.
In this trigger mode with negative polarity, the expose starts at falling edge of trigger signal.
The exposure duration time is based on the preset exposure setting stored by camera setting communication.
However, if the trigger signal input while exposing with previous trigger signal, resets exposing and exposing starts with newer trigger signal.
If the trigger signal input while output image with previous trigger signal, image is output and exposing starts with newer trigger signal.

9.4.1 Timing of edge preset trigger mode (Trigger input while exposing or image is out)



*Note: The exposure time is preset “ExposureTime” on GenICam setting.

10 Camera Functions

10.1 Save and load the camera settings

The camera has the camera setting save function, and camera setting including factory default loads function.
The camera has below two type of camera settings.

Default: The factory default settings (This setting cannot change)
UserSetX: Over writeable camera settings (X: 0 to 7)

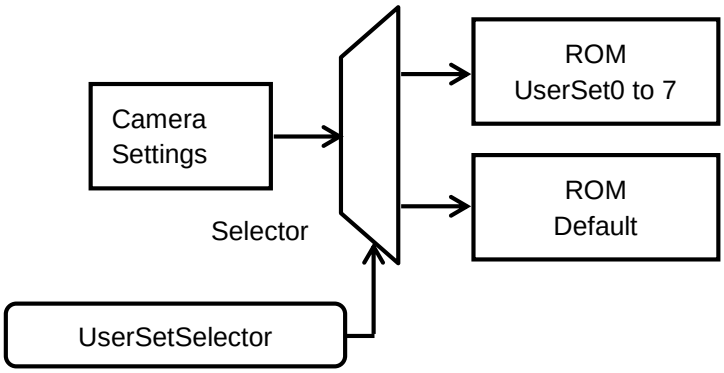
These camera settings load from ROM to register in RAM on camera, and camera settings at register in RAM on camera save to ROM.
The camera settings saving and loading are controllable with Parameters (“UserSetSelector”, “UserSetDefault”), and commands (“UserSetLoad”, “UserSetSave”) in “UserSetControl” category of GenICam.

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

GenICam Parameters

UserSetSelector	IEnumeration Type	Select “Default” or ”UserSetX” “UserSetLoad” or “UserSetSave” process for selected settings.
UserSetLoad	ICommand Type	The camera settings load from ROM to register in RAM.
UserSetSave	ICommand Type	The camera settings at register in RAM save to ROM.
UserSetDefault	IEnumeration Type	Select which settings (“Default” or “UserSetX”) load automatically when camera power is on. This selection saves automatically.

10.1.1 Saving Camera Settings

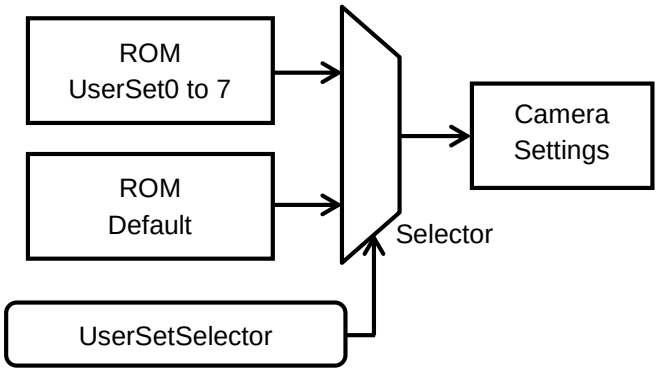


When executing “UserSetSave”, camera settings at the register in RAM are saved to the ROM that is selected at “UserSetSelector”.
Caution:
“UserSetSave” CANNOT execute when “Default” was selected at “UserSetSelector”

Setting Procedure

1. Selects “UserSetX” at “UserSetSelector”
2. Execute “UserSetSave”

10.1.2 Loading Camera Settings

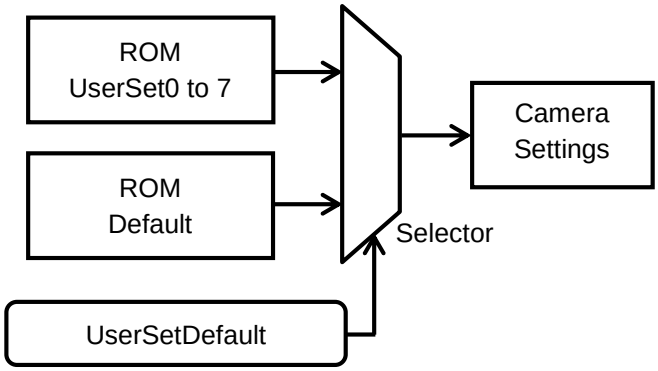


When executing “UserSetLoad”, camera settings load from selected ROM that was selected at “UserSetSelector” to register at RAM.

Setting Procedure

1. Select “User Set X” (or Default) at “User Set Selector”
2. Execute “User Set Load”

10.1.3 Loading Camera Settings when Camera Power is on



When the camera power is on, camera settings load from selected ROM that was selected at “UserSetDefault” to register at RAM.

Setting Procedure

1. Set “UserSetX” or “Default” at “UserSetDefault”

10.1.4 Camera Settings Initialization

Please follow the procedure in below for camera settings put back to factory default settings.

Setting Procedure

1. Selects “Default” at “UserSetSelector”.
2. Executes “UserSetLoad”.
3. Select “UserSetX” at “UserSetSelector”.
4. Executes “UserSetSave”.

10.2 Frame rate

This parameter sets the line rate (Hz) and frame rare (Hz) of output image from camera.

GenICam Parameters

AcquisitionLineRate	IFloat Type	Sets line rate in Hz unit (*1) Range is changed with pixel format of image. Default: 13,000.917712 (FS-B8KU35GES-x / 8bits output) 26,001.835424 (FS-B4KU35GES-x / 8bits output) 26,001.835424 (FS-B4KU7GES-x / 8bits output) 51,020.408163 (FS-B2KU7GES-x / 8bits output)
AcquisitionFrameRate	IFloat Type	Sets frame rate in Hz unit (*1) Range is changed with acquisition line rate, pixel format and height of image. Default: 13.0009178 (FS-B8KU35GES-x / 8bits output) 26.001835 (FS-B4KU35GES-x / 8bits output) 26.001835 (FS-B4KU7GES-x / 8bits output) 51.020408 (FS-B2KU7GES-x / 8bits output)

(*1) The approximate value of set value, sets to camera and display it.

10.3 Exposure Time

This parameter sets variable exposure time.

GenICam Parameters

ExposureMode	IEnumeration Type	Exposure control selection Selection: “Off”, “Timed” and “TriggerWidth” Off: Exposure time is “1 / Line rate” Timed: Exposure time is “ExposureTime” for one line. TriggerWidth: Exposure time is active pulse duration of input trigger signal
ExposureTime [ExposureTime Selector]	IFloat Type	Exposure time (in μsecond) (*1) Range: 2.000000 to Default: 26.400000 (FS-B8KU35GES-x / FS-B4KU35GES-x / FS-B4KU7GES-x) 17.400000 (FS-B2KU7GES-x)

(*1) The longest exposure time will be change with AcquisitionLineRate and Pixel Format selection.

10.4 Gain

The gain has Analog Gain, Digital Gain.

10.4.1 Analog Gain

This parameter sets analog gain.
Selects “AnalogAll” at “GainSelector”, sets gain at “Gain”.

GenICam Parameters

GainSelector	IEnumeration Type	Selects control gain AnalogAll: Analog Gain
Gain	IFloat Type	Analog Gain Range: 0 (x1) or 1 (x4) Default: 0

10.4.2 Digital Gain

This parameter sets digital gain.
Selects “DigitalAll” at “GainSelector”, sets gain at “Gain”.

GenICam Parameters

GainSelector	IEnumeration Type	Selects control gain DigitalAll: Digital Gain
DigitalGain	IFloat Type	Digital Gain Range: 0 to 255 Default: 0

Digital Gain Formula
Pixel level (brightness level) of image after applying digital gain =
(1 + “Digital Gain” / 64) * (brightness level - FFCOffsetTarget) + FFOffsetTarget

10.5 Image Flip

The horizontal flip image can be selected by “ReverseX”.
* Vertical flip image function is NOT available.

GenICam Parameters

ReverseX	IBoolean Type	Horizontal flip image ON / OFF selection Selection: “False” (Horizontal flip is Off), “True” (Horizontal flip is On) Default: “False” (Horizontal flip is Off)

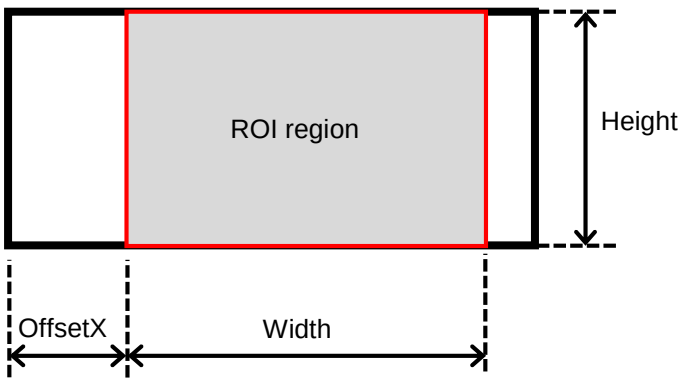
10.6 ROI (Region of Interest)

The specified region of image can be output from camera with ROI function.

GenICam Parameters

Width	IInteger Type	Width (horizontal size) of output image (in pixel) Range: 8 to 8,192 pixels (FS-B8KU35GES-x) 8 to 4,096 pixels (FS-B4KU7GES-x / FS-B4KU35GES-x) 8 to 2,048 pixels (FS-B2KU4GES-x) Default: 8,192 pixels (FS-B8KU35GES-x) 4,096 pixels (FS-B4KU7GES-x / FS-B4KU35GES-x) 2,048 pixels (FS-B2KU7GES-x) Adjustable steps: 8 pixels (“Width” + “OffsetX”) should not exceeded maximum width.
Height	IInteger Type	Height (vertical size) of output image (in line) Range: 16 to Default: 1,000 lines Adjustable steps: 1 The maximum height will be change with “Width” and “Pixel Format” settings.
OffsetX	IInteger Type	Horizontal offset for output image (in pixel) Range: 0 to 8,184 pixels (FS-B8KU35GES-x) 0 to 4,080 pixels (FS-B4KU7GES-x / FS-B4KU35GES-x) 0 to 2,048 pixels (FS-B2KU7GES-x) Default: 0 pixels Adjustable steps: 8

The ROI region settings are below:



10.7 Pixel Format

The image format from camera can be set on PixelFormat.

GenICam Parameters

PixelFormat	IEnumeration Type	PixelFormat

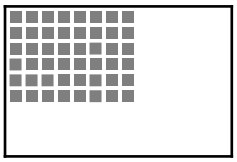
The following chart shows the available Pixel Formats on camera:

Output Bits	PixelFormat
8bits	Mono8
10bits	Mono10
10bits Packed	Mono10Packed
12bits	Mono12
12bits Packed	Mono12Packed

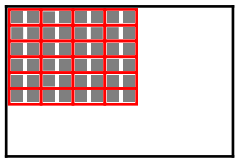
Each format specified on GenICam PFNC (Pixel Format Naming Convention).

10.8 Binning

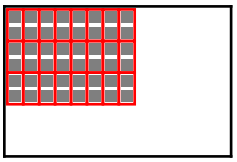
Binning is added adjacent pixels into one pixel.
The pixel data inside of red square add or average as one pixel.
When selecting “Binning (summing)”, sensitivity of image is increasing.
When selecting “Binning (average)”, noise is reducing.



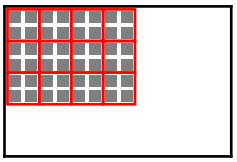
Binning X (1), Y (1)



Binning X (2), Y (1)



Binning X (1), Y (2)



Binning X (2), Y (2)

GenICam Parameter

BinningHorizontalMode	IEnumeration Type	Selects horizontal binning mode. Sum: summing Average: averaging
BinningHorizontal	IInteger Type	Sets binning on horizontal direction Selection: 1: Disable Binning, 2: x2 Binning Default: Disable Binning
BinningVerticalMode	IEnumeration Type	Selects vertical binning mode. Sum: summing Average: averaging
BinningVertical	IInteger Type	Sets binning on vertical direction Selection: 1: Disable Binning, 2: x2 Binning Default: Disable Binning

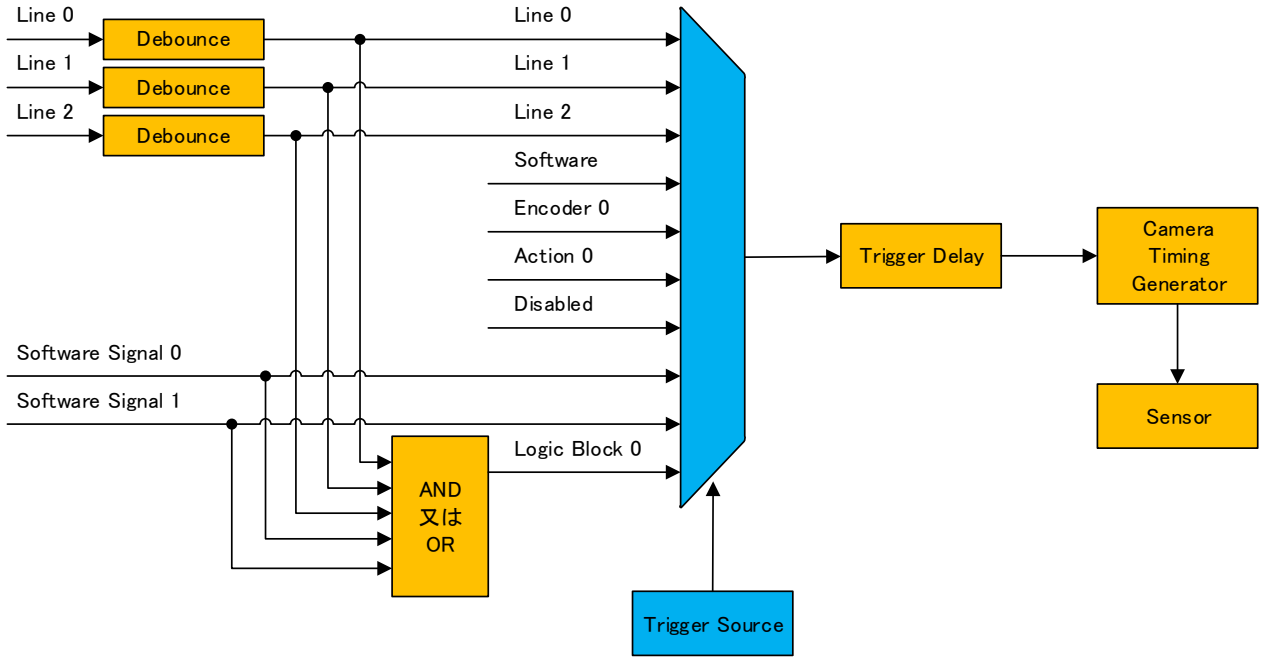
10.9 Trigger

The trigger type (trigger source) is selectable at “TriggerSource” under “AcquisitionControl”.
The trigger type (trigger source) is listed in below table.

Software	Software trigger generates by “TriggerSoftware”
Line 0	Hardware trigger through “Line0”
Line 1	Hardware trigger through “Line1”
Line 2	Hardware trigger through “Line2”
Software Signal 0	Software trigger generates by “SoftwareSignalControl”
Software Signal 1	Software trigger generates by “SoftwareSignalControl”
Action 0	Action command trigger
Logic Block 0	Trigger generates by “LogicBlockControl” Please refers “Trigger signal processing procedure” for more details
Encoder0	Trigger generated by “EncoderControl”
Disabled	Disabling trigger signal

10.9.1 Trigger signal processing procedure

The camera internal process for external hardware trigger signal or software trigger signal input is below:



The trigger signal is selectable by GenICam commands.

TriggerSource: select trigger type

10.10 Flat Field Correction Control

FFC (Filed Flat Correction) is used for correcting non-uniformity of image brightness resulting from lens or image sensor. When using this camera, FFC should be used because image sensor has fixed pattern noise.

Each pixel of image can be correcting with FFC function.
The correcting value of FFC function is calculating with information of acquired multiple image

GenICam Parameters

FFCOffsetMode	IEnumeration Type	Selection of offset FFC function (shading light condition) On: Output offset FFC processed image Off: Output original image (no offset FFC processing) Once: Processing offset FFC with FFCOffsetTarget Default: On
FFCGainMode	IEnumeration Type	Selection of gain FFC function (grey level condition) Off: Output gain FFC processed image On: Output original image (no gain FFC processing) Once: Processing gain FFC with FFCGainTarget TargetPlusOnce: Processing gain FFC with referencing brightest pixel. FFCGainTarget value is adding as pixel level (brightness level) to all pixels after processing FFC. Default: On
FFCOffsetTarget	IFloat Type	Target brightness level for offset FFC Range: 0 to 255 Default: 3
FFCGainTarget	IFloat Type	Target brightness level for gain FFC / adding brightness level after processing gain FFC with referencing brightest pixel Range: 0 to 255 Default: 10
FFCSetSelector	IEnumeration Type	Selection of FFC set Selection Default and FFCSet0 to FFCSet7 Processing FFCSetLoad (FFC data load function) or FFCSetSave (FFC data save function) with selected FFC set. * FFCSetSave (FFC data save function) is not selectable when selecting “Default” at “FFCSetSelector”
FFCSetLoad	ICommand Type	FFC data loads from flash memory on camera
FFCSetSave	ICommand Type	FFC data saves to flash memory on camera
FFCSetDefault	IEnumeration Type	Selection of FFC Set default When camera powering on, selected FFC Set data is applying as FFC data. Selection: Default and FFCSet0 to FFCSet7 * Please use “UserSetSave” to save FFCSetDefault setting.

10.10.1 FFC procedure

FFC procedure

1. Selects “Off” at FFCOffsetMode and FFCGainMode.
2. Sets target brightness level for offset FFC processing at FFCOffsetTarget.
3. Shading camera
4. When selecting “Once” at FFCOffsetMode offset FFC processing starts automatically.
5. FFCOffsetMode setting is switching from “Once” to “On” when offset FFC processing is finished.
6. Un-covers camera
   Please do not make saturated image.
   Please using the white smooth clean object for calibration and set focus.
   Please proceeding one of below gain FFC processing.

A) Gain FFC processing with target brightness pixel (FFCGainMode: Once)

A)-7. Sets target brightness level for gain FFC processing at FFCGainTarget.
The setting value should be 10 digits lower than most brighter pixel of image.

A)-8. When selecting “Once” at FFCGainMode, gain FFC processing starts automatically.

A)-9. FFCGainMode setting is switching from “Once” to “On” when gain FFC processing is finished.

B) Gain FFC processing with referencing brightest pixel (FFCGainMode: TargetPlusOnce)

B)-7. Sets adding brightness level from brightest pixel of image.

B)-8. When selecting “TargetPlusOnce” at FFCGainMode, gain FFC processing starts automatically.

B)-9. FFCGainMode setting is switching from “TargetPlusOnce” to “On” when gain FFC processing is finished.

Before applying FFC

After applying FFC

*Note1: It is necessary to set “Off” at TriggerMode as Free run operation when proceeding FFC function.

*Note2: It is necessary to adjust “ExposureTime” to brightness level of image is about 180 digits at 8bits output.

*Note3: It is necessary to read / polling settings of camera to check status of FFCOffsetMode and 、FFCGainMode after proceeding FFC function.

*Note4: It is necessary to proceeding FFC function when changing lens, light source or camera settings (AnalogGain, ExposureMode or TriggerMode of LineStart trigger)

10.11 Digital IO Control

Controls input and output signal through 12pin IO signal connector.

GenICam Paramters

LineSelector	IEnumeration Type	Selects setup IO pin on 12pin IO signal connector Selection: Line0, Line1, Line2, Line3, Line4 Default: Line0
LineInverter	IBoolean Type	Inverts polarity of signal through selected IO pin Selection: False (Invert Off), True (Invert On) Default: False
LineStatus	IBoolean Type	Displays status of selected IO pin (whether signal exist or not)
LineSource	IEnumeration Type	Selects output signal through selected IO pin Selection: UserOutput3, UserOutput4, FrameTriggerWait, FrameTrigger, LineTriggerWait, LineTrigger, SensorReadOut, AcquisitionTriggerWait, AcquisitionTrigger, ExposureActive, Timer0Active, Timer1Active, SoftwareSignal0, SoftwareSignal1, LogicBlock0, PulsePerSecond, Line0, Line1, Line2, FrameTimeout, Action0 Default: FrameTriggerWait
LineFormat	IEnumeration Type	Selects electronic format of signal for selected IO port Selection: TTL, RS422 Default: TTL
LineDebounceTime	IFloat Type	Sets debounce time for selected input IO pin (µsecond) Range: 1 to 1,000 Default: 1
UserOutputSelector	IEnumeration Type	Selects UserOuput that applying UserOutputValue Selection: UserOutput3, UserOutput4 Default: UserOutput3
UserOutputValue	IBoolean Type	Sets condition for UserOutput signal Selection: False, True Default: False

10.12 Counter And Timer Control

Controls “Timer” and “Counter”.

10.12.1 Timer Control

GenICam Parameters

TimerSelector	IEnumeration Type	Setup timer selection Selection: Timer0, Timer1 Default: Timer0
TimerDuration	IFloat Type	Duration of “Timer active” signal (in µsecond) Range: 1 to 16,777,215 Default: 1
TimerDelay	IFloat Type	Delay for “Timer active” signal (in µsecond) Range: 0 to 16,777,215 Default: 0
TimerValue	IFloat Type	Returns value for “Timer active” signal
TimerTriggerSource	IEnumeration Type	Reference signal selection to generate “Timer active” signal Selection: Off, Line0, Line1, Line2, FrameTrigger, ExposureStart, AcquisitionTrigger, SoftwareSignal0, “oftwareSignal1, LogicBlock0, Action0 Default: Off
TimerTriggerActivation	IEnumeration Type	Polarity of reference signal to generate “Timer active” signal Selection: RisingEdge, FallingEdge Default: RisingEdge”

When the timing of “Timer0active” signal is adjusting to active signal of Exposure, “Timer0” can be used as strobe control signal.

10.12.2 Counter Control

GenICam Parameters

CounterSelector	IEnumeration Type	Counter selection Selection: Counter0, Counter1 Default: Counter0
CounterEventSource	IEnumeration Type	Counter event source selection Selection: Off, FrameStart, FrameTrigger Default: Off
CounterResetSource	IEnumeration Type	Reference signal selection to reset counter Selection: Off, Line0, Line1, Line2 Default: Off
CounterResetActivation	IEnumeration Type	Polarity of reference signal to reset counter Selection: RisingEdge, FallingEdge Default: RisingEdge
CounterReset	ICommand Type	Reset switch Activate as switch when selecting “Software” at “CounterResetSource”
CounterValue	IInteger Type	Returns number of counter

10.13 Encoder Control

The camera operation controls by Rotary Encoder.

GenICam Parameters

EcnoderSelector	IEnumeration Type	Selects Rotary Encoder. Selection: Encoder0 Default: Encoder0
EncoderSourceA	IEnumeration Type	Selects input IO for A-phase of Rotary Encoder. Selection: Off, Line0, Line1, Line2 Default: Off
EncoderSourceB	IEnumeration Type	Selects input IO for B-phase of Rotary Encoder Selection: Off, Line0, Line1, Line2 Default: Off
EncoderMode	IEnumeration Type	Selects On / Off for jitter filtering for input encoder signal Selection: FourPhase (with filtering), HighResolution (without filtering) Default: FourPhase
EncoderDiviber	IInteger Type	Sets frequency division Range: 1 to 65535 Default: 1
EncoderOutputMode	IEnumeration Type	Selects output signal condition that how does target object move Selection: Off, DirectionUp, DirectionDown, Motion Default: Off
EncoderStatus	IEnumeration Type	Monitoring status of Rotary Encoder
EncoderTimeout	IFloat Type	The TimeOut event is occurring when no input signal from Rotary Encoder for specified period of time.
EncoderResetSource	IEnumeration Type	Selects signal for reset Rotary Encoder Selection: Off, AcquisitionStart, FrameStart, Line0, Line1, Line2, SoftwareSignal0, SoftwareSignal1, LogicBlock0, Action0 Default: Off
EncoderResetActivation	IEnumeration Type	Selects signal condition for reset Rotary Encoder Selection: RisingEdge, FallingEdge, AnyEdge, LevelHigh, LevelLow Default: RisingEdge
EncoderReset	ICommand Type	Resets Rotary Encoder by software signal
EncoderValueAtReset	IInteger Type	Sets default value when reset Rotary Encoder

10.14 Logic Block Control

The trigger signal generating with more than two input signals at Logic circuit.

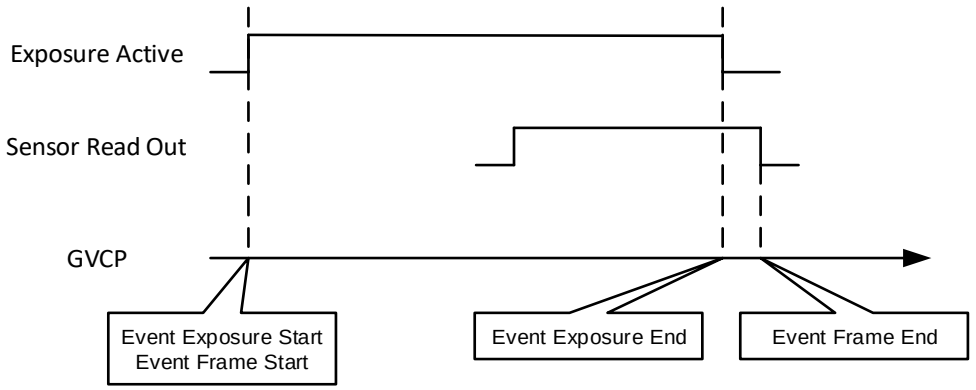
GenICam Parameters

LogicBlockSelector	IEnumeration Type	Selects setup LogicBlock Selection: LogicBlock0 Default: LogicBlock0
LogicBlockFunction	IEnumeration Type	Selects logic circuit of LogicBlock0 Selection: AND, OR Default: OR
LogicBlockInputNumber	IInteger Type	Selects number of input signal for LogicBlock0 Range: 2 to 4 Default: 2
LogicBlockInputSelector	IInteger Type	Selects input signal for LogicBlock0 Range: 0 to 3 Default: 0 Note. The range will be change with setting of LogicBlockInputNumber
LogicBlockInputSource	IEnumeration Type	Selects signal type for input signal that selected at LogicBlockInputSelector Selection: True, False, SoftwareSignal0, SoftwareSignal1, Line0, Line1, Line2 Default: True
LogicBlockInputInverter	IEnumeration Type	Inverts polarity of input signal that selected at LogicBlockInputSelector Selection: False (no invert), True (invert) Default: False

10.15 Event Control

The camera internal signal can be output as specified event information, like “exposure end”, to PC used by GVCP (GigE Vision Control Protocol).

e.g. Event control
Notified “Exposure End”



GenICam Parameters

Event Selector	IEnumeration Type	Event notification selection Selection: FrameTrigger, FrameStart, FrameEnd, Line0InputRisingEdge, Line0InputFallingEdge, Line1InputRisingEdge, Line1InputFallingEdge, Line2InputRisingEdge, Line2Input FallingEdge, BlockDiscard, ActionLate, AcquisitionTriggerMissed, FrameTriggerMissed, LineTriggerMissed, FrameTimeout, OverrunEvent
Event Notification	IEnumeration Type	Event notification ON / OFF selection On: Enable event notification Off: Disable event notification

10.16 Chunk Control

This function is attached additional image information to image data.

For example, the exposure time and gain information do not include in image data itself. However, Chunk data transfers these parameters when image was acquiring.

GenICam Parameters

ChunkModeActive	IBoolean Type	Chunk control ON / OFF selection Selection: “False” (Off), “True” (On) Default: “False” (Off)
ChunkSelector	IEnumeration Type	Transfer Chunk data selection Selection: Image, “CounterValue, Gain, ExposureTime, LineStatusAll, TimerValue, DeviceTemperature
ChunkEnable	IBoolean Type	Enable Chunk data that was selected at “Chunk Selector” Selection: “True” (Enable Chunk data) and “False” (Disable Chunk data)
ChunkCounterSelector	IEnumeration Type	CounterValue selection Selection: Counter0, Counter1 Default: Counter0
ChunkGainSelector	IEnumeration Type	Gain selection Selection: AnalogAll, DigitalAll Default: AnalogAll
ChunkTimerSelector	IEnumeration Type	Timer selection Selecrion: Timer0, Timer1 Default: Timer0

10.17 Action Control

The multiple cameras control by one action signal.

GenICam Parameters

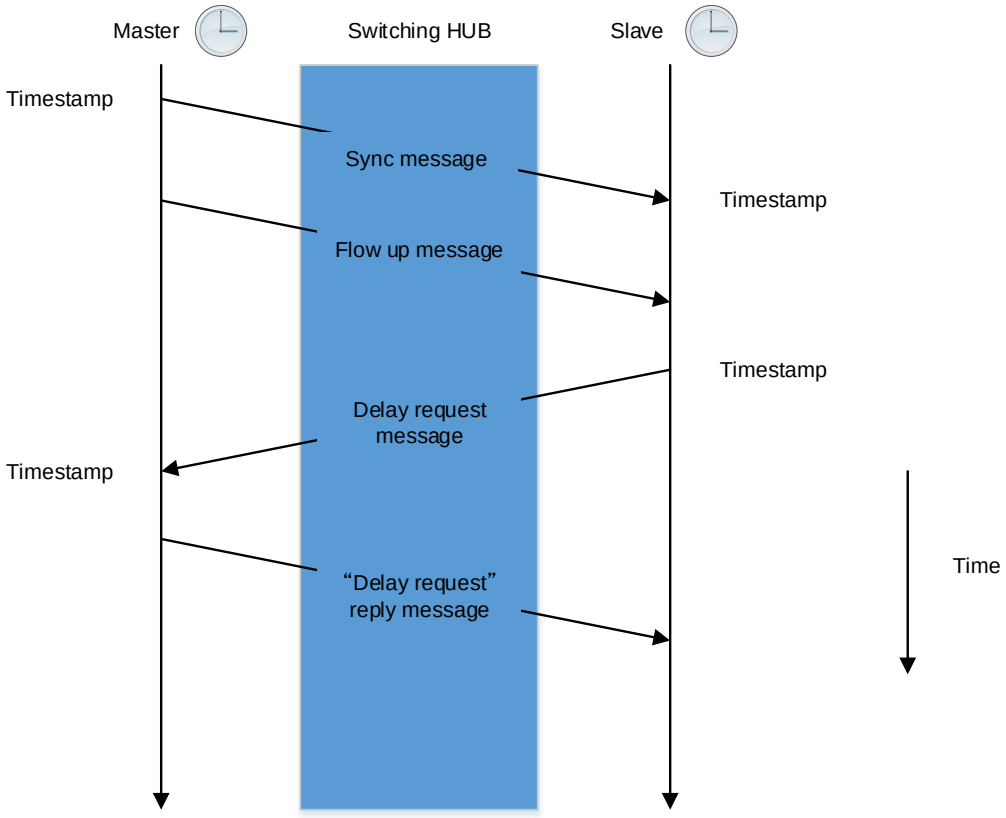
ActionDeviceKey	IInteger Type	Control identifier of camera
ActionQueueSize	IInteger Type	Size of scheduled action command queue
ActionSelector	IInteger Type	Action command application selection Fixed as “0”
ActionGroupKey	IInteger Type	Action command applies camera * The camera executes action command when group key of action command and group key of camera is matched.
ActionGroupMask	IInteger Type	Select camera to apply action command Logical AND of Group Mask of camera and Group Mask of action command is 1 for any bit of 32bits, camera executes action command.

10.18 IEEE1588

Precision Time Protocol (PTP) is implemented on camera, is synchronized to “Master Clock” in same network automatically.
The camera supports IEEE 1588-2008 of PTP Version 2. The accuracy of time (Timestamp) synchronized is different based on network system configuration.

1) BMC (Best Master Clock) function
BMC function is implemented on camera. The most accurate clock in same network is defined as “Master Clock” then time (Timestamp) synchronizes. If there are more than two devices has most accurate clock in same network, clock of smallest MAC address device is defined as “Master Clock”.

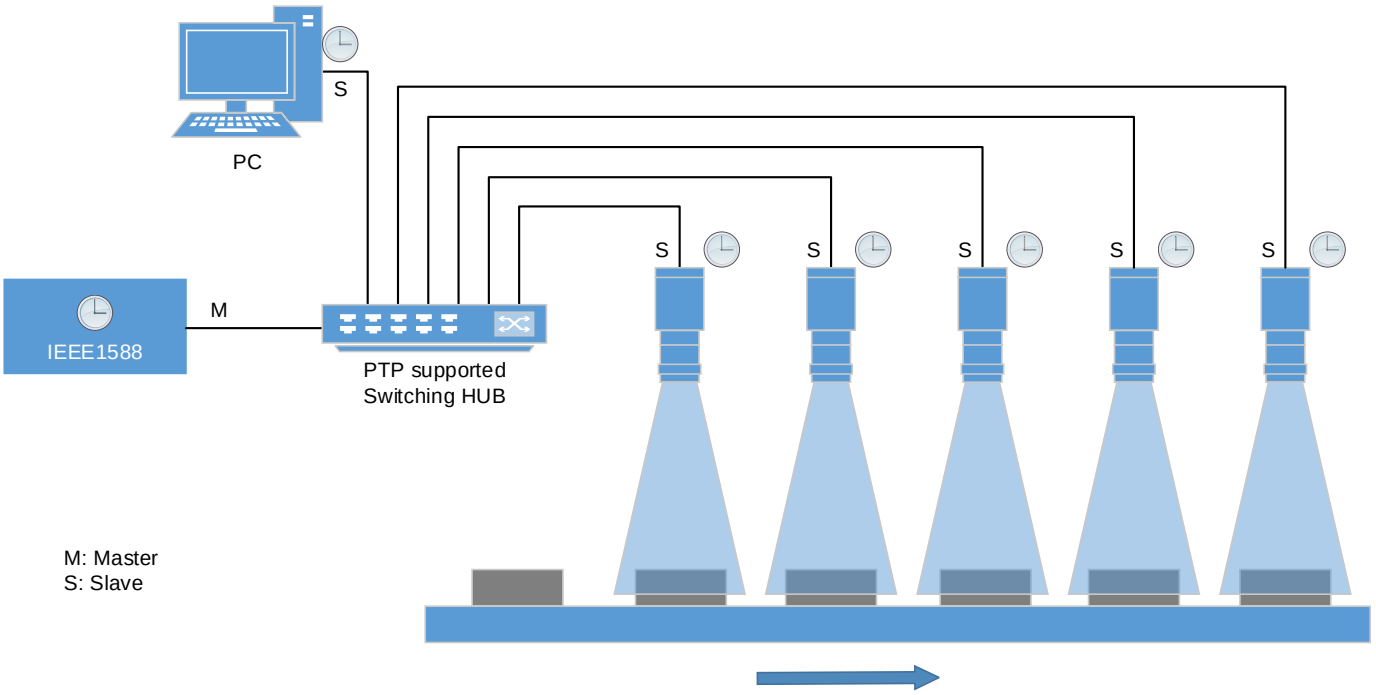
2) E2E (End-to-End) Transparent Clock
The camera supports E2E method. Time difference is correcting by blow algorithm



The master device and slave device exchange message included Timestamp.
Defined delay between master device and slave device by comparing these messages.
If time difference between master device and slave device is occurred, adjust internal clock of slave device to synchronize to master device.
Synchronize clock regularly to correcting time drift.

3) How to use PTP
Selects “True” at GevIEEE1588 then synchronize camera time to “Master Clock” (synchronize time is different depending on system). The camera is ready for action command after synchronize to “Master Clock”.

4) Synchronized exposure for trigger mode
When action command generating, action command is broadcasting to each camera and camera starts exposing.
Synchronized exposure does not secure if action command does NOT include Timestamp. If action command includes Timestamp, action command will be scheduled automatically and each camera start exposing at same time.
Action Control setting is required when action command generating.



e.g. PTP configuration

11 GenICam command list

11.1 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.
DeviceHardwareVersion	Version of the hardware in the device.
DeviceSerialNumber	Device's serial number.
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 sub minor 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.
DeviceMaxThroughput	Maximum bandwidth of the data that can be streamed out of the device.

Name	Description
DeviceLinkSelector	Selects which Link of the device to control.
DeviceLinkSpeed [DeviceLinkSelector]	Indicates the speed of transmission negotiated on the specified Link.
DeviceLinkHeartbeatTimeout [DeviceLinkSelector]	Controls the current heartbeat timeout of the specific Link.
DeviceLinkCommandTimeout [DeviceLinkSelector]	Indicates the command timeout of the specified Link.
DeviceStreamChannelCount	Indicates the number of streaming channels supported by the device.
DeviceStreamChannelSelector	Selects the stream channel to control.
DeviceStreamChannelType [DeviceStreamChannelSelector]	Reports the type of the stream channel.
DeviceStreamChannelLink [DeviceStreamChannelSelector]	Index of device's Link to use for streaming the specifed stream channel.
DeviceStreamChannelEndianness [DeviceStreamChannelSelector]	Endianness of multi-byte pixel data for this stream.
DeviceStreamChannelPacketSize [DeviceStreamChannelSelector]	Specifies the stream packet size, in bytes, to send on the selected channel for a Transmitter or specifies the maximum packet size supported by a receiver.
DeviceEventChannelCount	Indicates the number of event channels supported by the device.
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.
DeviceRegistersEndianness	Endianness of the registers of the device.
DeviceTemperatureSelector	Selects the location within the device, where the temperature will be measured.
DeviceTemperature [DeviceTemperatureSelector]	Device temperature in degrees Celsius (C).
TimestampReset	Resets the current value of the device timestamp counter.
TimestampLatch	Latches the current timestamp counter into Timestamp Latch Value.
TimestampLatchValue	Returns the latched value of the timestamp counter.
DeviceUserMemory	Read / Write the user data from / to the non-volatile memory.

11.2 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).
HeightMax	Maximum height of the image (in pixels).
RegionSelector	Selects the Region of interest to control.
RegionMode [RegionSelector]	Controls if the selected Region of interest is active and streaming.
Width [RegionSelector]	Width of the image provided by the device (in pixels).
Height [RegionSelector]	Height of the image provided by the device (in pixels).
OffsetX [RegionSelector]	Horizontal offset from the origin to the region of interest (in pixels).
BinningSelector	Selects which binning engine is controlled by the BinningHorizontal and BinningVertical features.
BinningHorizontalMode [BinningSelector]	Sets the mode to use to combine horizontal photo-sensitive cells together when BinningHorizontal is used.
BinningHorizontal [BinningSelector]	Number of horizontal photo-sensitive cells to combine together.
BinningVerticalMode [BinningSelector]	Sets the mode to use to combine vertical photo-sensitive cells together when BinningVertical is used.
BinningVertical [BinningSelector]	Number of vertical photo-sensitive cells to combine together.
ReverseX	Flip horizontally the image sent by the device.
PixelFormat	Format of the pixels provided by the device.
PixelSize	Total size in bits of a pixel of the image.
PixelColorFilter	Type of color filter that is applied to the image.
TestPatternGeneratorSelector	Selects which test pattern generator is controlled by the Test Pattern feature.
TestPattern [TestPatternGeneratorSelector]	Selects the type of test pattern that is generated by the device as image source.

11.3 AcquisitionControl

Name	Description
AcquisitionMode	Sets the acquisition mode of the device.
AcquisitionStart	Starts the Acquisition of the device.
AcquisitionStop	Stops the Acquisition of the device at the end of the current Frame.
AcquisitionFrameCount	Number of frames to acquire in Multi Frame Acquisition mode.
AcquisitionFrameRate	Controls the acquisition rate (in Hertz) at which the frames are captured.
AcquisitionLineRate	Controls the rate (in Hertz) at which the Lines in Frame are captured.
FrameTimeoutEnable	Enables the FrameTimeout.
FrameTimeout	Sets the timeout for frame completion.
TriggerSelector	Selects the type of trigger to configure.
TriggerMode [TriggerSelector]	Controls if the selected trigger is active.
TriggerSoftware [TriggerSelector]	Generates an internal trigger.
TriggerSource [TriggerSelector]	Specifies the internal signal or physical input Line to use as the trigger source.
TriggerActivation [TriggerSelector]	Specifies the activation mode of the trigger.
TriggerDelay [TriggerSelector]	Specifies the delay in microseconds (us) to apply after the trigger reception before activating it.
ExposureMode	Sets the operation mode of the Exposure.
ExposureTimeSelector	Selects which exposure time is controlled by the Exposure Time feature.
ExposureTime [ExposureTimeSelector]	Sets the Exposure time when Exposure Mode is Timed and Exposure Auto is Off.

11.4 AnalogControl

Name	Description
GainSelector	Selects which Gain is controlled by the various Gain features.
Gain [GainSelector]	Controls the selected gain as an absolute physical value.

11.5 DigitalIOControl

Name	Description
LineSelector	Selects the physical line (or pin) of the external device connector or the virtual line of the Transport Layer to configure.
LineMode [LineSelector]	Controls if the physical Line is used to Input or Output a signal.
LineInverter [LineSelector]	Controls the inversion of the signal of the selected input or output Line.
LineStatus [LineSelector]	Returns the current status of the selected input or output Line.
LineStatusAll	Returns the current status of all available Line signals at time of polling in a single bitfield.
LineSource [LineSelector]	Selects which internal acquisition or I/O source signal to output on the selected Line.
LineFormat [LineSelector]	Controls the current electrical format of the selected physical input or output Line.
LineDebounceTime [LineSelector]	Sets the value of the input line debouncer time.
UserOutputSelector	Selects which bit of the User Output register will be set by User Output Value.
UserOutputValue [UseOutputSelector]	Sets the value of the bit selected by User Output Selector.

11.6 CounterAndTimerControl

Name	Description
CounterSelector	Selects which Counter to configure.
CounterEventSource [CounterSelector]	Select the events that will be the source to increment the Counter.
CounterResetSource [CounterSelector]	Selects the signals that will be the source to reset the Counter.
CounterResetActivation [CounterSelector]	Selects the Activation mode of the Counter Reset Source signal.
CounterReset [CounterSelector]	Does a software reset of the selected Counter and starts it.
CounterValue [CounterSelector]	Reads or writes the current value of the selected Counter.
TimerSelector	Selects which Timer to configure.
TimerDuration [TimerSelector]	Sets the duration (in microseconds) of the Timer pulse.
TimerDelay [TimerSelector]	Sets the duration (in microseconds) of the delay to apply at the reception of a trigger before starting the Timer.
TimerValue [TimerSelector]	Reads or writes the current value (in microseconds) of the selected Timer.
TimerTriggerSource [TimerSelector]	Selects the source of the trigger to start the Timer.
TimerTriggerActivation [TimerSelector]	Selects the activation mode of the trigger to start the Timer.

11.7 EncoderControl

Name	Description
EncoderSelector	Selects which Encoder to configure.
EncoderSourceA [EncoderSelector]	Selects the signal which will be the source of the A input of the Encoder.
EncoderSourceB [EncoderSelector]	Selects the signal which will be the source of the B input of the Encoder.
EncoderMode [EncoderSelector]	Selects if the count of encoder uses FourPhase mode with jitter filtering or the HighResolution mode without jitter filtering.
EncoderDriver [EncoderSelector]	Sets how many Encoder increment/decrements are needed to generate an Encoder output pulse signal.
EncoderOutputMode [EncoderSelector]	Selects the conditions for the Encoder interface to generate a valid Encoder output signal.
EncoderStatus [EncoderSelector]	Returns the motion status of the encoder.
EncoderTimeout [EncoderSelector]	Sets the maximum time interval between encoder counter increments before the status turns to static.
EncoderResetSource [EncoderSelector]	Selects the signals that will be the source to reset the Encoder.
EncoderResetActivation [EncoderSelector]	Selects the Activation mode of the Encoder Reset Source signal.
EncoderReset [EncoderSelector]	Does a software reset of the selected Encoder and starts it.
EncoderValueAtReset [EncoderSelector]	Reads the value of the of the position counter of the selected Encoder when it was reset by a signal or by an explicit EncoderReset command.

11.8 LogicBlockControl

Name	Description
LogicBlockSelector	Specifies the Logic Block to configure.
LogicBlockFunction [LogicBlockSelector]	Selects the combinational logic Function of the Logic Block to configure.
LogicBlockInputNumber [LogicBlockSelector]	Specifies the number of active signal inputs of the Logic Block.
LogicBlockInputSelector [LogicBlockSelector]	Selects the Logic Block's input to configure.
LogicBlockInputSource [LogicBlockSelector] [LogicBlockInputSelector]	Selects the source signal for the input into the Logic Block.
LogicBlockInputInverter [LogicBlockSelector] [LogicBlockInputSelector]	Selects if the selected Logic Block Input source signal is inverted.

11.9 SoftwareSignalControl

Name	Description
SoftwareSignalSelector	Selects which Software Signal features to control.
SoftwareSignalPulse [SoftwareSignalSelector]	Generates a pulse signal that can be used as a software trigger.

11.10 ActionControl

Name	Description
ActionDeviceKey	Provides the device key that allows the device to check the validity of action commands.
ActionQueueSize	Indicates the size of the scheduled action commands queue.
ActionSelector	Selects to which Action Signal further Action settings apply.
ActionGroupMask [ActionSelector]	Provides the mask that the device will use to validate the action on reception of the action protocol message.
ActionGroupKey [ActionSelector]	Provides the key that the device will use to validate the action on reception of the action protocol message.

11.11 EventControl

Name	Description
EventSelector	Selects which Event to signal to the host application.
EventNotification [EventSelector]	Activate or deactivate the notification to the host application of the occurrence of the selected Event.
EventFrameTriggerData	Category that contains all the data features related to the Frame Trigger Event.
EventFrameStartData	Category that contains all the data features related to the Frame Start Event.
EventFrameEndData	Category that contains all the data features related to the Frame End Event.
EventLine0RisingEdgeData	Category that contains all the data features related to the Line0 Rising Edge Event.
EventLine0FallingEdgeData	Category that contains all the data features related to the Line0 Falling Edge Event.
EventLine1RisingEdgeData	Category that contains all the data features related to the Line1 Rising Edge Event.
EventLine1FallingEdgeData	Category that contains all the data features related to the Line1 Falling Edge Event.
EventLine2RisingEdgeData	Category that contains all the data features related to the Line2 Rising Edge Event.
EventLine2FallingEdgeData	Category that contains all the data features related to the Line2 Falling Edge Event.
EventBlockDiscardData	Category that contains all the data features related to the Block Discard Event.
EventActionLateData	Category that contains all the data features related to the Action Late Event.
EventAcquisitionTriggerMissedDate	Category that contains all the data features related to the Acquisition Trigger Missed Event.
EventFrameTriggerMissedDate	Category that contains all the data features related to the Frame Trigger Missed Event.
EventLineTriggerMissedDate	Category that contains all the data features related to the Line Trigger Missed Event.
EventFrameTimeoutDate	Category that contains all the data features related to the Frame Timeout Event.
EventOverrunEventDate	Category that contains all the data features related to the Overrun Event.
EventTestData	Category that contains all the data features related to the Test Event .

11.12 UserSetControl

Name	Description
UserSetSelector	Selects the feature User Set to load, save or configure.
UserSetLoad [UserSetSelector]	Loads the User Set specified by User Set Selector to the device and makes it active.
UseSetSave [UserSetSelector]	Save the User Set specified by User Set Selector 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.

11.13 FileAccessControl

Name	Description
FileSelector	Selects the target file in the device.
FileOperationSelector [FileSelector]	Selects the target operation for the selected file in the device.
FileOperationExecute [FileSelector] [FileOperationSelector]	Executes the operation selected by File Operation Selector on the selected file.
FileOpenMode [FileSelector]	Selects the access mode in which a file is opened in the device.
FileAccessBuffer	Defines the intermediate access buffer that allows the exchange of data between the device file storage and the application.
FileAccessOffset [FileSelector] [FileOperationSelector]	Controls the Offset of the mapping between the device file storage and the File Access Buffer.
FileAccessLength [FileSelector] [FileOperationSelector]	Controls the Length of the mapping between the device file storage and the File Access Buffer
FileOperationStatus [FileSelector] [FileOperationSelector]	Represents the file operation execution status.
FileOperationResult [FileSelector] [FileOperationSelector]	Represents the file operation result.
FileSize [FileSelector]	Represents the size of the selected file in bytes.

11.14 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 [ChunkSelector]	Enables the inclusion of the selected Chunk data in the payload of the image.
ChunkCounterSelector	Selects which counter to retrieve data from.
ChunkCounterValue [ChunkCounterSelector]	Returns the value of the selected Chunk counter.
ChunkGainSelector	Selects which Gain to return.
ChunkGain [ChunkGainSelector]	Returns the gain used to capture the image.
ChunkExposureTimeSelector	Selects which Exposure Time to return.
ChunkExposureTime [ChunExposureTimeSelector]	Returns the exposure time used to capture the image.
ChunkLineStatusAll	Returns the status of all the I/O lines at the time of the Frame Start internal event.
ChunkTimerSelector	Selects which timer to retrieve data from.
ChunkTimerValue [ChunkTimerSelector]	Returns the value of the selected Timer.
ChunkDeviceTemperature	Indicates the value of the temperature when the image was acquired.

11.15 TestControl

Name	Description
TestPendingAck	Tests the device's pending acknowledge feature.
TestEventGenerate	Generates a Test Event.

11.16 TransportLayerControl

Name	Description
PayloadSize	Provides the number of bytes transferred for each image or chunk on the stream channel.
PtpEnable	Enable the Precision Time Protocol (PTP).
PtpClockAccuracy	Indicate the expected accuracy of the device PTP clock when it is the grandmaster, or in the event it becomes the grandmaster.
PtpDataSetLatch	Latches the current values from the device's PTP clock data set.
PtpStatus	Returns the latched state of the PTP clock.
PtpServoStatus	Returns the latched state of the clock servo.
PtpOffsetFromMaster	The latched offset from the PTP master clock in nanoseconds.
PtpClockID	The latched clock ID of the PTP device. PTP Parent Clock ID.
PtpParentClockID	The latched parent clock ID of the PTP device. The parent clock ID is the clock ID of the current master clock.
PtpGrandmasterClockID	The latched grandmaster clock ID of the PTP device. The grandmaster clock ID is the clock ID of the current grandmaster clock.
GevPhysicalLinkConfiguration	Controls the principal link configuration to use on next restart / power-up of the device.
GevCurrentPhysicalLinkConfiguration	Indicates the current physical link configuration of the device.
GevSupportedOptionSelector	Selects the GEV option to interrogate for existing support.
GevSupportedOption [GevSupportedOptionSelector]	Returns if the selected GEV option is supported.
GevInterfaceSelector	Selects which logical link to control.
GevMACAddress [GevInterfaceSelector]	MAC address of the logical link.
GevPAUSEFrameReception [GevInterfaceSelector]	Controls whether incoming PAUSE Frames are handled on the given logical link.
GevPAUSEFrameTransmission [GevInterfaceSelector]	Controls whether incoming PAUSE Frames can be generated on the given logical link.
GevCurrentIPConfigurationLLA [GevInterfaceSelector]	Controls whether the Link Local Address IP configuration scheme is activated on the given logical link.
GevCurrentIPConfigurationDHCP [GevInterfaceSelector]	Controls whether the DHCP IP configuration scheme is activated on the given logical link.
GevCurrentIPConfigurationPersistentIP [GevInterfaceSelector]	Controls whether the Persistent IP configuration scheme is activated on the given logical link.
GevCurrentIPAddress [GevInterfaceSelector]	Reports the IP address for the given logical link.
GevCurrentSubnetMask [GevInterfaceSelector]	Reports the subnet mask of the given logical link.
GevCurrentDefaultGateway [GevInterfaceSelector]	Reports the default gateway IP address to be used on the given logical link.

Name	Description
GevIPConfigurationStatus [GevInterfaceSelector]	Reports the current IP configuration status.
GevPersistentIPAddress [GevInterfaceSelector]	Controls the Persistent IP address for this logical link.
GevPersistentSubnetMask [GevInterfaceSelector]	Controls the Persistent subnet mask associated with the Persistent IP address on this logical link.
GevPersistentDefaultGateway [GevInterfaceSelector]	Controls the persistent default gateway for this logical link.
GevGVCPExtendedStatusCodesSelector	Selects the GigE Vision version to control extended status codes for.
GevGVCPExtendedStatusCodes [GevGVCPExtendedStatusCodesSelector]	Enables the generation of extended status codes.
GevGVCPPendingAck	Enables the generation of PENDING_ACK.
GevPrimaryApplicationSwitchoverKey	Controls the key to use to authenticate primary application switchover requests.
GevGVCPExpendedIDMode	Enables the extended IDs mode.
GevCCP	Controls the device access privilege of an application.
GevPrimaryApplicationSocket	Returns the UDP source port of the primary application.
GevPrimaryApplicationIPAddress	Returns the address of the primary application.
GevMCPHostPort	Controls the port to which the device must send messages.
GevMCDA	Controls the destination IP address for the message channel.
GevMCTT	Provides the transmission timeout value in milliseconds.
GevMCRC	Controls the number of retransmissions allowed when a message channel message times out.
GevMCSP	This feature indicates the source port for the message channel.
GevStreamChannelSelector	Selects the stream channel to control.
GevSCPInterfaceIndex [GevStreamChannelSelector]	Index of the logical link to use.
GevSCPHostPort [GevStreamChannelSelector]	Controls the port of the selected channel to which a GVSP transmitter must send data stream or the port from which a GVSP receiver may receive data stream.
GeSCPSFireTestPacket [GevStreamChannelSelector]	Sends a test packet.
GevSCPSDoNotFragment [GevStreamChannelSelector]	The state of this feature is copied into the "do not fragment" bit of IP header of each stream packet.
GevSCPSPacketSize [GevStreamChannelSelector]	This GigE Vision specific feature corresponds to DeviceStreamChannelPacketSize and should be kept in sync with it.
GevSCPD [GevStreamChannelSelector]	Controls the delay (in GEV timestamp counter unit) to insert between each frame for this stream channel.

Name	Description
GevSCDA [GevStreamChannelSelector]	Controls the destination IP address of the selected stream channel to which a GVSP transmitter must send data stream or the destination IP address from which a GVSP receiver may receive data stream.
GevSCSP [GevStreamChannelSelector]	Indicates the source port of the stream channel.
GevSCFTD	Controls the delay (in GEV timestamp counter unit) to insert between each packet for this stream channel.

11.17 Flat Field Correction Control

Name	Description
FFCOffsetMode	Controls if the selected FFCOffset is active.
FFCGainMode	Controls if the selected FFCGain is active.
FFCOffsetTarget	Sets the value of the target offset level for Once mode.
FFCGainTarget	Sets the value of the target gain level for Once mode.
FFCStatusAll	Returns the FFC status all.
FFCSetSelector	Selects the feature FFC Set to load, save or configure.
FFCSetLoad [FFCSetSelector]	Loads the FFC Set specified by FFCSetSelector to the device and makes it active.
FFCSetSave [FFCSetSelector]	Save the FFC Set specified by FFCSetSelector to the non-volatile memory of the device.
FFCSetDefault	Selects the feature FFC Set to load and make active by default when the device is reset.

12 Revision History

Rev	Date	Changes	Note
00	2020/03/10	● New document	
		●	

Note: Product specifications would be changed without notification.

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