CIS

CoaXPress I/F

25M pixels CMOS B/W Camera

VCC-25CXP1M

Product Specifications & Operational Manual

CIS Corporation

Table of Contents

1. Handling Precautions

1.1. Camera Handling Precautions

- ☐ Do not use or store camera in dusty or humid places.
- ☐ Do not apply excessive force, vibration, or static electricity that could damage camera. Please handle camera with care.
- ☐ Do not shoot direct images that are extremely bright (e.g., strong light source, sun, etc.). When extremely strong light source is shot, smear or blooming may occur. Put the lens cap on when camera is not in use.
- ☐ Follow the instructions in Chapter 3.3., "External Connector Pin Assignment" for connecting camera. Improper connection may cause damages not only to the camera but also to the connected devices.
- ☐ Confirm mutual ground potential carefully before connecting camera to monitors or computers. Any AC leak from the connected devices may cause damages or destroy the camera.
- ☐ Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera.
- ☐ Voltage ripple of camera power DC+12~24V±10% must be within ±50mV. Improper power supply voltage may cause noises on video signals.

  [Notes for using external power supply to the camera]

  Voltage depression may become bigger depends on diameter and length of the cable.

  Please refer to the following for the specifications of external power supply.

  [Recommended value of power voltage]

  1. Power voltage: V 2. Cable length: ℓ(m) 3. Resistance value per 1m of cable: r(Ω)

  Calculation of output voltage of external power: V[V] = 12[V] + r[Ω/m] × ℓ[m] × 1[A] V
- ☐ Rise time of camera power supply voltage must be less than +10V, Max. 60ms. Please avoid noises like chattering.
- ☐ Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

Our warranty does not apply to damages or defects caused by neglecting the instructions and precautions explained in this manual.

1.2. Restrictions on Applications

- ☐ The camera must not be used for any nuclear equipment or aerospace equipment with which mechanical failure or malfunction could result in serious bodily injury or loss of human life.
- ☐ The camera must not be used under conditions or environments other than those specified in this manual.

1.3. Disclaimers (Exception Clause)

CIS should not be liable for any damages or losses if;

- ☐ damages or losses are caused by earthquake, lightning strike, fire, flood, or other acts of God.
- ☐ damages or losses are caused by deliberate or accidental misuse by user, or failure to observe information and instructions explained in this manual.
- ☐ damages or losses are caused by repair or modification conducted by user or any unauthorized party.

2. Product Outline

VCC-25CXP1M is a B/W camera with CoaXPress interface. Compact in size, 65mm (H) x 65mm (W) x 65mm (D) with 25M pixels resolution. Complies with CoaXPress Version 1.1.1 and transfers data up to 100m with CXP-1 and 40m with CXP-6. Must have function ready for Machine Vision applications such as trigger shutter, ROI, Gain, shading correction, and black level adjustment.

2.1. Features

- ☐ 65mm cubic size
- ☐ Global shutter type CMOS sensor
- ☐ Complies with CoaXPress CXP-1, CXP-2, CXP-3, CXP-5, and CXP-6
- ☐ 4 lanes
- ☐ PoCXP
- ☐ Maximum cable length: Approx. 100m with CXP-1 / Approx. 40m with CXP-6.
- ☐ ROI
- ☐ Sub-sampling
- ☐ Exposure setting, Gain setting
- ☐ External trigger mode (Fixed trigger shutter mode / Pulse width trigger shutter mode)
- ☐ Complies to GenICam
- ☐ M48 lens mount

2.2. Accessories

- ☐ Optional accessory
  - M48 to F lens mount conversion adaptor

3. Specifications

3.1. General Specifications

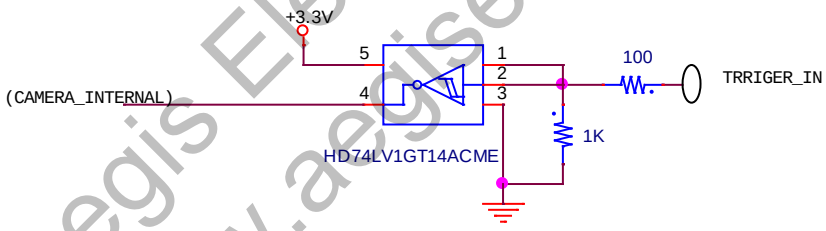
Electrical Specifications			
Image sensor	Sensor type	APS-H, global shutter type CMOS sensor	
	Effective pixels	5120(H) × 5120(V)	
	Unit cell size	4.5μm(H) × 4.5μm(V)	
Interface		Complies with CoaXPress Ver,1.1.1., CXP6/CXP5/CXP3/CXP2/ CXP1 x4 lanes	
Video output frequency	Pixel clock frequency	72MHz	
Video output format		Mono 8 / Mono 10	
Frame rate	CXP1 8bit/10bit	17.17fps/13.73fps	
	CXP2 8bit/10bit	30.52fps/24.41fps	
	CXP3 8bit/10bit	40.13fps/33.80fps	
	CXP5 8bit/10bit	68.40fps/54.72fps	
	CXP6 8bit/10bit	81.83fps/65.10fps	
Resolution (The maximum pixel size)		5120 (H) × 5120(V)	
Video signals	White clip level	FFh	With MONO8
	Set up level	02h±02h	With MONO8, with factory setting
	Dark shading	0~2(H), 0~5(V)	With MONO8, with factory setting
Sensitivity		F8 400lx (Shutter speed 1/30s, Gain 0dB)	
Minimum illumination		F1.4 5.2lx (Gain+18dB, Shutter OFF, level=50%)	
Gain variable range		x1~x8 (0dB~18dB)	
Shutter speed		Preset: 1/30000, 1/10000, 1/5000, 1/2000, 1/1000, 1/500, 1/200, 1/100, 1/60, 1/50, 1/30 [s] Manual: 30[μs]~72590[μs]	
Gamma correction		None (γ=1)	
Trigger mode		Free run mode (Camera internal trigger) Trigger mode (Host, External terminal) ・ Fixed trigger shutter ・ Pulse width trigger shutter	
Partial scan		Preset 10 patterns (4096x4096, 4096x3072, 3840x2896, 3840x2160, 2560x2048, 2048x2048, 2048x1440, 1920x1200, 1920x1080, 1280x1024)	
Sequence function		Set start (X, Y) coordinate, horizontal size, vertical size, Exposure, and Gain setting for 16 parameter sets. Control mode: Trigger mode, Burst mode, and index mode	
Power voltage		12pins circular connector or PoCXP 12pin: 12~24V	
Power consumption		7.8W (CXP-1), 10.6W (CXP-6) [with free run]	
Mechanical Specifications			
Dimensions		H:65mm W:65mm D:65mm excluding projection.	
Weight		Approx. 290g	
Lens Mount		M48 mount	

Environmental Specifications			
Safety/Quality Standards		Complies with UL Standard including materials. CE: EMC: 2014/30/EU Emission: EN61000-6-4:2007+A1:2011 Immunity: EN61000-6-2:2005 RoHS: 2011/65/EU EN50581 (RoHS2)	
Durability	Vibration	Acceleration	: 98m/s^2 (10G)
		Frequency	: 20 ~ 200Hz
		Direction	: X, Y, and Z 3 directions
		Testing time	: 120min for each direction
	Shock	No malfunction with 980m/s^2 (100)G for ±X, ±Y, and ±Z, 6 directions without packaging.	
Operational temperature		-5 ~ +45°C Humidity: 20 ~ 80%RH with no condensation.	
Storage temperature		-25 ~ +60°C Humidity: 20 ~ 80%RH with no condensation.	

3.2. Input and Output Specifications

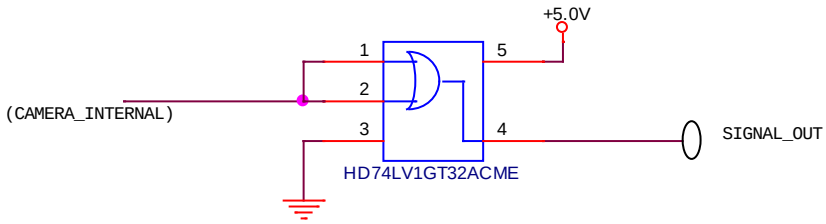
3.2.1 Trigger Input (12pins circular connector, No.11 pin)

- ☐ 5.0V, 3.3V CMOS level / TTL level
- ☐ Input voltage Low: 0.5Vdc (Max), High: 2.1Vdc (Min)
- ☐ To use this terminal, set Trigger Source of AcquisitionControl to Line 0.



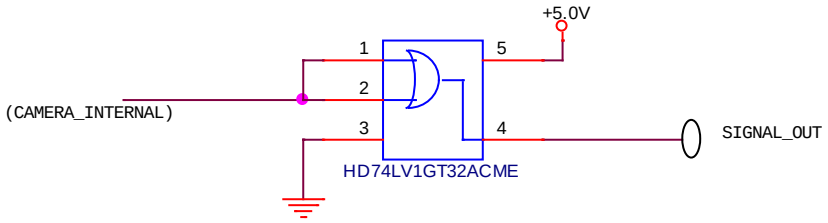
3.2.2 Exposure Output (12pins circular connector No.9 pin)

- ☐ 5.0V CMOS logic level output
- ☐ Output voltage Low: 0.55Vdc (Max), High: 3.8Vdc (Min)



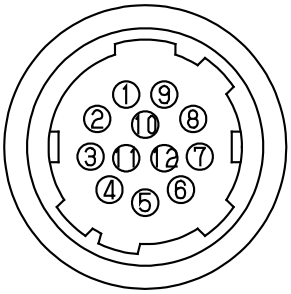
3.2.3 FVALL_OUT/LVAL_OUT/ UplinkTrigger_OUT (12pins circular connector No. 6, 7, and 10 pin)

- ☐ 5.0V CMOS logic level output
- ☐ Output voltage Low: 0.55Vdc (Max), High: 3.8Vdc (Min)



3.3. External Connector Pin Assignment

3.3.1 12pins Circular Connector HR10-10R-12PA (73) (HIROSE) or Equivalent



Pin No.	Signals	Description
1	GND	GND
2	Power	External power input
3	NC	
4	NC	
5	GND	GND
6	LVAL_OUT	Line read out signals output
7	FVAL_OUT	Frame read out signals output
8	GND	GND
9	EXPOSURE_OUT	Sensor exposure signals output
10	LinkTrigger_OUT	External trigger signals output from Host Device (LinkTrigger0)
11	TRIGGER_IN	External trigger input (Line0)
12	GND	GND

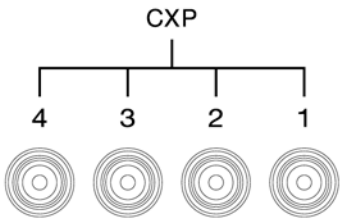
※NC=Non-Connection. Do not connect anything to the terminal.

※LinkTrigger_OUT signal is to monitor the external trigger signals from Host Device.

※Reference: HR10-10R-12PA (HIROSE) can connect up to AWG26.

3.3.2 75Ω DIN Connector (Quad type)

- ☐ CoaXPress video output signals. (Make sure to connect 4 cables.)
- ☐ No. 1 pin is for PoCXP.



(Cambridge Connectors)

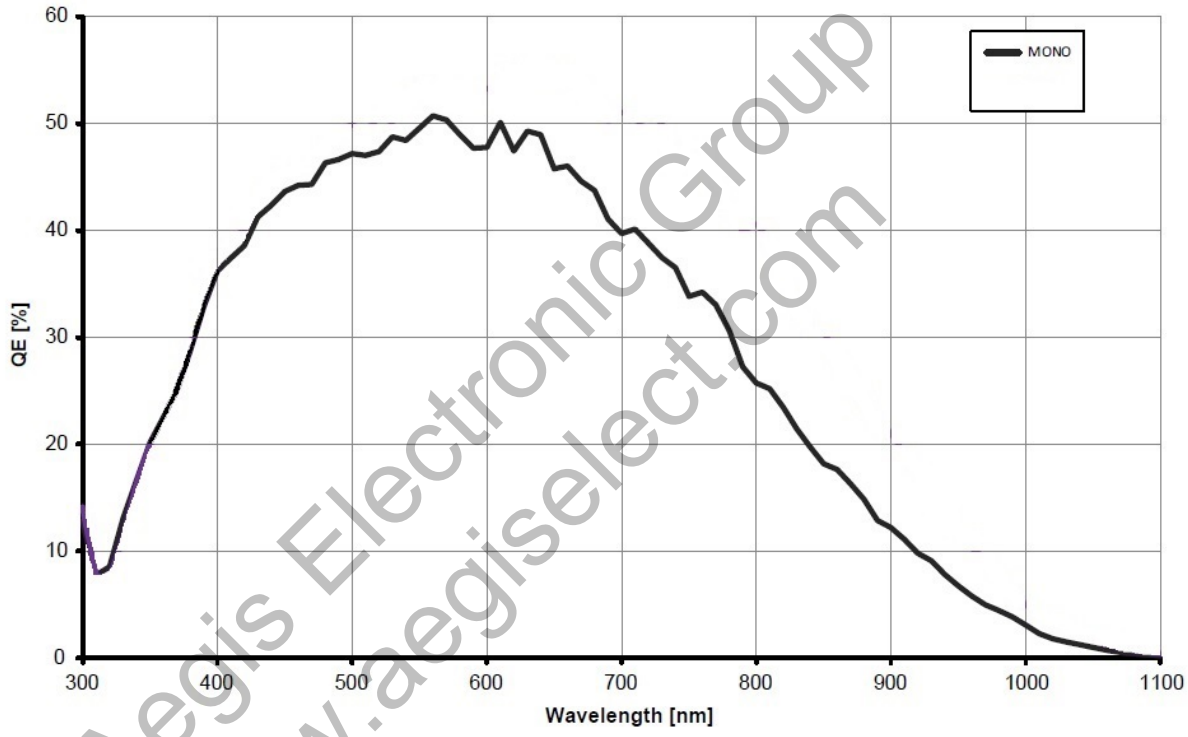
3.3.3 LED Indicator

☐ With LED indicator ON, lighting patterns show the camera status by its way of lighting.

OFF	No power supply.
Green/Orange Fast Blinking [12.5Hz]	Disconnection of 4 cable lines.
Green Lighting	Completion of connection between device and host.
Green Fast Blinking [12.5Hz]	Transmitting video data.
Orange Slow Blinking [1Hz]	Waiting for a trigger input.
Red Slow Blinking [0.5Hz]	Image transmission error or inappropriate trigger input.

3.4. Spectral Response

※ Excludes characteristics of lens, IR cut filter, and light source.



4. Camera Functions

4.1. Camera Interface

☐ Complies with CoaXPress interface standard.

[Note] The indication of commands and parameters in this manual may vary depends on the indication software to use.

4.2. Camera Information

☐ Indication of camera information.

DeviceControl	
DeviceModelName	(ReadOnly)
DeviceVersion	(ReadOnly)
DeviceFirmwareVersion	(ReadOnly)
DeviceSerialNumber	(ReadOnly)

- DeviceModelName : Model name of the camera
- DeviceVersion : Circuit version
- DeviceFirmwareVersion : Firmware version
- DeviceSerialNumber : Serial number of the camera

☐ Set a letter string as user ID with up to 16 characters including terminal NUL letter (\0). Execute "UserSetSave" to save the letter string to volatile memory in the camera. Execute "UserSetDefault" to restore to factory setting.

DeviceControl	
DeviceUserID	[User definition]

4.3. LED Operational Mode

☐ This is to change operational mode of LED at the rear of camera. For information on lighting patterns, refer to Section 3.3.3. LED Indicator.

DeviceControl	
DeviceIndicatorMode	Active ErrorStatus Inactive

- Active : Indication of communication status of CoaXPress
- ErrorStatus : OFF with normal operation.
  Lights only with video transmission error or inappropriate trigger input.
- Inactive : ALL LED OFF

4.4. Temperature Indication

☐ This is to indicate temperature register value of image sensor.

DeviceControl	
DeviceTemperature	(ReadOnly)

[Note]

- The value of register is not calibrated. Please regard it as reference value.

Image sensor temperature [℃]	30	40	50
DeviceTemperature	94	108	122

4.5. Partial Scan (ROI)

☐ This is to increase frame rate by cutting and reducing read out area.

☐ Partial scan and sub-sampling mode are mutually exclusive.

ImageFormatControl	
Width	
Height	
OffsetX	X coordinate
OffsetY	Y coordinate
ROIQuickChange*	(Execute)

☐ Preset ROI

- Execute "ROIQuickChange(Xsize)x(Ysize)" to update "Width", "Height", "OffsetX", and "OffsetY".
- 10 patterns are prepared as preset ROI.
- Execute "ROIQuickChange(Xsize)x(Ysize)" to cut out read area from the center part.
- Execute "ROIQuickChangeOff" to restore to full size 5120x5120.
- The frame rate for each "ROIQuickChange(Xsize)x(Ysize)" will be as the following table “Preset ROI frame rate” depend on image size, PixelFormat, and link rate.

☐ Custom ROI

- With Width, specify the size of ROI for X direction per 64 pixels.
- With Height, specify the size of ROI for Y direction per 2 pixels.
- With OffsetX, specify offset of ROI for X direction from left per 64 pixels.
- With OffsetY, specify offset of ROI for Y direction from top per 2 pixels.
- OffsetX and OffsetY must meet the following conditions.

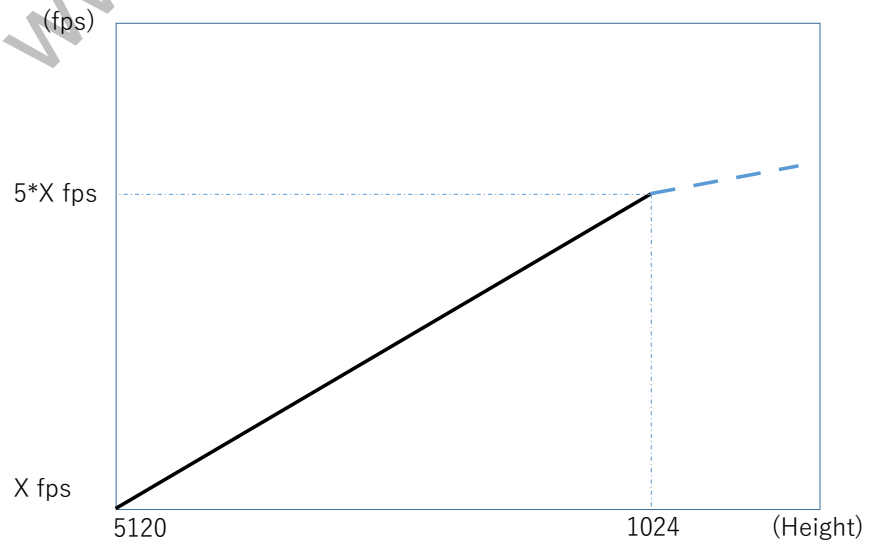
  OffsetX+Width≦5120, OffsetY+Height≦5120

- The frame rate for Custom ROI will be limited with preset ROI frame rate depend on set Width and Height.

[Note]

- Frame rate limitation is only for internal sync. mode. External sync. mode operates with the cycle of external triggers.
- With external sync mode, frame rate changes lineally with respect to Height when Height is 1024 or more. When Height is less than 1024, frame rate will not change lineally with respect to Height. Please refer to Section 4.11.2.1 Restrictions on Trigger Pulse Input Timing.

Conceptual diagram of frame rate with external sync mode



Preset ROI frame rate [fps]

ROI Setting Mode (WidthxHeight,OffsetX,OffsetY)	Known as	PixelFormat	Link rate				
			CXP1_X4	CXP2_X4	CXP3_X4	CXP5_X4	CXP6_X4
ROIQuickChangeOff (5120x5120,0,0)	25M	mono8	17.17	30.52	40.13	68.40	81.38
		mono10	13.73	24.41	33.80	54.72	65.10
ROIQuickChange4096x4096 (4096x4096,512,512)	16M	mono8	23.88	43.95	61.04	87.90	124.67
		mono10	18.62	39.24	49.94	79.18	99.74
ROIQuickChange4096x3072 (4096x3072,512,1024)	12M	mono8	30.52	57.82	78.47	115.65	162.76
		mono10	24.97	52.32	68.67	102.21	130.21
ROIQuickChange3840x2896 (3840x2896,640,1112)	10M	mono8	34.33	64.75	87.03	125.57	175.81
		mono10	26.80	58.21	75.77	114.16	140.63
ROIQuickChange3840x2160 (3840x2160,640,1480)	4K QFHD	mono8	45.78	82.92	118.78	154.20	231.32
		mono10	34.88	75.77	102.21	137.34	185.05
ROIQuickChange2560x2048 (2560x2048,1280,1536)	5M	mono8	54.93	114.16	122.07	175.69	244.14
		mono10	40.69	94.51	122.07	175.69	195.31
ROIQuickChange2048x2048 (2048x2048,1536,1536)	4M	mono8	57.82	122.07	122.93	189.04	244.14
		mono10	42.26	109.87	122.93	189.04	195.31
ROIQuickChange1920x1440 (1920x1440,1600,1840)		mono8	78.47	169.03	169.03	244.14	351.12
		mono10	61.04	156.96	169.03	244.14	281.29
ROIQuickChange1920x1200 (1920x1200,1600,1960)	WUXGA	mono8	91.56	199.76	199.76	288.18	399.52
		mono10	73.24	187.02	199.76	288.18	319.69
ROIQuickChange1920x1080 (1920x1080,1600,2020)	Full HD	mono8	109.87	222.52	222.52	313.97	462.75
		mono10	78.47	204.42	222.52	313.97	370.10
ROIQuickChange1280x1024 (1280x1024,1920,2048)	SXGA	mono8	122.07	244.14	244.14	374.11	487.57
		mono10	84.52	219.73	244.14	374.11	390.63

Custom ROI frame rate [fps] (CXP6_X4, mono8, and AcquisitionMode)

Width / Height	5120≧	4096≧	3840≧	2560≧	2048≧	1920≧	1280≧
5120≧	81.38	81.38	81.38	81.38	81.38	81.38	81.38
4096≧	81.38	124.67	124.67	124.67	124.67	124.67	124.67
3072≧	81.38	162.76	162.76	162.76	162.76	162.76	162.76
2896≧	81.38	162.76	175.81	175.81	175.81	175.81	175.81
2160≧	81.38	162.76	231.32	231.32	231.32	231.32	231.32
2048≧	81.38	162.76	231.32	244.14	244.14	244.14	244.14
1440≧	81.38	162.76	231.32	244.14	244.14	351.12	351.12
1200≧	81.38	162.76	231.32	244.14	244.14	399.52	399.52
1080≧	81.38	162.76	231.32	244.14	244.14	462.75	462.75
1024≧	81.38	162.76	231.32	244.14	244.14	462.75	487.57

[Note 1] in the table is the frame rate defined by ROIQuickChange(Width)x(Height).

[Note 2] from “Preset ROI frame rate” will be defined when Link rate is other than CXP6_X4, or PixelFormat is mono10. The values will be limited to smaller values for both Width and Height.

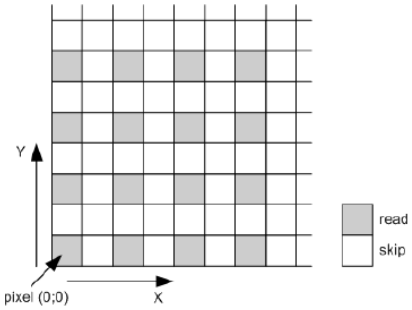
4.6. Sub-sampling

ImageFormatControl	
Subsampling	Subsampling_Off Subsampling_On

☐ This is the mode to increase its frame rate by reducing the pixel numbers to read out, reducing both horizontal and vertical pixel number in half, that is, 1/4 of the entire pixels. The field angle remains the same as the one for full resolution.

☐ Sub-sampling mode and partial scan (ROI) are mutually exclusive.

☐ Defective pixels correction is invalid while operating sub-sampling.



Frame rate with Sub-sampling mode [fps]

Sub-sampling mode (Pixel numbers)	PixelFormat	Link rate				
		CXP1_X4	CXP2_X4	CXP3_X4	CXP5_X4	CXP6_X4
Sub-sampling (2560x2560)	mono8	49.94	85.33	85.33	137.33	199.75
	mono10	46.75	79.90	85.33	137.33	159.80

4.7. Flip

ImageFormatControl	
ReverseX	True/False
ReverseY	True/False

- ReverseX : Flip the image of X direction.
- ReverseY : Flip the image of Y direction.

4.8. Pixel Format

ImageFormatControl	
PixelFormat	Mono8 Mono10

- Mono8 : Monochrome 8bit
- Mono10 : Monochrome 10bit

4.9. Cursor Indication

☐ This is to show cursor on your display screen.

ImageFormatControl	
ShowCursor	On/Off
CursorX	X coordinate
CursorY	Y coordinate
CursorColor	White/Black

- ShowCursor : Cursor indication On/Off.
- CursorX : To specify X coordinate of vertical cursor.
- CursorY : To specify Y coordinate of horizontal cursor.
- CursorColor : To select the color of cursor (black or white).

[Note]

- The cooridinate of cursor becomes as below with Reverse and ROI indication.
  ReverseX=False, ReverseY=False : The top left of ROI screen becomes the origin (0,0).
  ReverseX=True, ReverseY=False : The top right of ROI screen becomes the origin (0,0).
  ReverseX=False, ReverseY=True : The bottom left of ROI screen becomes the origin (0,0).
  ReverseX=True, ReverseY=True : The bottom right of ROI screen becomes the origin (0,0).
- With zooming out, cursor may be out of view.

[Note]

- Cursor indication is invalid when test pattern indication is ON.

4.10. Test Pattern Indication

☐ This is to display test pattern from camera. This is useful to check if your system is operating properly.

ImageFormatControl	
TestPattern	ON/OFF

[Note]

- Displaying test pattern and cursor are mutually exclusive.

4.11. Trigger Mode

Acquisition Control	
TriggerSelectorAndActivation	AcquisitionMode FrameStartRisingEdge FrameStartFallingEdge FrameStartLevelHigh FrameStartLevelLow FrameBurstStart
TriggerSource	LinkTrigger0 Line0
TriggerSoftware	(Execute)
AcquisitionFrameRate	(ReadOnly)

- TriggerSelectorAndActivation : Trigger selector
  This is to select how to start capturing video and trigger polarity out of the followings.

- AcquisitionMode : Free run mode [Internal sync. mode]
- FrameStartRisingEdge : Fixed trigger shutter mode : Rising edge [External sync. mode]
- FrameStartFallingEdge : Fixed trigger shutter mode : Falling edge [External sync. mode]
- FrameStartLevelHigh : Pulse width trigger shutter mode : High active [External sync. mode]
- FrameStartLevelLow : Pulse width trigger shutter mode : Low active [External sync. mode]
- FrameBurstStart : Burst mode of sequence function [Internal sync. mode]

- TriggerSource

  This is to select where to send external trigger.
  - LinkTrigger0 : External trigger input from CoaXPress Host Device. Please refer to specification manuals of Host Device such as frame grabber board to know how to generate triggers.
  - Line0 : External trigger input from 12pins circular connector.

- TriggerSoftware : Software trigger

  Camera generates a trigger to capture one frame image by executing this command.
  Valid when TriggerSelectorAndActivation is FrameStartRisingEdge or FrameBurstStart.

- AcquisitionFrameRate : Indication of frame rate with internal sync. mode

4.11.1 Internal Sync. Mode (Free Run Mode)

☐ With this mode, camera continuously outputs images.

☐ Set TriggerSelectorAndActivation to AcquisitionMode.

☐ Please refer to the following table for the frame rate [fps] when ROI is invalid.

PixelFormat	CXP1_X4	CXP2_X4	CXP3_X4	CXP5_X4	CXP6_X4
mono8	17.17	30.52	40.13	68.40	81.38
mono10	13.73	24.41	33.80	54.72	65.10

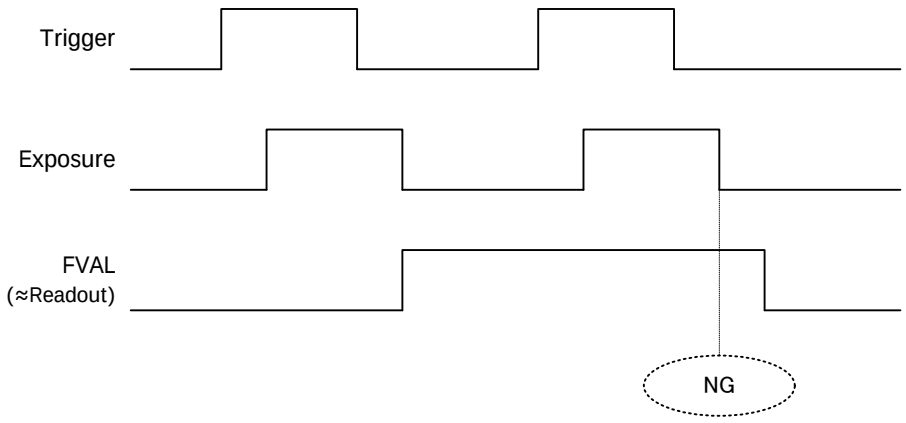
4.11.2 External Sync. Mode

☐ This is a mode to capture images with preferred timings by inputting external trigger signals.

☐ Set "TriggerSelectorAndActivation" to other than "AcquisitionMode".

4.11.2.1 Restrictions on Trigger Pulse Input Timing

☐ User can input a trigger for the next frame while camera is reading out signals. However, do not input a trigger pulse to end exposure while camera is reading out signals. In other words, a trigger pulse to start reading out signals for the next frame before completion of reading out signals for the prior frame is restricted.



☐ If there are trigger input with restricted timing explained in the above and with timing of end exposure right after FVAL becomes “L”, image output may stop or image becomes all black.

☐ When the camera stops operation or outputs abnormal images with normal mode, stop inputting triggers and execute "SensorReset" command to restore to normal operation.

☐ When the camera stops operation or outputs abnormal images with normal mode, stop inputting triggers, turn off SequencerActivation, and execute "SensorReset" command to restore to normal operation.

Device Control	
SensorReset	(Execute)

4.11.2.2 Trigger Pulse input Timing and Delay Time to Start Exposure

☐ Due to the image sensor characteristics, there is a difference in delay time from inputting triggers to starts exposure between normal readout operation (starts exposure after completed readout prior images) and overlapping readout operation (starts exposure of next frame while readout current images).

Trigger Pulse input Timing and Delay Time to Start Exposure [µs]

	Link rate				
	CXP1_X4	CXP2_X4	CXP3_X4	CXP5_X4	CXP6_X4
Delay time to start exposure with normal readout operation Exposure delay time (A) in timing chart in Section 4.11.2.3.	9.6	9.5	9.5	9.5	9.5
Delay time to start exposure with overlapping readout operation Exposure delay time (B) in timing chart in Section 4.11.2.3.	9.6~27	9.5~18	9.5~18	9.5~14	9.5~12

4.11.2.3 Fixed Trigger Shutter Mode

☐ This is a mode to start exposure with external trigger input and expose for a set period.

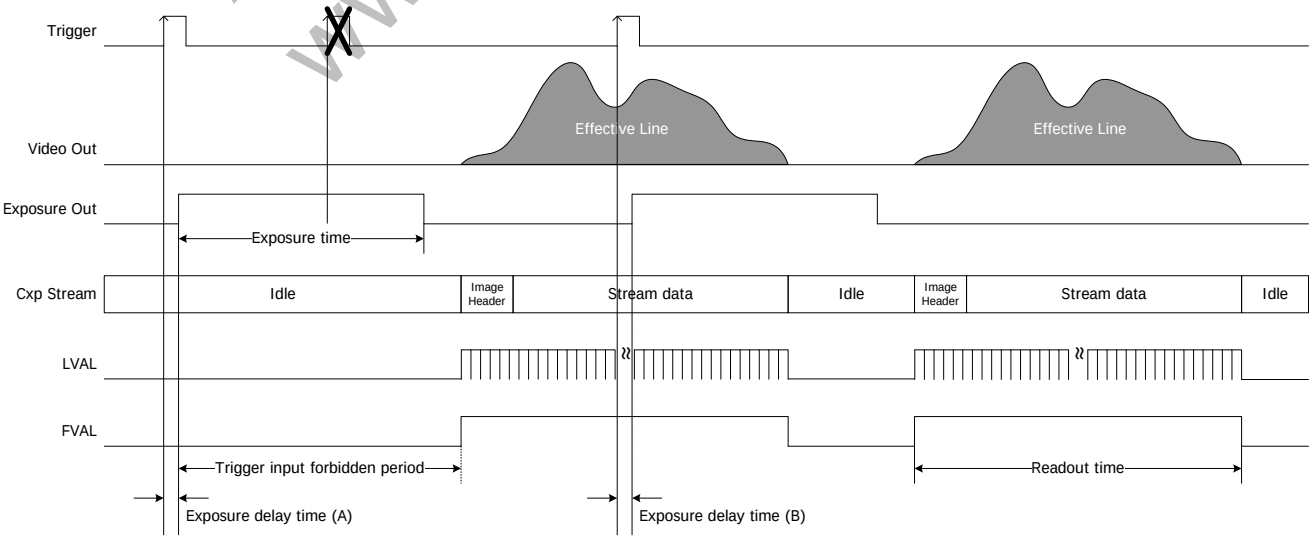
☐ Set "TriggerSelectorAndActivation" to "FrameStartRisingEdge" or "FrameStartFallingEdge".

☐ Trigger cycle must be longer than FVAL period (frame data readout time) and exposure time.

☐ Trigger operation is CLK sync., H-V sync reset.

☐ Input trigger pulse width in the range of 30us ~ Max. exposure time.

☐ Max. exposure time depends on ROI settings, "PixelFormat", and link rate. (Refer to Section 4.12 Exposure Time).



4.11.2.4 Pulse Width Trigger Shutter Mode

☐ This is a mode to start exposure with external trigger input and set exposure time with trigger pulse width.

☐ Set "TriggerSelectorAndActivation" to "FrameStartLevelHigh" or "FrameStartLevelLow".

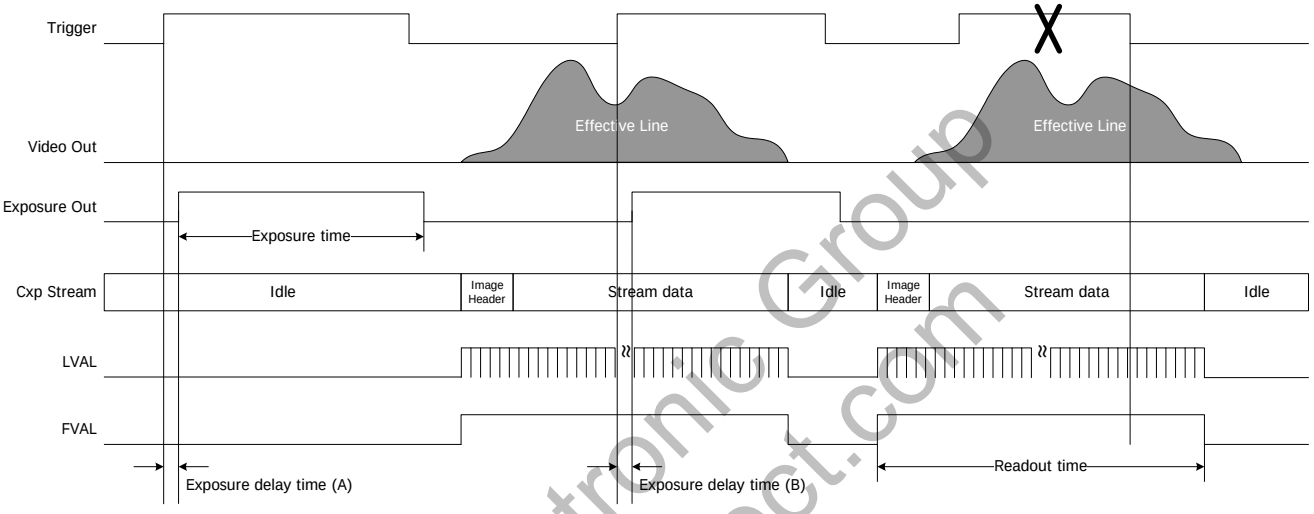
☐ Trigger cycle must be longer than FVAL period (frame data readout time).

☐ Trigger operation is CLKsync., H-V sync reset.

☐ Min. trigger width is 30µs.

[Note for trigger pulse input]

Functionally, there is no upper limitation. However, noises such as dark noises, lines, pixel-wise FPN, and shading might be noticeable at long time exposure.



4.12. Exposure Time

Acquisition Control	
ExposureTime (us)	30~Max. exposure time
ExposureTimeMax	(ReadOnly)
PresetShutter1_Xs	(Execute)

♦ ExposureTime

Set exposure time per 1µs. The minimum exposure time is 30µs.

The maximum exposure time depends on ROI settings, "PixelFormat", and link rate. Set smaller value than the value designated in the following table.

ROI settings mode (Video output size)	Known as	Pixel Format	Link rate				
			CXP1_X4	CXP2_X4	CXP3_X4	CXP5_X4	CXP6_X4
ROIQuickChangeOff (5120x5120)	25M	mono8	58026	32540	24689	14392	12060
		mono10	72590	36181	29354	18033	15132
ROIQuickChange4096x4096 (4096x4096)	16M	mono8	41642	22528	16156	11150	7793
		mono10	53475	25258	19797	12401	9784
ROIQuickChange4096x3072 (4096x3072)	12M	mono8	32540	17066	12515	8419	5916
		mono10	39822	18887	14336	9557	7452
ROIQuickChange3840x2896 (3840x2896)	10M	mono8	28899	15160	11320	7736	5461
		mono10	37091	16952	12999	8590	6883
ROIQuickChange3840x2160 (3840x2160)	4K QFHD	mono8	21617	11832	8192	6257	4096
		mono10	28444	12970	9557	7054	5176
ROIQuickChange2560x2048 (2560x2048)	5M	mono8	17976	8533	7964	5461	3868
		mono10	24348	10410	7964	5461	4949
ROIQuickChange2048x2048 (2048x2048)	4M	mono8	17066	7964	7907	5063	3868
		mono10	23438	8874	7907	5063	4949
ROIQuickChange1920x1440 (1920x1440)		mono8	12515	5688	5688	3868	2616
		mono10	16156	6144	5688	3868	3356
ROIQuickChange1920x1200 (1920x1200)	WUXGA	mono8	10695	4778	4778	3299	2275
		mono10	13425	5120	4778	3299	2958
ROIQuickChange1920x1080 (1920x1080)	Full HD	mono8	8874	4266	4266	2958	1934
		mono10	12515	4664	4266	2958	2503
ROIQuickChange1280x1024 (1280x1024)	SXGA	mono8	7964	3868	3868	2446	1820
		mono10	11605	4323	3868	2474	2446
Subsampling (2560x2560)		mono8	19569	11548	11548	6144	3868
		mono10	21162	12401	11548	6144	5120

- ExposureTimeMax : Max. exposure time

  The maximum exposure time depends on ROI settings, "PixelFormat", and link rate.

- PresetShutter1_Xs : Preset shutter value

  The preset shutter value will be reflected to the settings values of exposure time.

PresetShutter1_Xs	Shutter (s)	Exposure time (µs)
Shutter_1_30s	1/30	33333 us
Shutter_1_50s	1/50	20000 us
Shutter_1_60s	1/60	16667 us
Shutter_1_100s	1/100	10000 us
Shutter_1_200s	1/200	5000 us
Shutter_1_500s	1/500	2000 us
Shutter_1_1000s	1/1000	1000 us
Shutter_1_2000s	1/2000	500 us
Shutter_1_5000s	1/5000	200 us
Shutter_1_10000s	1/10000	100 us
Shutter_1_30000s	1/30000	30 us

[Note]

This model VCC-25CXP1M can start exposure for next frame while outputting images. Shutter line might be noticeable depends on camera operational mode and gain settings.

4.13. Gain

AnalogControl	
Gain	1.0~8.0
PresetGainX	(Execute)

- Gain : User can set gain value in the range of x1~x8 per x0.25..

  [Note]

  Gain setting range is up to +8 times. However, with high gain settings, noise will increase.

- PresetGainX : Preset gain

  Set preset gain values to reflect them to manual gain. Function does not reflect manual gain values to preset gain. Preset values are not subject to save.

PresetGainX	Magnification	Decibel equivalent
Gain_x1	x1	0dB
Gain_x2	x2	6.0dB
Gain_x3	x3	9.5dB
Gain_x4	x4	12.0dB
Gain_x5	x5	14.0dB
Gain_x6	x6	15.6dB
Gain_x7	x7	16.9dB
Gain_x8	x8	18.0dB

4.14. Black Level Adjustment

☐ This is to adjust black level.

AnalogControl	
BlackOffset	0~255

[Note]

- User can adjust black level by relative values. When increase/decrease value by 1, luminance level will change by approx. 0.3 with 8bit output and approx. 1.2 with 10bit output.
- If the user set the value lower than the initial value, saturation level might not achieve the maximum level of output range.
- Make sure to adjust black level to the deepest black with sequence control mode.

4.15. Shading Correction

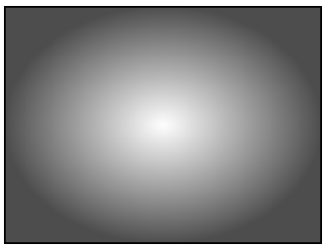
☐ This is to correct the drop in the amount of peripheral light caused by lens and others.

AnalogControl	
ShadingCorrection	True/False
DetectShading	(Execute)

- ShadingCorrection

  Turn ShadingCorrection “True” to start shading correction according to correction data prepared by shading detection.

Before shading correction



After shading correction

- DetectShading : Shading detection

  Shoot an object with stable brightness such as pattern box, to full screen. Execute DetectShading to automatically calculate correction data.

  [Note]

  - Turn ShadingCorrection “False”, and turn off partial scan mode (ROI) and sub-sampling to detect shading. Make sure to set image size to 5120x5120 to execute.
  - Execute shading detection again when switched ReverseY.
  - Acquire correction data only when camera is in operation. Acquisition of shading correction data is invalid when there is no output from camera.
  - Execute UserSetSave to save the correction data.
  - When obtain correction data with trigger shutter mode, the data sometimes becomes unstable. In this case, change the trigger cycle in small measure and obtain correction data again.

4.16. Defective Pixel Correction

☐ Defective pixel correction registered at factory.

CIS compensates noticeable CMOS pixel defects found upon shipment from our factory.
User can disable this function.

AnalogControl	
DefectivePixelCorrection	True/False

4.17. Link Speed and Link Count

Transfer Control	
ConnectionConfig	CXP1_X4 CXP2_X4 CXP3_X4 CXP5_X4 CXP6_X4

- CXP1_X4 : Link speed=1.250Gbps, Link count=4
- CXP2_X4 : Link speed=2.500Gbps, Link count=4
- CXP3_X4 : Link speed=3.125Gbps, Link count=4
- CXP5_X4 : Link speed=5.000Gbps, Link count=4
- CXP6_X4 : Link speed=6.250Gbps, Link count=4

4.18. How to Save and Initialize Settings

☐ Execute “UserSetSave” to save settings into camera non-volatile memory. Camera initializes with saved settings upon next rebooting.

UserSets	
UserSetSave	(Execute)
UserSetDefault	(Execute)

- UserSetSave : This is to save camera setting values.
- UserSetDefault : This is to restore camera settings to factory settings.

☐ Set ConnectionConfig to "CXP3_X4" to execute "UserSetDefault".

☐ Immediately after completion of UserSetDefault, camera settings will be restored to factory settings. However, in some cases, command indication remains as previous settings. Please make sure to update commands.

4.19. Sequence Control Function

☐ This is to apply multiple preset parameter sets to the camera with each trigger input.

☐ User can set 16 patterns of parameter set in advance.

Shutter, gain, start X coordinate, start Y coordinate, X size, and Y size parameter can be set for each parameter.

☐ Designate “Index” for operation sequence. Designate parameter set number to apply for Max. 16 patterns of

☐ There are 3 types of control mode; Trigger mode, burst mode, and index mode.

4.19.1 How to Operate Sequence Control

☐ Set items in the following order to use sequence control function.

(1) Trigger shutter mode
AcquisitionControl – TriggerSelectorAndActivation
This is to select trigger type and its polarity out of followings according to sequence operation.
FrameStartRisingEdge/ FrameStartFallingEdge/ FrameStartLevelHigh/ FrameStartLevelLow/ FrameBurstStart

(2) Defective pixels correction, Sub-sampling, and ROI settings
Turn DefectivePixelCorrection “False”, and turn SubsamplingMode “OFF”. (These functions will not operate with sequence control function.)
Make sure to set ROI of ImageFormatControl to ROIQuickChangeOff.

(3) Select Max. size of ROI
Select SequenserMaxROIsize bigger than the Max. X size and Y size of parameter set use with sequence control .

(4) Set Max. 16 sets of parameter table for sequence to use.

(5) Set the following items after turn off sequence mode (SequencerControl -- SequencerActivation).
In case of trigger mode and burst mode: Turn off Sequence mode, then select FrameStartPredefined.
In case of index mode: Turn off sequence mode, then select FrameStartIndexSelector.

(6) Input trigger pulse to operate sequence control function.
When sequence control ends, it stops at the last screen of sequence control with burst mode.

(7) Turn off SequencerActivation to return to the status before sequence control.

[Restrictions on trigger pulse input timing]

Restrictions on trigger input timing for sequence control operation are the same as the one for normal mode.
When the camera is set to index mode, input a trigger when Ack is responded after setting of IndexSelectorModeIndexNumber is completed.

[Note]

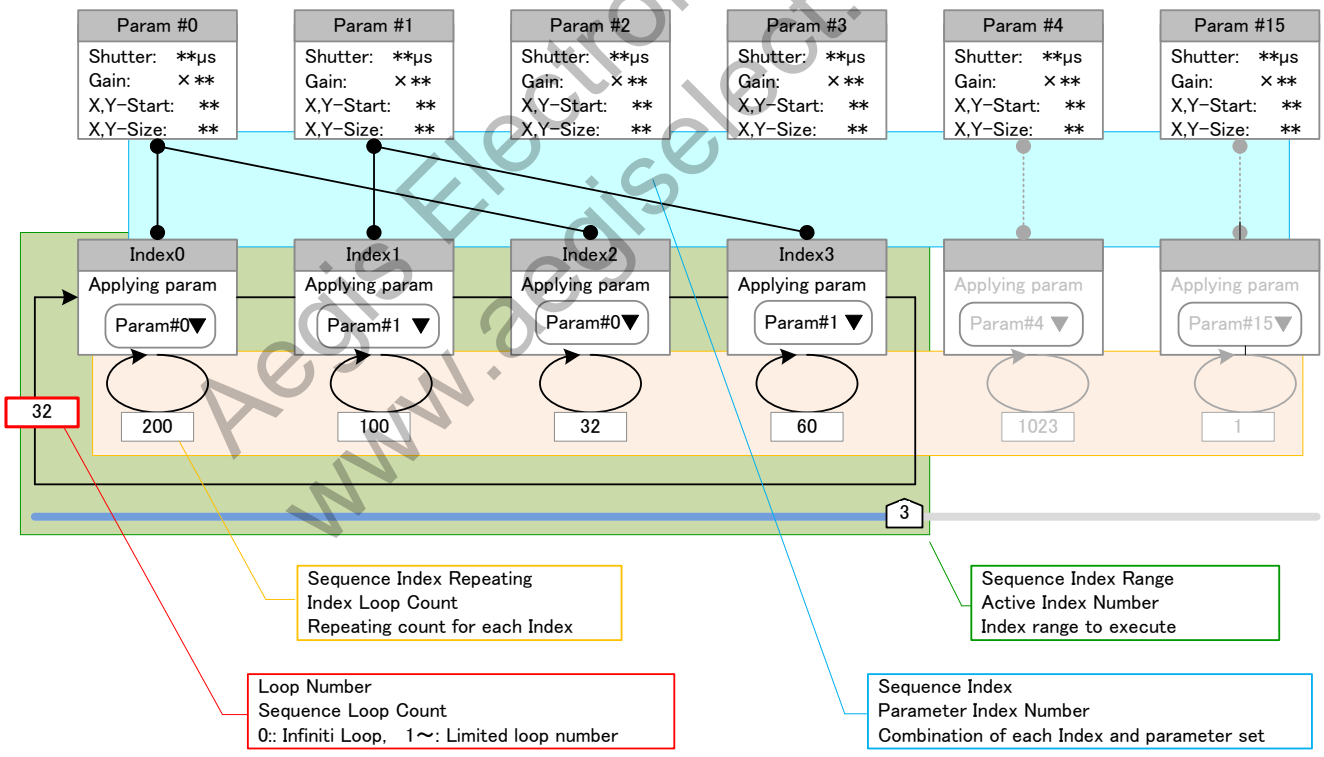
- Make sure to turn of SequencerActivation to set sequence.
- Set SequencerActivation manually after reboot the camera since UserSetSave is not effective for SequencerActivation.
- If the trigger is input to the camera, camera starts sequence with the timing when SequencerActivation is set to other than off.
- Make sure to set smaller value than the values designated in Section 4.12 “Max. Exposure time” of exposure time for each parameter set depends on SequenserMaxROIsize and link rate to use.
- Sequence operation might stop if normal operation mode is operated during sequence operation. Make sure to turn off sequence operation first.

4.19.2 Trigger Mode Operation and Burst Mode Operation Outline

☐ This is to designate the transitional motion of Index in advance.
User can set the repeating count for each Index, the number of index, and loop count.

☐ Trigger mode
Index repeat count will be added per external trigger input, and the designated parameter set will be applied to the camera.

☐ Burst mode
Operation of burst mode is equivalent to free run of internal sync mode. Sequence starts with trigger input, Camera internal trigger adds Index repeat count automatically, and camera applies the designated parameter set.



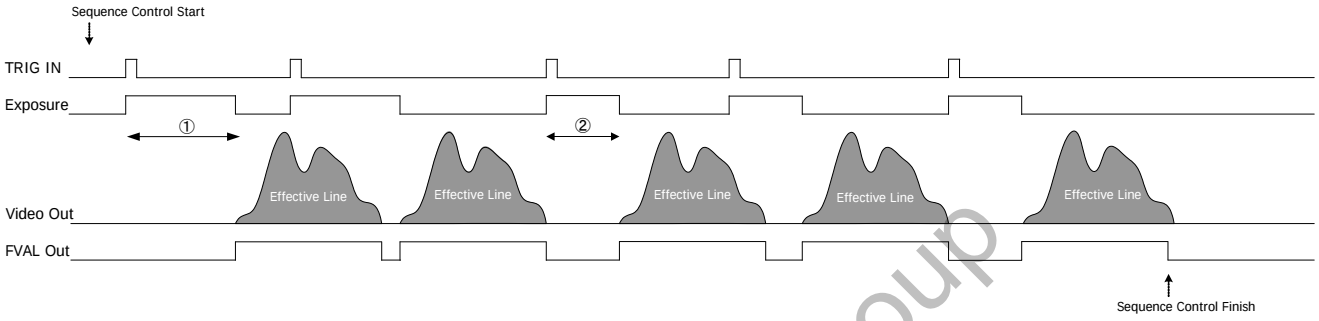
4.19.3 Trigger Mode

☐ User can control sequence operation with edge control by using trigger input signal, and pulse width control.

☐ Set TriggerSelectorAndActivation to either FrameStartRisingEdge/ FrameStartFallingEdge/ FrameStartLevelHigh/ FrameStartLevelLow. User can set repeating count, Index number to use, and loop count for each index.

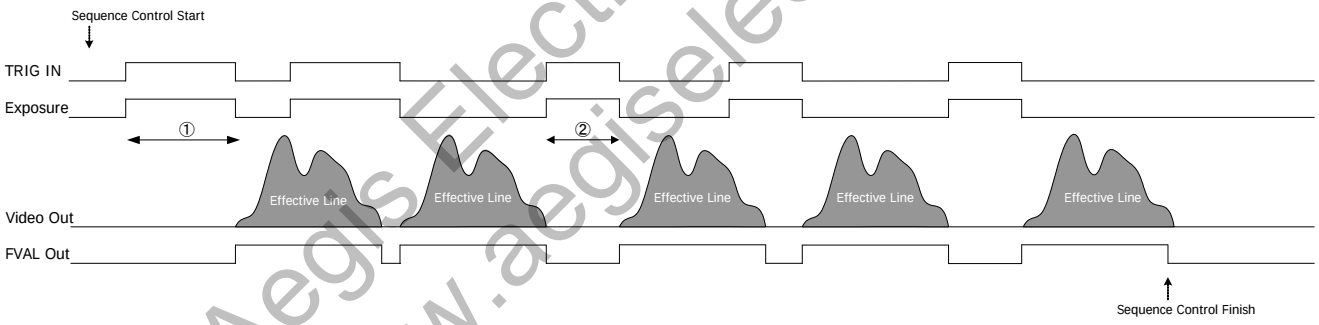
(1) Edge control

- Sequence starts with trigger input when TriggerSelectorAndActivation is FrameStartRisingEdge or FrameStartFallingEdge.
- Exposure time (① and ②) for each frame will be controlled by preset sequence parameter set.
- Sequence operation ends and the camera stops its operation with the timing of camera completed outputting images for sequence loop count.



(2) Pulse width control

- Sequence starts with trigger input when TriggerSelectorAndActivation is FrameStartLevelHigh or FrameStartLevelLow.
- Trigger pulse width is exposure time (① and ②) for each frame.
- Sequence operation ends and the camera stops its operation with the timing of camera completed outputting images for sequence loop count.



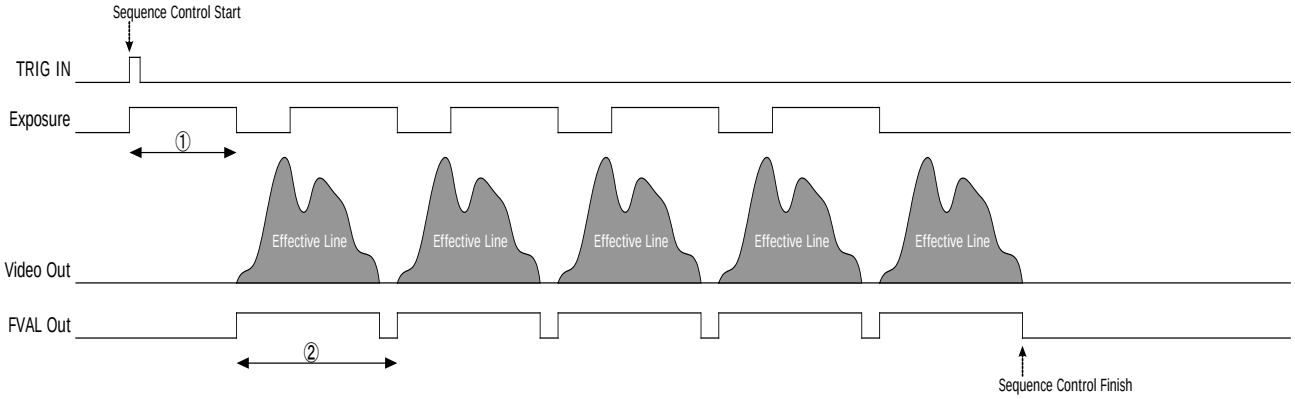
4.19.4 Burst Mode

☐ Sequence starts and end with edge control or level control uses trigger input, and with register start.

☐ Set TriggerSelectorAndActivation to FrameBurstStart.

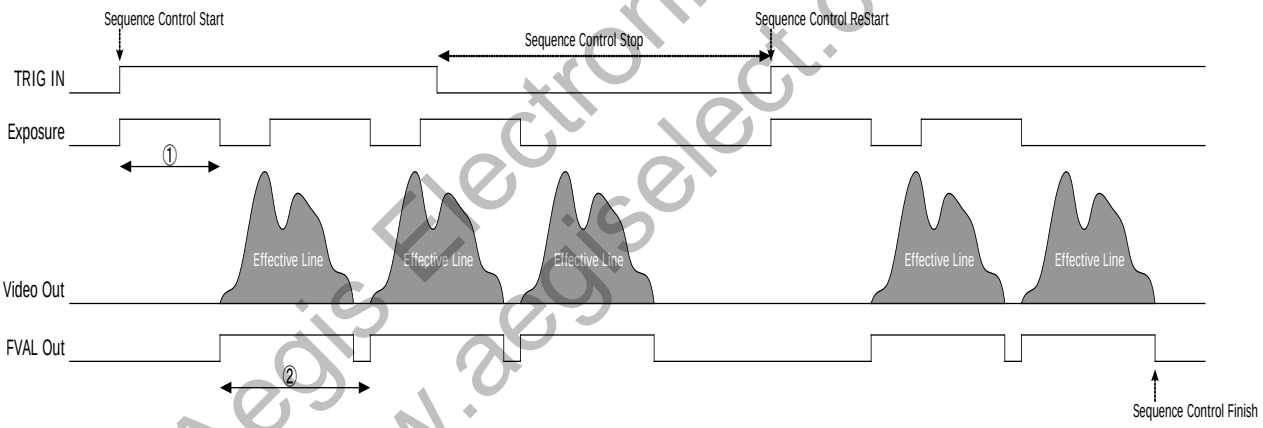
(1) Edge control

- Sequence starts with trigger input when SequencerActivation is FrameBurstStartEdge.
- Exposure time (①) for each frame and output frame time (②) will be limited by the preset sequence parameter set and image size.
- Sequence operation ends and the camera stops its operation with the timing of camera completed outputting images for sequence loop count.



(2) Level control

- In case SequencerActivation is FrameBurstStartLevel, sequence operates while trigger input is High level.
- Set trigger input to Low level to pause in the middle of the operation. If you wish to end operation, turn TriggerSelectorAndActivation off.
- Set trigger input to High level if you wish to resume operation When pausing operation,
- Sequence operation ends and the camera stops its operation with the timing of camera completed outputting images for sequence loop count.



(3) Register Start

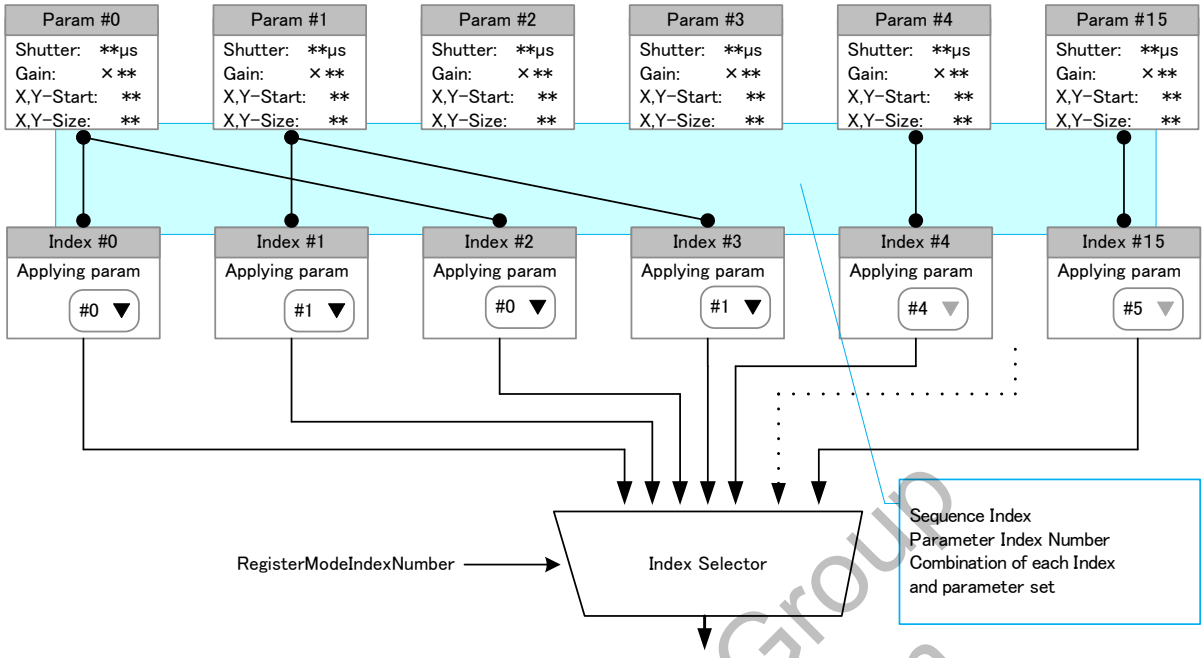
- This is to execute sequence operation as same as edge control right after selected FrameBurstStartSoftware of SequencerActivation

4.19.5 Index Mode

☐ This is a mode to designate index number to apply with IndexSelectorModeIndexNumber directly.

☐ Parameter set of Index designated by IndexSelectorModeIndexNumber will be applied to the camera per trigger input.

☐ Set TriggerSelectorAndActivation to either FrameStartRisingEdge, FrameStartFallingEdge, FrameStartLevelHigh, and FrameStartLevelLow.



(1) Edge control

- Exposure time for each frame will be limited by the preset sequence parameter set.

(2) Pulse width control

- Trigger pulse width is exposure time for each frame. Exposure time of parameter set will not be referred.

4.19.6 Sequence Control Settings

☐ Execute UserSetSave to save settings. SequencerActivation will be always off after reboot the camera. Therefore, please set it every time when use sequence mode.

☐ Settings for sequence control

Acquisition Control	
TriggerSelectorAndActivation	AquisitionMode FrameStartRisingEdge FrameStartFallingEdge FrameStartLevelHigh FrameStartLevelLow FrameBurstStart

・FrameStartRisingEdge : Set sequence control to rising edge of trigger pulse
・FrameStartFallingEdge : Set sequence control to falling edge of trigger pulse.
・FrameStartLevelHigh : Set sequence control to high level of trigger pulse.
・FrameStartLevelLow : Set sequence control to low level of trigger pulse.
・FrameBurstStart : Set when use sequence control with burst mode.

☐ Settings to start sequence mode

SequencerControl	
SequencerActivation	OFF FrameStartPredefined FrameStartIndexSelector FrameBurstStartEdge FrameBurstStartLevel FrameBurstStartSoftware

・SequencerActivation : Set mode for sequence control.
・FrameStartPredefined : Set when start trigger mode.
・FrameStartIndexSelector : Set when start index mode.
・FrameBurstStartEdge : Set when start burst mode with edge control. (Selectable with FrameBurstStart)
・FrameBurstStartLevel : Set when start burst mode with level control. (Selectable with FrameBurstStart)
・FrameBurstStartSoftware : Set when start burst mode with register start. (Selectable with FrameBurstStart)

☐ Settings for sequence loop count and range

SequencerControl	
ActiveIndexNumber	0~15

・ActiveIndexNumber : Designate index number to repeat with trigger mode and burst mode.

SequencerConfigurationParameter	
ParameterIndexNumber	
Index0	Parameter number of Index0
Index1	Parameter number of Index1
Index2	Parameter number of Index2
Index3	Parameter number of Index3
Index4	Parameter number of Index4
Index5	Parameter number of Index5
Index6	Parameter number of Index6
Index7	Parameter number of Index7
Index8	Parameter number of Index8
Index9	Parameter number of Index9
Index10	Parameter number of Index10
Index11	Parameter number of Index11
Index12	Parameter number of Index12
Index13	Parameter number of Index13
Index14	Parameter number of Index14
Index15	Parameter number of Index15

- Set the parameter number to execute for Index0~Index15.

SequencerConfigurationParameter	
IndexLoopCount	
IndexCount0	Repeating count of Index0
IndexCount1	Repeating count of Index1
IndexCount2	Repeating count of Index2
IndexCount3	Repeating count of Index3
IndexCount4	Repeating count of Index4
IndexCount5	Repeating count of Index5
IndexCount6	Repeating count of Index6
IndexCount7	Repeating count of Index7
IndexCount8	Repeating count of Index8
IndexCount9	Repeating count of Index9
IndexCount10	Repeating count of Index10
IndexCount11	Repeating count of Index11
IndexCount12	Repeating count of Index12
IndexCount13	Repeating count of Index13
IndexCount14	Repeating count of Index14
IndexCount15	Repeating count of Index15

- Set the number of times to execute each Index (1~1023)

SequencerConfigurationParameter	
SequencerLoopCount	Sequence loop count
IndexSelectorModeIndexNumber	Index number to execute

・SequencerLoopCount : Set the number of times (0~1023) to execute sequence with burst. It will become infinite loop with “0”.

・IndexSelectorModeIndexNumber : With index mode, repeat the Index designated here infinitely.

☐ Settings of sequence parameter set

- There are 16 parameter sets prepared. When user changes the number of SequencerParameterSetSelector, parameter set switches as well. Camera will maintains the setting data even when the parameter number is changed.

SequencerControl	
PatameterSetSettingNumber	Parameter number
PatameterSetSettingNumber	
SequencerExposureTime	Exposure time
SequencerGain	Gain
SequencerWidth	Size for X direction
SequencerHeight	Size for Y direction
SequencerOffsetX	Offset for X direction
SequencerOffsetY	Offset for Y direction

・PatameterSetSettingNumber : Designate parameter number and set the next parameter. (0~15)

・SequencerExposureTime : Set exposure time for each parameter.

・SequencerGain : Set gain for each parameter.

・SequencerWidth : Set the size of X direction for each parameter.

・SequencerHeight : Set the size of Y direction for each parameter.

・SequencerOffsetX : Set Offset of X direction for each parameter.

・SequencerOffsetY : Set Offset of Y direction for each parameter.

[Note]

The input value of SequencerWidth, SequencerHeight, SequencerOffsetX and SequencerOffsetY will be limited to the size of SequencerMaxROISize. Input SequencerWidth, SequencerHeight, SequencerOffsetX, and SequencerOffsetY after set SequencerMaxROISize.

SequencerControl	
SequencerMaxROISize	ROISize_5120x5120 ROISize_4096x4096 ROISize_4096x3072 ROISize_3840x2896 ROISize_3840x2160 ROISize_2560x2048 ROISize_2048x2048 ROISize_1920x1440 ROISize_1920x1200 ROISize_1920x1080 ROISize_1280x1024
SequencerMaxExposureTime	(ReadOnly)

・SequencerMaxROISize : Select SequenserMaxROIsize bigger than the Max. X size and Y size of parameter set use with sequence control.

・SequencerMaxExposureTime : Indicate the Max. exposure time available for the selected

・ SequencerMaxROISize. Make sure to set the smaller value than this for the

・ exposure time for each parameter.

4.19.7 Sequence Status Information

☐ This is to indicate the status of Sequence control. The status information is embedded in the effective image area to be output while operating sequence control.

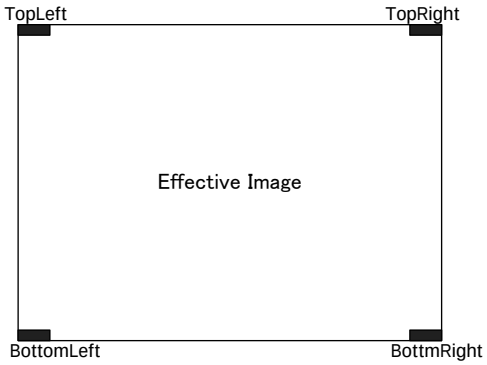
SequencerStatus	
IndexNumberStatus	(ReadOnly)
RepeatNumberStatus	(ReadOnly)
LoopNumberStatus	(ReadOnly)
FrameBurstStatus	(ReadOnly)

・IndexNumberStatus : Indicate the Index number in execution.

・RepeatNumberStatus : Indicate the Index repeating count in execution.

・LoopNumberStatus : Indicate Sequence loop count in execution.

・FrameBurstStatus : Indicate burst mode status of sequence.



SequencerControl		
SequencerInformationLocation	Off	None
	TopLeft	Top left 5 pixel
	TopRight	Top right 5 pixel
	BottomLeft	Bottom left 5 pixel
	BottomRight	Bottom right 5 pixel

・SequencerInformationLocation ：Designate the pixel position to embed the status information of sequence.

☐ Information on Index number, Index repeating count, and Loop count is output to each pixel as follows.

Mono10 : MSB ◄——— 10bit ———► LSB

Mono8: MSB ◄——— 8bit ———► LSB

pix0	Index number[3:0]	“0000”	“00”
pix1	Repeating count [7:0]		“00”
pix2	“000000”	Repeating count [9:8]	“00”
pix3	Loop count [7:0]		“00”
pix4	“000000”	Loop count [9:8]	“00”

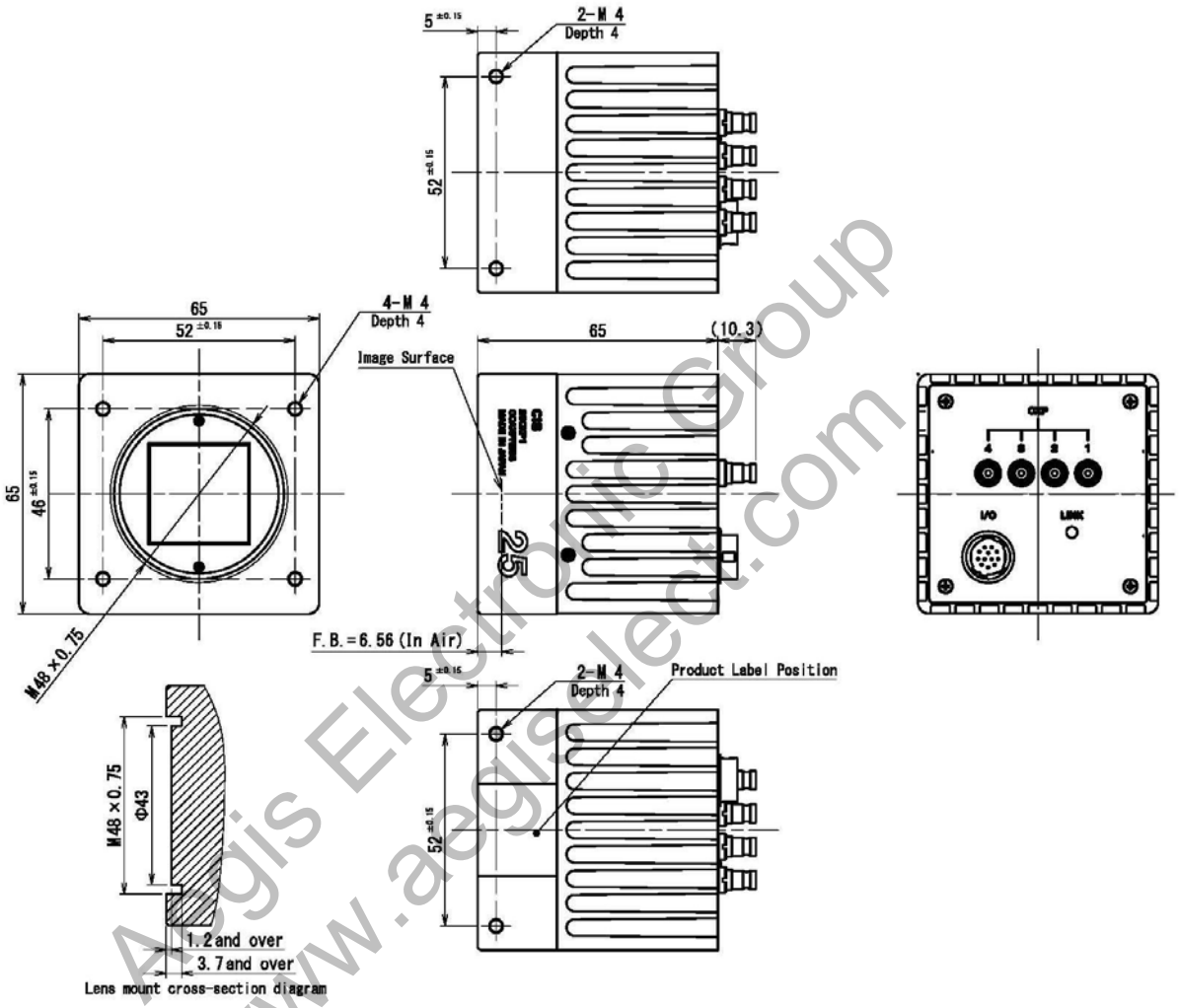
5. Factory Settings

Function	Data	Descriptions
DeviceUserID	DeviceUserID	
DeviceIndicatorMode	Active	
Width	5120	
Height	5120	
OffsetX	0	
OffsetY	0	
SubsamplingMode	Subsumpling_Off	
ReverseX	False	
ReverseY	False	
PixelFormat	Mono8	
ShowCursor	Off	
CursorX	0	
CursorY	0	
CursorColor	White	
TestPattern	Off	
TriggerSelectorAndActivation	AcquisitionMode	
TriggerSource	LinkTrigger0	
ExposureTime	30.000	
Gain	1.000	
BlackOffset	10	
ShadingCorrection	False	
DefectivePixelCorrection	True	
ConnectionConfig	CXP3_X4	
SequencerMaxROISize	ROISize_5120x5120	
SequencerInfomationLocation	Off	
ActiveIndexNumber	0	
SequencerActivation	Off	
Index0~Index15	0~15	Same value as Index number
Index0Count~Index15Count	1	All 1
SequencerLoopCount	0	
IndexSelectorModeIndexNumber	0	
ParameterSetSettingNumber	0	
SequencerExposureTime	30.000	
SequencerGain	1.000	
SequencerWidth	5120	
SequencerHeight	5120	
SequencerOffsetX	0	
SequencerOffsetY	0	

※ Factory settings are the same as UserSetDefault command.

6. Dimensions

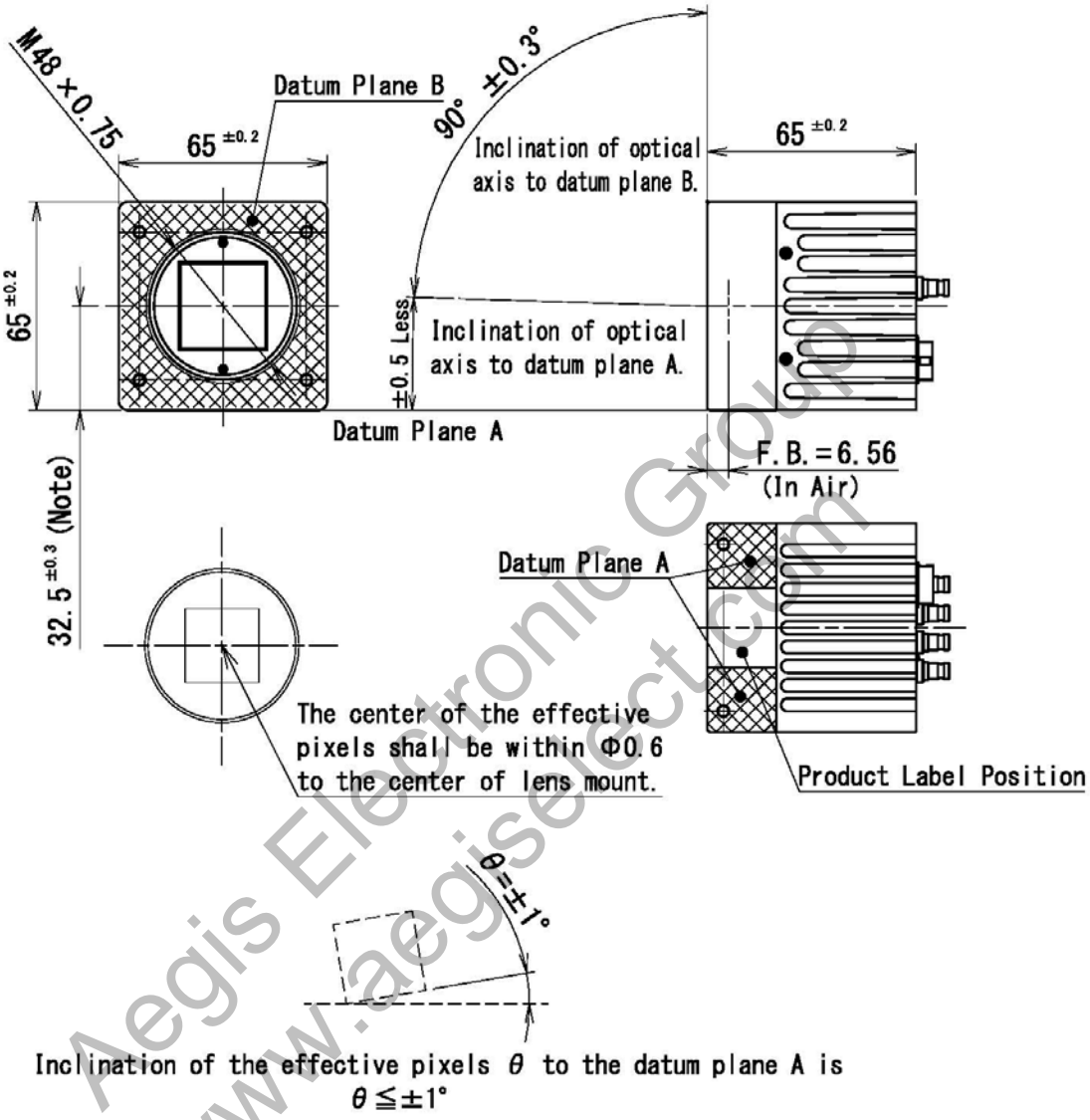
6.1. Camera Dimensions



Note 2) Lens mount screw complies with M48×0.75-6H. Please refer to JIIA LE-004-2011.
Note 1) Please make sure the protrusion portion does not interfer with the lens selected.
Refer to the lens mount cross-section diagram for the details.

935-0042-00
(Unit:mm)

6.2. Optical Axis Accuracy



Note : Dimensions from datum plane A to the center of the lens mount.

937-0013-00
(Unit : mm)

7. Case for Indemnity (Limited Warranty)

7.1. Product Warranty

The term of warranty of this product is within 3 years from the date of shipping out from our factory.
If you use the product properly and discover a defect during the warranty period, and if that was caused by designing or manufacturing, CIS Corporation, at its option, repairs or replaces it at no charge to you. Products out of warranty period will be subject to charge.

CIS should not hold responsible for damages or losses if;

- damages or losses are caused by earthquake, lightning strike, fire, flood or other acts of God.
- damages or losses are caused by deliberate or accidental misuse by user, or failure to observe the information contained in the instructions in this Product Specification and Operational Manual.
- damages or losses are caused by repair or modification conducted by customer or any unauthorized party.

7.2. CMOS Defective Pixels

CIS applies defective pixel correction prior to the shipment of the product. However, the number of defective pixels are subject to increase due primarily to the effect of cosmic rays. Due to this nature, CIS should not hold responsible for the natural increase of defective pixels.

7.3. Product Support

Should you have any problems in function of the product you purchased, and if you need our further analysis and/or repair, please contact your local distributor.