

CIS

**CoaXPress over Fiber
21M pixels CMOS (B/W) Camera**

VCC-21CoF2M

**Product Specifications
& Operational Manual**

(Preliminary)

CIS Corporation

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PRELIMINARY
Aegis Electronic Group
www.aegiselect.com

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., high-intensity lights or sunlight, etc.). When extremely strong light source is shot, smear or blooming may occur. Put the lens protective 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+24V±10% must be within ±50mV. Improper power supply voltage may cause noises on video signals.
- 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-21CoF2M is B/W camera with CoaXPress over Fiber interface. Using an APS-H" global shutter CMOS image sensor, the camera achieves 21M pixels resolution with 80mm (H) × 80mm(W) × 150mm(D) in size (TBD).

Complies with CoaXPress Ver,1.1.1 and CoaXPress over Fiber.

Must have function ready for FA/Machine Vision applications such as trigger shutter, ROI, Gain, black level adjustment, and defective pixel correction. Suitable for various FA/Machine vision applications which requires high speed.

2.1. Features

- Global shutter type CMOS sensor
- CoaXPress over Fiber (QSFP28)
- Maximum cable length: approx. 300m (Details are TBD)
- ROI (Vertical and centered only) / 2x2 binning
- Exposure setting, Gain setting, and Gamma setting
- External trigger mode (Fixed trigger shutter mode / Pulse width trigger shutter mode)
- Complies to GenICam
- TFL-II lens mount

2.2. Accessories

- Optional accessory
 - ◆ TFL-II to F lens mount conversion adaptor

3. Specifications

3.1. General Specifications

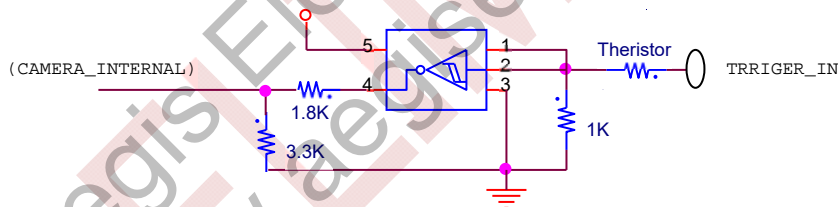
Electrical Specifications			
Image sensor	Sensor type	APS-H, global shutter type CMOS sensor	
	Effective pixels	5120(H) × 4096(V)	
	Unit cell size	4.5μm(H) × 4.5μm(V)	
Optical interface connector		Enhanced Quad Small Form-factor Pluggable (QSFP28) port Complies with SFF-8665 (28 Gb/s 4 x Pluggable Transceiver)	
Interface		Complies with CoaXPress Ver,1.1.1 and CXP over Fiber	
Video output frequency	Pixel clock frequency	**T.B.D** MHz	
Video output format		Mono 8 / Mono 10 / Mono 12	
Frame rate	8bit/10bit/12bit	525.9541 / 411.5791 / 248.8776 fps **T.B.D**	
Resolution (The maximum pixel size)		5120(H) × 4096(V)	
Video signals (Gain 0dB)	White clip level	FFh	with Mono 8bit
	Set up level	01±01h	with Mono 8bit, with factory setting
	Dark shading	0~1h(H), 0~1h(V)	with Mono 8bit, with factory setting
Sensitivity		F8 **T.B.D.** lx (Mono12, Shutter speed 4000μs, Gain x1)	
Minimum illumination		F2.6 **T.B.D.** lx (Mono12, Shutter speed 4000μs, Gain x8, level=50%)	
Gain variable range		x1~x8 F2.6 **T.B.D.** lx (0dB~18dB)	
Shutter speed		4[μs]~ 10,000,000 [μs]	
Gamma correction		γ =0.10~1.80	
Trigger mode		Free run mode (Camera internal sync.) External trigger sync. mode (Host, external terminal)	
Partial scan		Manual ROI (Vertical and centered only)	
Power requirements		12pins circular connector: +24V±10%	
Power consumption		**T.B.D** [with free run] max.	
Mechanical Specifications			
Dimensions		H:80mm W:80mm D:150mm excluding projection. **T.B.D.**	
Weight		Approx. **T.B.D** g	
Lens Mount		TFL-II mount	

Environmental Specifications			
Safety/Quality Standards (To be applied for)		CE: EMC: 2014/30/EU	
		Emission: EN61000-6-4:2007+A1:2011 Immunity: EN61000-6-2:2019	
		RoHS: 2011/65/EU (EU)2015/863	
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		0 ~ +45°C **T.B.D.** Humidity: 20 ~ 80%RH with no condensation.	
Storage temperature		-25 ~ +60°C **T.B.D.** Humidity: 20 ~ 80%RH with no condensation.	

3.2. Input and Output Specifications

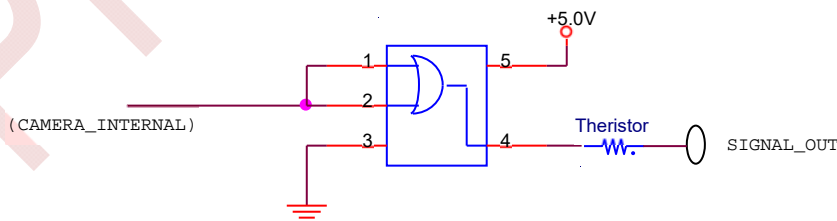
3.2.1 12PIN Connector External Input (Trigger No. 11 pin)

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



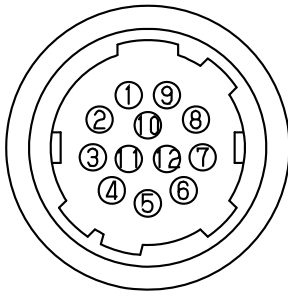
3.2.2 12PIN Connector External Output (No. 7, 9, and 10 pin)

- 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	Signal Name	Explanation
1	GND	GND
2	Power input	External power input +24V±10%
3	NC	
4	NC	
5	GND	GND
6	NC	
7	GPO1	General output (Factory setting: Low)
8	GND	GND
9	GPO2	General output (Factory setting: Low)
10	GPO3	General output (Factory setting: Low)
11	TRIGGER_IN	External trigger input
12	GND	GND

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

※Output signals of general output is selectable with Section 4.21. Camera Timing I/O.

3.3.2 Fiber Connector

Image output signals for CoaXPress

T.B.D

3.3.3 LED Indicator

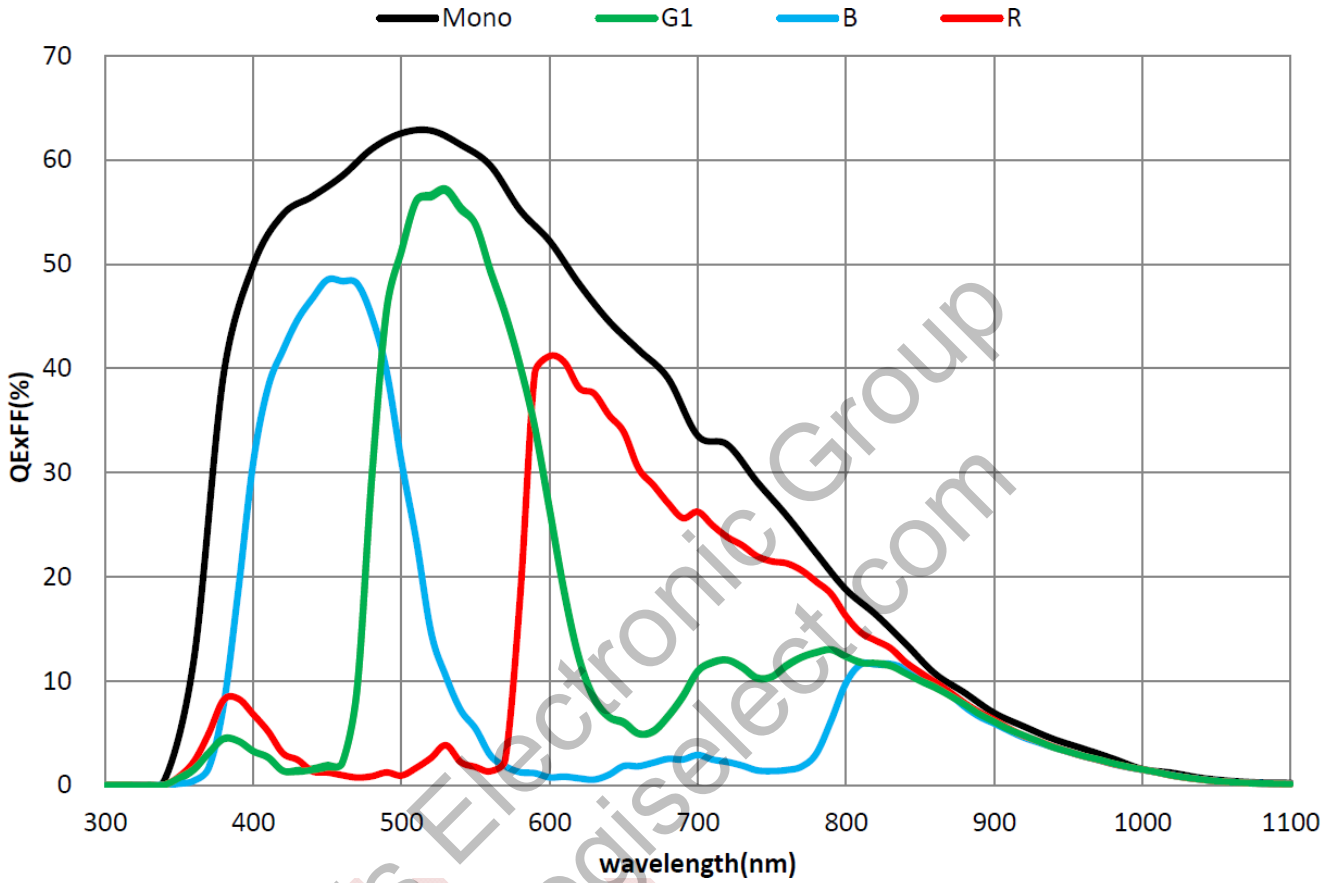
With LED indicator ON, lighting patterns show the camera status by its way of lighting.

OFF	No power supply.
Green/Orange Fast Blinking [12.5Hz]	Disconnection of 2 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 Fast Blinking [12.5Hz]	Image transmission error or inappropriate trigger input. [Error]

※When camera detects inappropriate trigger with external trigger sync. mode, error occurs.

3.4. Spectral Response

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



4. Camera Functions

4.1. Camera Interface

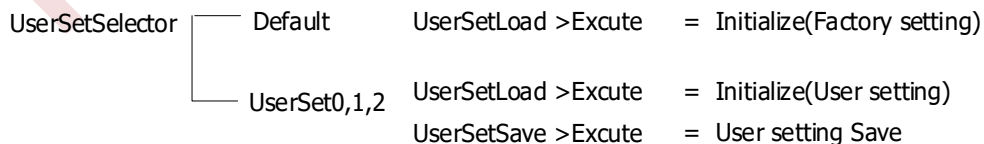
- Complies with CoaXPress 1.1.1 .

4.2. Saving and Initializing Settings

UserSets	
	Default 【Not subject to set】
UserSetSelector	UserSet0 UserSet1 UserSet2
UserSetLoad	Execute
UserSetSave	Execute
UserSetDefault	Default UserSet0 UserSet1 UserSet2

- UserSetSelector: This is to select camera settings.
With Default, only UserSetLoad is enabled. UserSetSave is disabled.
 - UserSetLoad: This is to load camera settings selected with UserSetSelector from the non-volatile memory.
When UserSetSelector is Default, this command reads out the factory settings.
However, ConnectionConfig, PixelFormat, DeviceUserID, DeviceUserString, UserSetDefault, Defective pixel correction value, Shading correction value, and the boundary correction value maintain the set values.
 - UserSetSave: This is to save camera settings.
With Default, only UserSetLoad is enabled. UserSetSave is disabled.
 - UserSetDefault: This is to select settings upon initialization of the camera.
Camera starts up with loading the selected settings.
However, even with Default, DeviceUserID, DeviceUserString, Defective pixel correction value, Shading correction value, and the boundary correction value maintain the saved set values.
- UserSetDefault saves setting values immediately.
 - Upon execution of UserSetLoad, camera changes setting values to the loaded values.
Please update the command because some display software may not refresh automatically.
 - The following settings are not dependent on UserSet0, 1, or 2 (as the camera only has one setting).

UserSetDefault, DeviceUserID, DeviceUserString, Defective pixel correction value, Shading correction value, and the boundary correction value.



4.3. Device 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

TransferLayerControl		
DeviceTapGeometry	Geometry_1X_2YE	ReadOnly

 User information

DeviceControl	
DeviceUserID	Manual
DeviceUserString	Manual

- DeviceUserID: Set a letter string as DeviceUserID with up to 16 characters including terminal NUL letter (¥0).
- DeviceUserString: Set a letter string as DeviceUserString with up to 256 characters including terminal NUL letter (¥0).
- Execute UserSetSave to save these letter strings to camera non-volatile memory.
- These data are not subject to "UserSetLoad" with "Default" and camera keeps the current settings.
- Camera reads out the saved setting values when initialized with UserSetDefault=Default.

4.4. Link Speed and Link Count

TransferLayerControl		
ConnectionConfig	CXP12_X4**T.B.D.**	ReadOnly

CXP12_X4 : Link speed = 12.5Gbps, Link count = 4

4.5. Pixel Format

ImageFormatControl	
PixelFormat	Mono8 Mono10 Mono12

- Mono8 : Monochrome 8bit
- Mono10 : Monochrome 10bit
- Mono12 : Monochrome 12bit

[Note]

- To change settings with internal sync. mode, make sure to readjust exposure time setting.
- Setting values are not subject to "UserSetLoad" with "Default" and camera keeps the current settings.

4.6. Flip

ImageFormatControl	
ReverseX	True/False
ReverseY	False ※ Fixed

ReverseX : This is to flip the image in horizontal direction.

ReverseY : This model "VCC-21CoF2M" is fixed to False.

[Note]

- When flipping the image in horizontal direction with ROI, the value of OffsetX for each RegionSelector also flips.
- When indicating test pattern, the image will not flip in horizontal direction even if ReverseX is set to True.
- When indicating cursor, the cursor will be indicated at the position with normal rotation even if ReverseX is set to True.

4.7. Trigger Mode

Acquisition Control	
TriggerSelector	AcquisitionStart FrameStart
TriggerMode	Off/On
TriggerActivation	RisingEdge FallingEdge LevelHigh LevelLow
TriggerSource	LinkTrigger0 Line0 Software
TriggerSoftware	Execute

- TriggerSelector
This is to select how to start capturing video out of the followings.
 - AcquisitionStart : Free run mode [Internal sync. mode]
 - FrameStart : External trigger sync. mode [External sync. mode]
- TriggerMode
This is to select enable/disable of trigger with external trigger sync. mode.
 - Off : Trigger is disabled
 - On : Trigger is enabled
- TriggerActivation
This is to select trigger polarity out of the followings.
Enabled when TriggerSelector mode is FrameStart.
 - RisingEdge : Rising edge [External sync. mode]
 - FallingEdge : Falling edge [Internal sync. mode]
 - LevelHigh : High active [External sync. mode]
 - LevelLow : Low active [External sync. mode]

- TriggerSource

This is to select where to send external trigger.

- LinkTrigger0 : External trigger input from CoaXPress Host Device.
Please refer to the specification manuals of Host Device such as frame grabber board to know how to generate triggers.
※Some grabber boards may adjust the trigger generation interval internally if the transfer speed of the camera exceeds the processing speed of the grabber board. In such cases, the frame rate display may appear to decrease.
※When LinkTrigger0 is selected, FallingEdge and LevelLow for TriggerActivation are deprecated. Depending on the grabber board, the first frame may not be displayed.
- Line0 : External trigger input from 12pins circular connector.
- Software : Select when executing TriggerSoftware.

- TriggerSoftware: Software trigger

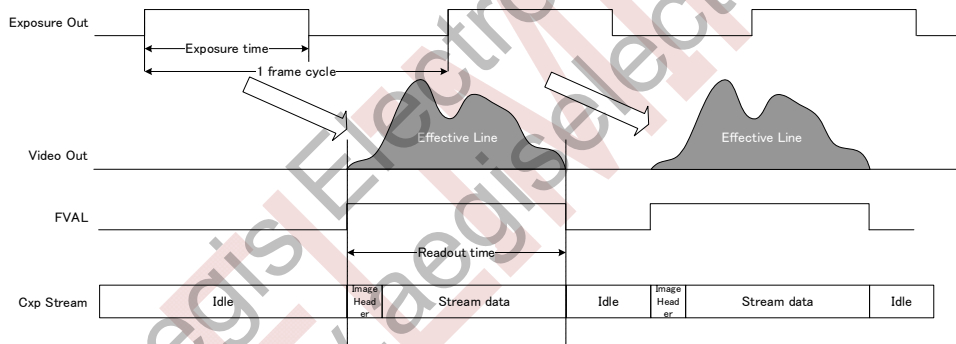
Camera generates a trigger to capture one frame image by executing this command.

Enabled when TriggerSelector mode is FrameStart and TriggerSource is Software.

※Please set TriggerActivation to RisingEdge.

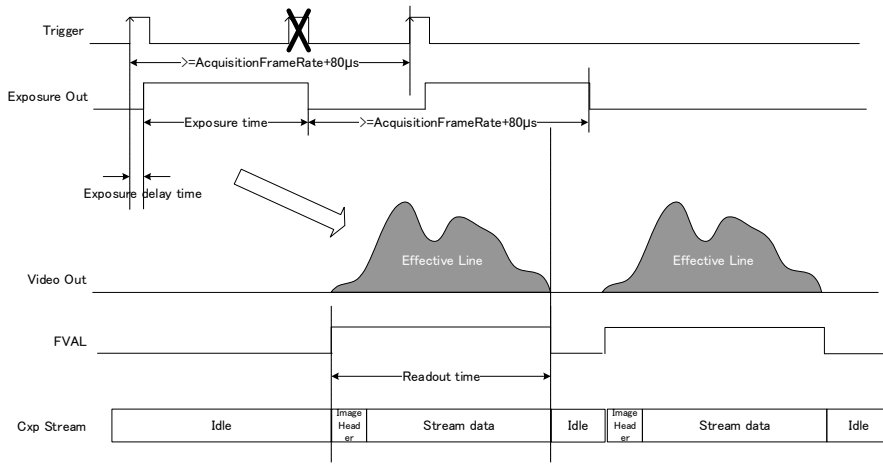
4.7.1 Internal Sync. Mode (Free Run Mode)

- With this mode, camera continuously outputs images.
- Set TriggerSelector to AcquisitionStart.



4.7.2 External Sync. Mode (Fixed Trigger Shutter Mode)

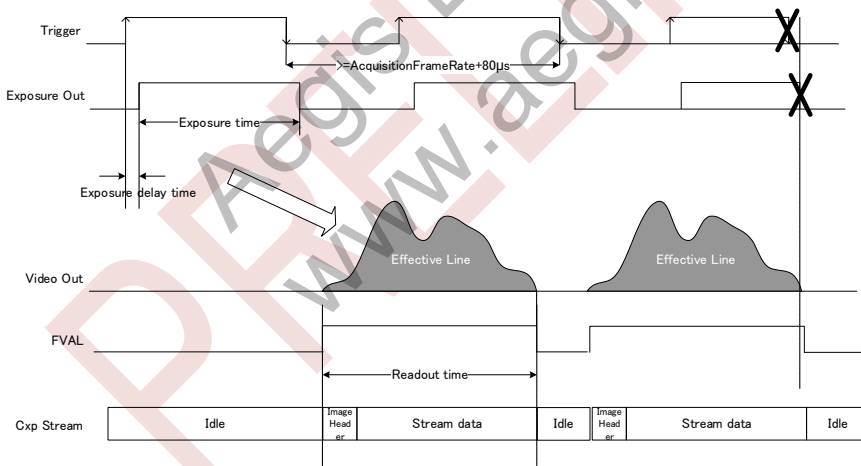
- This is a mode to capture images with preferred timings by inputting external trigger signals.
- Set "TriggerSelector" to "FrameStart".
- With a trigger signal input, camera exposes for a period set by "ExposureTime".
- Set "TriggerActivation" to "RisingEdge" or "FallingEdge".
- Trigger cycle must be longer than " $1/\text{AcquisitionFrameRate} + 80\mu\text{s}$ ".
- When FVAL is Hi (readout), the falling edge of ExposureOut is inhibited (If such prohibited operation occurs, IllegalTrigger will become 1).
- Input trigger with more than $1\mu\text{s}$ of trigger pulse width.



Exposure delay time = $8\mu\text{s}$

4.7.3 External Sync. Mode (Pulse Width Trigger Shutter Mode)

- This is a mode to capture images with preferred timings by inputting external trigger signals.
- Set "TriggerSelector" to "FrameStart".
- Camera exposes according to the level of the trigger.
- Set "TriggerActivation" to "LevelHigh" or "LevelLow".
- Trigger cycle must be longer than " $1/\text{AcquisitionFrameRate} + 80\mu\text{s}$ ".
- When FVAL is Hi (readout), the falling edge of the next trigger is inhibited (If such prohibited operation occurs, IllegalTrigger will become 1).
- Input trigger with more than $4\mu\text{s}$ of trigger pulse width.



Exposure delay time = $8\mu\text{s}$

4.7.4 Restrictions on Trigger Pulse Input Timing

- The timing to end exposure while reading out the prior frame is restricted.
※ Please refer to the diagram in the previous page.
- If there is a trigger input with restricted timing explained in the above, “IllegalTriggerFlag” becomes “1”.

AcquisitionControl	
IllegalTriggerFlag	[ReadOnly]

“0” shows that the camera is operating normally, and “1” shows that there is more than one trigger input with restricted timing.

DeviceControl	
ErrorFlagReset	Execute

Reset IllegalTriggerFlag to “0”.

4.8. Frame Rate

AcquisitionControl	
AcquisitionFrameRate	AcquisitionFrameRate.Min~AcquisitionFrameRate.Max

This is to set frame rate (Hz) for internal sync mode.
Do not change the value while grabbing images.

- ◆ AcquisitionFrameRate.Min : The lower limit value
Varies with PixelFormat, ROI(Height) setting, and binning setting
- ◆ AcquisitionFrameRate.Max : The upper limit value
Varies with PixelFormat, ROI(Height) setting, and binning setting

Example)
With ROI

Width	Height	PixelFormat	Min[Hz]	Max[Hz]
640	480	Mono8	8.9407	3816.01
		Mono10	7.1526	3121.74
		Mono12	5.9605	1958.78
1024	768	Mono8	8.9407	2547.03
		Mono10	7.1526	2047.78
		Mono12	5.9605	1266.01
1280	1024	Mono8	8.9407	1965.92
		Mono10	7.1526	1568.21
		Mono12	5.9605	963.20
3840	2400	Mono8	8.9407	883.03
		Mono10	7.1526	694.28
		Mono12	5.9605	421.42
5120	4096	Mono8	8.9407	525.95
		Mono10	7.1526	411.57
		Mono12	5.9605	248.87

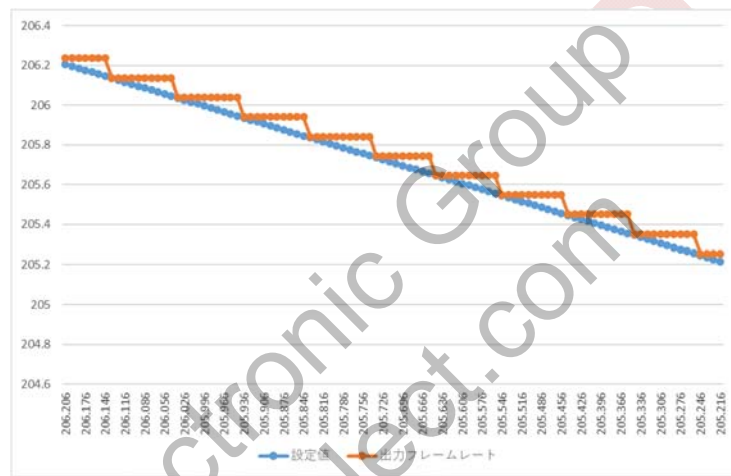
With Binning (Average)

Width	Height	PixelFormat	Min[Hz]	Max[Hz]
2560	2016	Mono8	8.9407	725.3526
		Mono10	7.1526	620.3474
		Mono12	5.9605	473.0369

※Min/Max values in the above table may have difference of ±0.0001 with the actual displayed values.

[Note]

- The smaller the ROI (Height) setting and the closer the frame rate is to the maximum, the greater the discrepancy between the set value and the actual frame rate becomes.
- There is a range between AcquisitionFrameRate.Min/Max where changing the settings does not affect the output.



4.9. Gain

AnalogControl	
Gain	1.00~8.00

- Gain: x1 to x8 preferred gain settings per 0.01.

[Note]

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

4.10. Gamma Correction

AnalogControl	
Gamma	0.10~1.80

- Gamma : This is to set gamma correction value per 0.01 step. Do not change values while acquiring images.

4.11. Exposure Time

Acquisition Control	
ExposureTime [μ s]	4~10,000,000

- ExposureTime: This is to set exposure time per 1 μ s.

ExposureTime.Min : The lower limit value of exposure time

ExposureTime.Max : The upper limit value of exposure time

- With internal sync mode: Varies according to the PixelFormat, Height, and Binning setting.
- With external sync mode: 10000000us

[Note]

- When using internal sync, values greater than 65536us are rounded to the nearest 10us (truncated).
Ex: In case of 65536us, it is reflected as 65530us.
- If the AcquisitionFrameRate setting exceeds the frame time, it is clipped.

4.12. Partial Scan (ROI)

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

ImageFormatControl	
RegionSelector	Region0 [Not subject to save]
RegionMode	On/Off
Width	640~5120
Height	480~4096
OffsetX	0~5120-Width
OffsetY	ReadOnly
ROIQuickChange*	Execute

- ROI

- RegionSelector : This is to select Region to set ROI.
- RegionMode : This is to set enable/disable of ROI.

Make sure to set RegionMode=Off for the features below.

- Width : This is to set the size of ROI in X direction per 32-pixel units.
- Height : This is to set the size of ROI in Y direction per 32-pixel units.
- OffsetX : This is to set the position of Offset in X direction per 32-pixel units.
- OffsetY : This is to indicate the position of Offset in Y direction.

[Note]

- Partial scan (ROI) and 2x2 binning are mutually exclusive.
- After changing the partial scan (ROI), check AcquisitionFrameRate and ExposureTime and re-set as necessary.
- When partial scan (ROI) is reduced, AcquisitionFrameRateMax increases, but AcquisitionFrameRate remains the same. On the contrary, a larger AcquisitionFrameRateMax results in a smaller AcquisitionFrameRate, and the AcquisitionFrameRate clips when it exceeds the AcquisitionFrameRateMax.
- ExposureTime clips above ExposureTimeMax as Height changes.

4.13. 2X2 Binning

ImageFormatControl	
BinningHorizontal	1~2
BinningHorizontalMode	Sum/Average
BinningVertical	1~2
BinningVerticalMode	Sum/Average

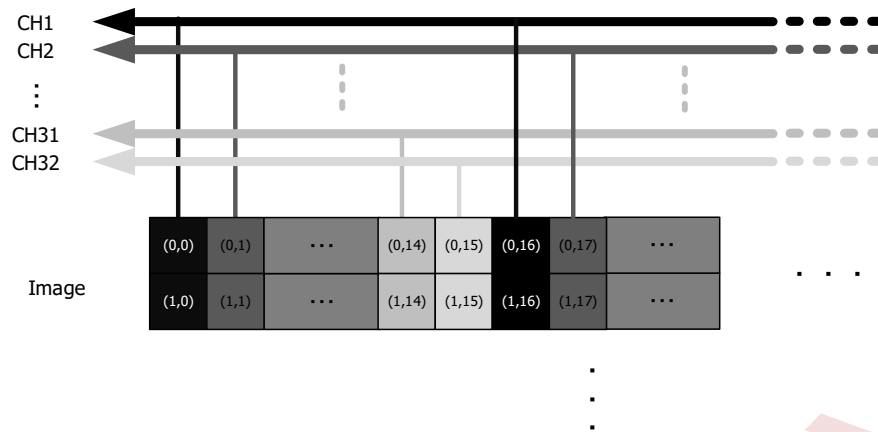
- Horizontal setting and Vertical setting mutually link. If user changes either horizontal setting or vertical setting to 2, mode becomes to 2x2 binning mode. BinningHorizontalMode setting and BinningVerticalMode setting mutually link as well.
- 4 pixels of horizontal and vertical will be mixed and output as 1 pixel. When the camera is set to BinningHorizontalMode and BinningVerticalMode=Sum, sensitivity will be approx. 4 times higher than normal status. With Average, sensitivity is the same as normal status, however, the noise level becomes less.
- Since the vertical line from the sensor output becomes 1/2, frame rate increases while maintaining the field angle for full resolution when BinningHorizontalMode and BinningVerticalMode are Average. With Sum, frame rate is the same as the one for full scale.
- Height becomes 2016 ($\neq 2048$) when BinningHorizontalMode and BinningVerticalMode are Average.
- 2x2 binning mode and ROI are mutually exclusive and effective only with full scale.

[Note]

- 2x2 binning (Average) and defective pixel correction are mutually exclusive. Make sure to turn off DefectivePixelCorrection to change mode to 2x2 binning (Average).
- To change settings with internal sync. mode, make sure to check and readjust AcquisitionFrameRate, and ExposureTime as necessary.

4.14. Defective Pixel Correction

- This is a function to detect and correct the defective pixels in the output data from the sensor.
- There are two types of defective pixel data.
 - Defective data registered at factory.
Black and white defective pixel data registered upon shipment from our factory. These data cannot be overwritten.
 - Defective data registered by user.
Data registered by user. In addition to the correction of defective pixel data registered upon shipment, we provide a method to update the defective pixel data. With DefectPixelDefault command, user can delete these user-registered data. This is not subject to UserSetDefault.
- User can register up to 1024 points. (There are 32 CHs in each of TOP and BOTTOM, and 16 points in each CH.)
[CH (Channel)]
Camera performs image processing with 32 CH interleave per TOP and BOTTOM.



Enable or disable Defective Pixel Correction

This is to enable or disable defective pixel correction function. Function controls both defective pixel correction data registered at factory and registered by user at one time.

Updating defective pixel data with coordinates X and Y.

This function allows you to register and delete any pixel as a defective pixel by specifying its coordinates.



Defective pixel correction function calculates value for X pixel referring to the peripheral pixels. When all peripheral pixels, shown as X1, X2, X3, and X4, are already registered as defective pixels, user cannot correct the X pixel.

AnalogControl	
DefectPixelCorrection	On/Off
DefectPixelAdd	Execute
DefectPixelAddOffsetY	0~4095 【Not subject to save】
DefectPixelAddOffsetX	0~5119 【Not subject to save】
DefectPixelDelete	Execute

- DefectPixelCorrection: Enable or disable defective pixel correction function.
- DefectPixelAddOffsetY: Specify Y coordinate. (With Binning, specify the coordinate before binning)
- DefectPixelAddOffsetX: Specify X coordinate. (With Binning, specify the coordinate before binning)
- Execute DefectPixelAdd to register the specified coordinates as defective pixels.
- Execute DefectPixelDelete to delete the specified coordinates from registered defective pixels.

- When user specify the same coordinates as those registered at factory, function ignores them.
- DefectPixelDelete command deletes only the added pixels by user with DefectPixelAdd or DefectDetection.
- Data registered at factory is not subject to delete with DefectPixelDelete command.

□ Updating defective pixel data with detection function

This is for user to detect and register correction data of white defect pixels. Make sure to shield light from image sensor to execute.

AnalogControl	
DefectDetectionThesholdValue	0~4095
DefectDetection	(Execute)
DefectDetectionStatus	(Read Only)
DefectPixelDefault	(Execute)
DefectCorrectMode	Reacquire/Add (Not subject to save)

- DefectDetectionThresholdValue: This is to set a threshold value (0 ~ 4095: 12bit equivalent) for user defective pixel detection. Function registers data with luminance level that exceeds the threshold value specified here. With 8-bit images, specify a value of 16 times of signal level as a threshold value.
- DefectDetection: This is to detect defective pixels. Make sure to shield light from image sensor to execute. Function automatically registers pixels that exceed the level specified with DefectDetectionThresholdValue. Function reflects defective pixel correction registered by user immediately after execution. Execute UserSetSave after DefectDetection to save data into non-volatile memory.
 - DefectDetectionStatus: This is to indicate results of defective pixel detection proceeded by user.

0	No defective pixel correction data registered by user.
Value (Under 1024)	Number of defective pixels detected and registered by user.
[Error code]	
0x000e0001 (917505)	Total number of defective pixel correction data exceeds the maximum number to register. (1024 points)
0x000e0002 (917506)	Total number of defective pixel correction data exceeds the maximum number to register in one CH. (32)

- When an error code returns, check if user threshold value (DefectDetectionThresholdValue) is appropriate. Also, reacquire DefectCorrectMode or execute DefectPixelDelete. Confirm that the lens is closed (light-shielded state), change the detection conditions (gain, threshold, etc.), and re-execute DefectDetectionStatus.
- DefectCorrectMode: This is to select detection mode of defective pixels out of the followings.
 - Reacquire mode: This mode deletes defective pixel data except those registered by specifying coordinates and reacquire defective pixels.
 - Add mode: This mode acquires defective pixels in addition to the current pixels registered.

[Note]

- Make sure to acquire defective pixel correction data when camera is in operation.
- Make sure to turn OFF Partial Scan and 2x2 Binning mode to execute defective pixel correction. (The size must be 5120x4096 to execute).
- To acquire user registered defective correction data by changing threshold value of DefectDetectionThresholdValue, execute entire delete DefectPixelDefault and re-acquire user registered defective correction data.

- Maximum number of defective pixels to register and the maximum number of defective pixels to correct may not always be the same due to following reasons.
 - (1) With white defects detection, if one of interleave channel reaches the maximum number of defective pixels to register, correction stops. Function registers data up to that point, outputs error, and ends operation.
 - (2) When there is no effective pixel around the pixel to add (on the left, right, top, and bottom), user can register but cannot correct that pixel.
 - Even when executing UserSetLoad with UserSetSelector=Default, camera maintains the current settings of correction data.
 - Upon activating camera with UserSetDefault=Default, camera reads out the saved settings of correction data.

Entire deletion of user registered information

This is to delete entire information registered by user with designating coordinates or with executing defect detection.

AnalogControl	
DefectPixelDefault	Execute

- DefectPixelDefault: This is to delete entire defective pixel correction data registered by user.

Indication of defective pixel coordinates

This is to indicate the coordinates of defective pixels registered by user and factory.

AnalogControl	
RegisteredDefectSelector	UserState/InitialState 【Not subject to save】
RegisteredDefectNumber	(ReadOnly)
DefectPixelNumber	1~1024/1~1024 【Not subject to save】
DefectPixelOffsetY	(ReadOnly)
DefectPixelOffsetX	(ReadOnly)
DefectPixelType	(ReadOnly)

- RegisteredDefectSelector: Selection of defective pixel data.
- RegisteredDefectNumber: Number of defective pixel data registered.
- DefectPixelNumber: This is to set the Table number of the registered defective pixels.
Specify Table number of defective pixel data registered at factory and registered by user.
- DefectPixelOffsetY: This is to indicate Y coordinate of the defective pixel specified with DefectPixelNumber.
When user specifies a table number with no defective pixel data, it shows 65535.
With Binning mode, the command indicates the coordinates before binning.
- DefectPixelOffsetX: This is to indicate X coordinate of the defective pixel specified with DefectPixelNumber.
When user specifies a table number with no defective pixel data, it shows 65535.
With Binning mode, the command indicates the coordinates before binning.
- DefectPixelType: This is to indicate defect type of the pixel specified with DefectPixelNumber.
 - 1: White defects registered upon shipment from factory
 - 2: Black defects registered upon shipment from factory
 - 6: Defects registered by user
 - 7: Defects additionally registered by user
 - 65535: Table without defects

AnalogControl	
ChannelNumber	Top_CH01~Top_CH32 【Not subject to save】 Bottom_CH01~Bottom_CH32
DefectPixelChannelCount	(ReadOnly)

4.15. Shading Correction

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

AnalogControl	
ShadingCorrectionDataSelector	Off/Table1/Table2/Table3/Table4
DetectShading	(Execute)

- ◆ ShadingCorrectionDataSelector

This is to select shading Off or shading correction Table to use.

By selecting Table1- Table4, correction function turns ON with each correction value.

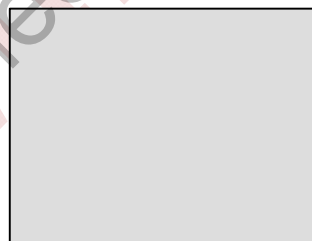
- ◆ DetectShading

User can acquire correction data to the designated Table by executing DetectShading while selecting Table1- Table4. To detect shading, make sure to turn OFF partial scan and 2x2 binning. Shoot an object with stable brightness such as pattern box to full screen to execute DetectShading. Execute UserSetSave to save the acquired correction data.

Before shading correction



After shading correction



[Note]

- Acquire correction data when camera is in operation.
(When the camera does not output anything, user cannot acquire shading correction data.)
- Execute UserSetSave to save the correction data of Table1~Table4 into non-volatile memory at the same time.
- Even when executing Default with UserSetLoad, camera maintains correction data.
- Upon activating camera with UserSetDefault=Default, camera reads out the saved correction data.

4.16. Black Level Adjustment

- This is to adjust black level.

AnalogControl	
BlackOffset	-128~128

[Note] This is not a function to adjust the output level of the camera.

4.17. Test Pattern Indication

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

ImageFormatControl	
TestPattern	OFF GreyHorizontalRamp GreyHorizontalRampMoving

[Note] Displaying test pattern and cursor are mutually exclusive.

4.18. Cursor Indication

- This is to show cursor on your display screen.

ImageFormatControl	
CursorPattern	On/Off
CursorOffsetX	X coordinate
CursorOffsetY	Y coordinate
CursorColor	White/Black

- CursorPattern : Cursor indication On/Off.
- CursorOffsetX : X coordinate of vertical cursor.
- CursorOffsetY : Y coordinate of horizontal cursor.
- CursorColor : This is to select the color of cursor (black or white).

[Note]

- ♦ Make sure to turn off test pattern to show the cursor on your display screen.
- ♦ When the camera is set to ROI, CursorOffsetX=0 and CursorOffsetY=0 becomes the display origin.
- ♦ If the cursor does not appear on the display screen, readjust the ROI settings.

4.19. LED Operational Mode

- This is to change operational mode of LED at the rear of camera.

For information on lighting patterns, refer to 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

4.20. Temperature

- This is to show camera's temperature.

DeviceControl		
DeviceTemperatureSelector	Sensor FPGA	【Not subject to save】
DeviceTemperature	ReadOnly	

[Note] Register values are not calibrated.

4.21. Camera Timing I/O

- Camera outputs the following signals through pin No. 7, 9, and 10 of 12pins circular connector according to LineSource settings.

Digital IO Control	
LineSelector	Line1 : 7pin
	Line2 : 9pin
	Line3 : 10pin [Not subject to save]
LineMode	Output (ReadOnly)
LineSource	OFF : Invalid
	ExposureActive : Indicate exposure period of image sensor with Hi active.
	FrameActive : Indicate effective period of frame with Hi active.
	LineActive : Indicate effective period of line with Hi active.
	TriggerPacketActive : Decode and output packet signals of uplink trigger from the frame grabber board.

4.22. Source Tag Reset

DigitalIOControl	
SourceTagReset	(Execute)

- This is to reset SourceTag of image header to 0.

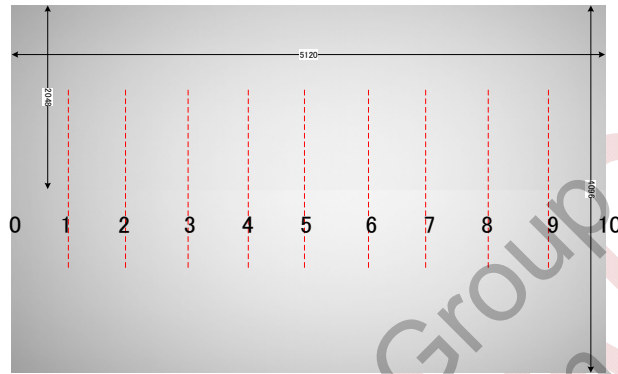
4.23. Boundary Correction

Due to the characteristics of this camera's sensor, there may be a difference in level between the upper and lower halves of the output image. This function allows you to fine-tune the differences. Settings can be adjusted for each PixelFormat: 8-bit, 10-bit, and 12-bit.

AnalogControl	
BoundaryCorrectionAdjustSelector	PixelDepth8bit [Not subject to save]
	PixelDepth10bit
	PixelDepth12bit
BoundaryCorrectionAdjustAddress	0~10 [Not subject to save]
BoundaryCorrectionAdjustData	-100~100
BoundaryCorrectionAdjustReset	Execute

- BoundaryCorrectionAdjustSelector :
This is to select 8bit/10bit/12bit when registering boundary correction data or resetting boundary correction data with BoundaryCorrectionAdjustReset.
- BoundaryCorrectionAdjustAddress :
Boundary correction is set in registers 0~10 for each BoundaryCorrectionAdjustSelector. This is to set the address of that register.

- **BoundaryCorrectionAdjustData** :
This is to register correction data of each BoundaryCorrectionAdjustAddress 0~10 of BoundaryCorrectionAdjustSelector. Can be set in the range of -100~100, with smaller values decreasing the level of the lower half and larger values increasing the level of the lower half.
- **BoundaryCorrectionAdjustReset** :
This is to reset correction data of each BoundaryCorrectionAdjustAddress 0~10 of BoundaryCorrectionAdjustSelector to 0.



[Note]

- Even when executing UserSetLoad with UserSetSelector=Default, camera maintains the current settings with BoundaryCorrectionAdjustData.
- Upon activation with UserSetDefault=Default, camera reads out the saved setting values with BoundaryCorrectionAdjustData.

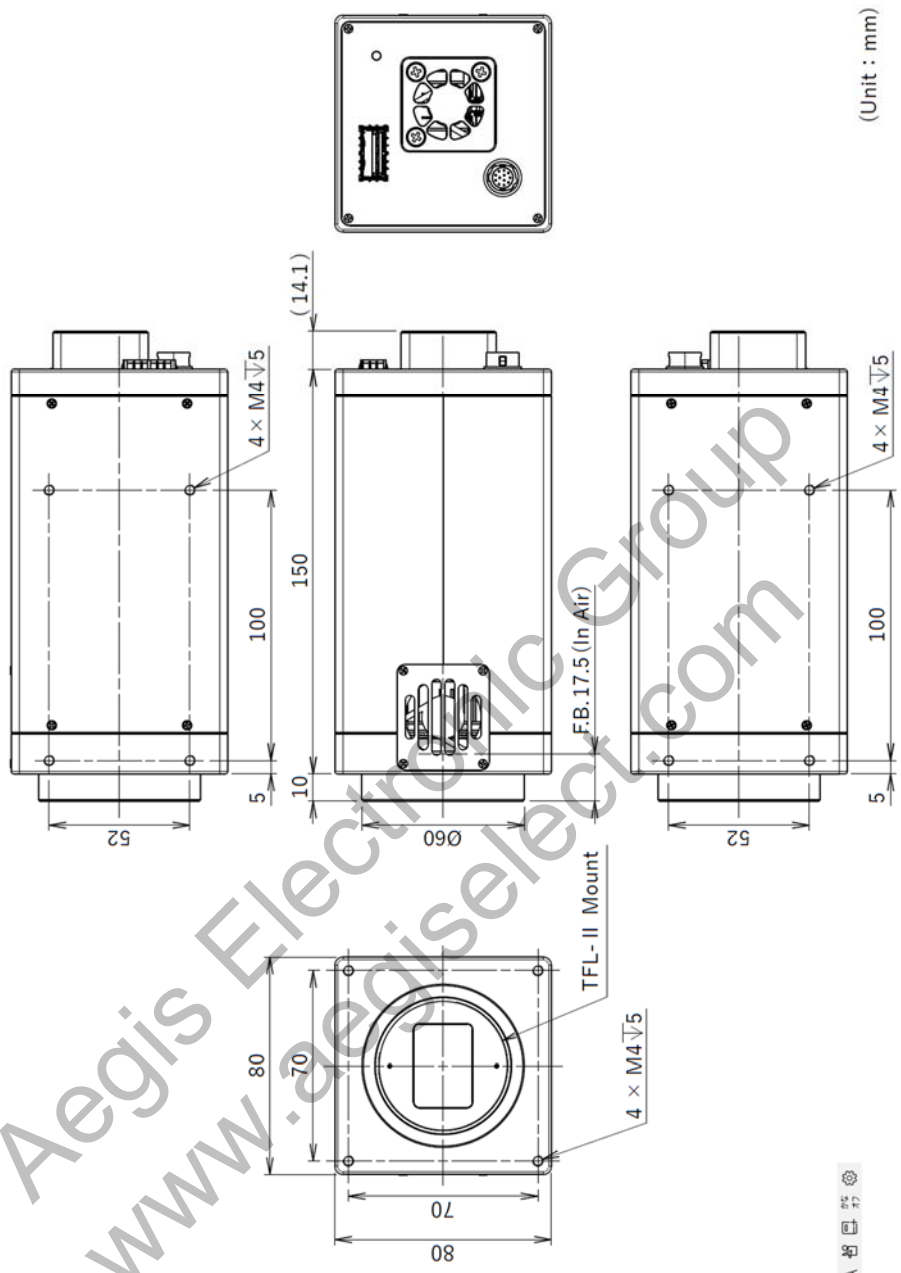
5. Factory Settings

Function	Data	Explanation
DeviceControl		
DeviceIndicatorMode	Active	
ImageFormatControl		
RegionMode	On	
Width	5120	
Height	4096	
BinningHorizontalMode	Average	
BinningHorizontal	1	
BinningVerticalMode	Average	
BinningVertical	1	
PixelFormat	Mono8	
ReverseX	False	
ReverseY	False	Fixed
CursorPattern	Off	
CursorOffsetX	2560	
CursorOffsetY	2048	
CursorColor	White	
TestPattern	Off	
AcquisitionControl		
TriggerSelector	AcquisitionStart	
TriggerActivation	RisingEdge	
TriggerSource	LinkTrigger0	
ExposureTime	1835 **T.B.D**	
AcquisitionFrameRate	525.95	
AnalogControl		
Gain	1.0	
ShadingCorrectionDataSelector	0	
ShadingCorrection	False	
Gamma	1.0	
BlackOffset	0	
BoundaryCorrectionAdjustSelector	PixelDepth8bit	
BoundaryCorrectionAdjustAddress	0	
BoundaryCorrectionAdjustData	0	
PixelCorrectionControl		
DefectivePixelCorrection	On	
DefectivePixelAddOffsetX	0	
DefectivePixelAddOffsetY	0	
DefectivePixelThresholdValue	4095	
TransportLayerControl		
ConnectionConfig	CXP12_X4**T.B.D.**	Fixed

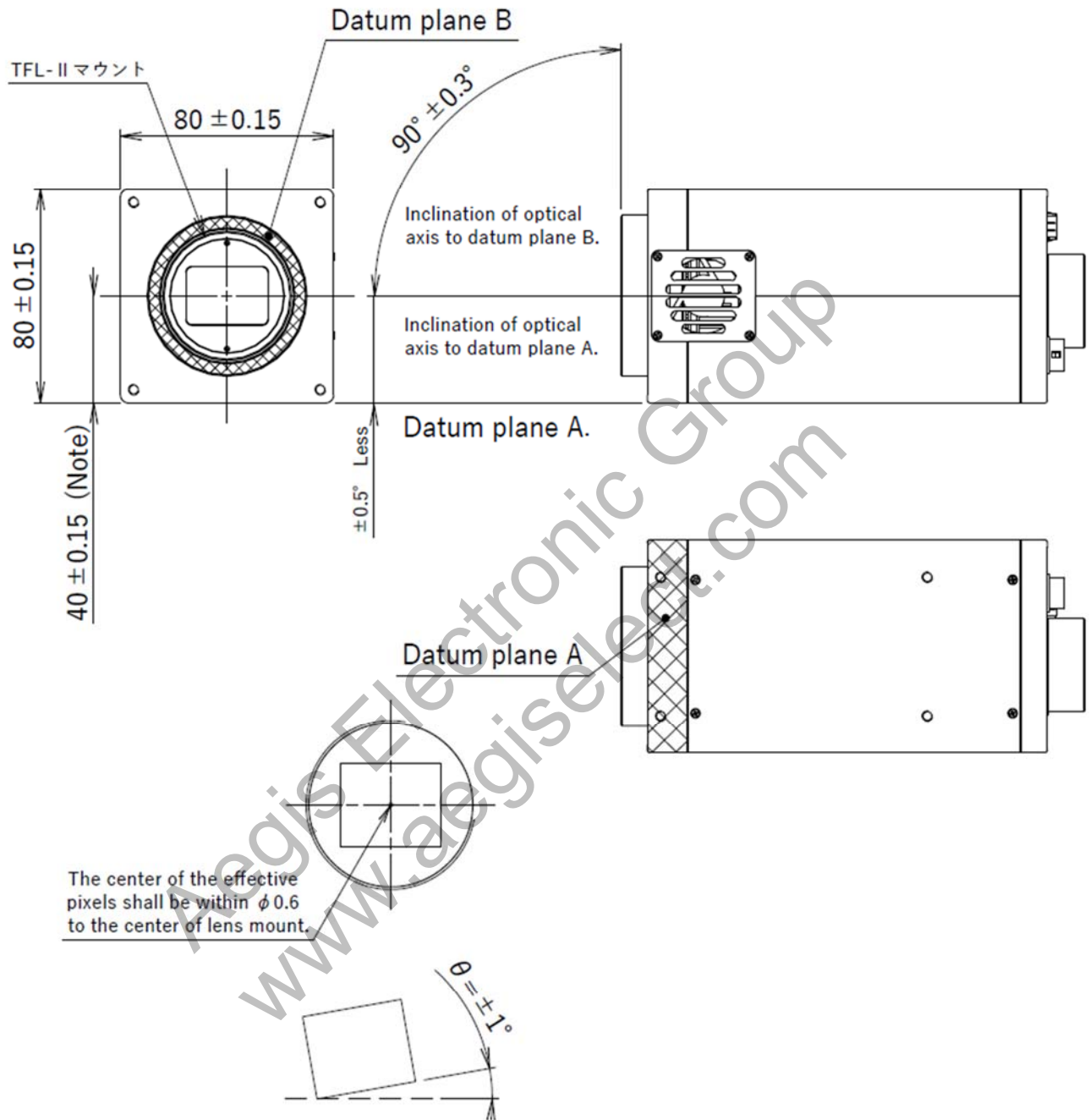
※ The values of factory settings are the same as Default of UserSetDefault.

6. Dimensions

6.1. Camera Dimensions



6.2. Optical Axis Accuracy



Inclination of effective pixels θ to datum plane A is $\theta \cong \pm 1^\circ$.

(Unit : mm)

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

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 shipment of the product. However, the number of defective pixels is 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.