See the possibilities

User Manual

AM-200GE
AB-200GE

2M Digital Progressive Scan
Monochrome and Color Camera

Document Version:1.1
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1035E-1110

Supplement

The following statement is related to the regulation on " Measures for the Administration of the control of Pollution by Electronic Information Products " , known as " China RoHS ". The table shows contained Hazardous Substances in this camera.

mark shows that the environment-friendly use period of contained Hazardous Substances is 15 years.

重要注意事项

有毒，有害物质或元素名称及含量表

根据中华人民共和国信息产业部『电子信息产品污染控制管理办法』，本产品《 有毒，有害物质或元素名称及含量表 》如下.

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PPB)	多溴二苯醚 (PBDE)
螺丝固定座	×	○	○	○	○	○
连接插头	×	○	○	○	○	○
电路板	×	○	○	○	○	○
.....	.....	.....	.....	.....	.....	.....

○: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006规定的限量要求以下。
×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006规定的限量要求。
（企业可在此处、根据实际情况对上表中打 " × " 的技术原因进行进一步说明。）

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电子信息产品中含有的有毒有害物质或元素在正常使用的条件下不会发生外泄或突变、电子信息产品用户使用该电子信息产品不会对环境造成严重污染或对基人身、财产造成严重损害的期限。

数字「15」为期限15年。

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	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PPB)	多溴二苯醚 (PBDE)
螺丝固定座	×	○	○	○	○	○
光学滤色镜	×	○	×	○	○	○
连接插头	×	○	○	○	○	○
电路板	×	○	○	○	○	○
.....	.....	.....	.....	.....	.....	.....

○: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006规定的限量要求以下。
×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006规定的限量要求。
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数字「15」为期限15年。

Notice

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Company and product names mentioned in this manual are trademarks or registered trademarks of their respective owners.

Warranty

For information about the warranty, please contact your factory representative.

Certifications

CE compliance

As defined by the Directive 2004/108/EC of the European Parliament and of the Council, EMC (Electromagnetic compatibility), JAI Ltd., Japan declares that AM-200GE and AB-200GE complies with the following provisions applying to its standards.
EN 61000-6-3 (Generic emission standard part 1)
EN 61000-6-2 (immunity)

FCC

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Warning

Changes or modifications to this unit not expressly approved by the party responsible for FCC compliance could void the user's authority to operate the equipment.

Table of Contents

JAI GigE® Vision Camera operation manuals

To understand and operate this JAI GigE® Vision camera properly, JAI provides the following manuals.

User's manual (this booklet)	Describes functions and operation of the hardware
JAI SDK & Control Tool User Guide	Describes functions and operation of the Control Tool
JAI SDK Getting Started Guide	Describes the network interface

User's manual is available at **www.jai.com**
JAI SDK & Control Tool User Guide and JAI SDK Getting Started Guide are provided with the JAI SDK which is available at **www.jai.com**.

Introduction

GigE Vision is the new standard interface using Gigabit Ethernet for machine vision applications and it was mainly set up by AIA (Automated Imaging Association) members. GigE Vision is capable of transmitting large amounts of uncompressed image data through an inexpensive general purpose LAN cable for a long distance.

GigE Vision also supports the GenICam™ standard which is mainly set up by the EMVA (European Machine Vision Association). The purpose of the GenICam standard is to provide a common program interface for various machine vision cameras. By using GenICam, cameras from different manufactures can seamlessly connect in one platform.

For details about the GigE Vision standard, please visit the AIA web site, www.machinevisiononline.org and for GenICam, the EMVA web site, www.genicam.org.

JAI GigE Vision cameras comply with both the GigE Vision standard and the GenICam standard.

Before using GigE Vision camera

All software products described in this manual pertain to the proper use of JAI GigE Vision cameras. Product names mentioned in this manual are used only for the explanation of operation. Registered trademarks or trademarks belong to their manufacturers.
To use the JAI SDK, it is necessary to accept the "Software license agreement" first.

This manual describes necessary equipment and the details of camera functions.

Software installation

The JAI GigE Vision SDK & Control Tool can be downloaded from the JAI web site at www.jai.com. The JAI SDK is available for Windows XP and Vista, 32-bit and 64-bit.
For the details of software installation, please refer to the "Getting Started Guide" supplied on the JAI SDK download page.

Camera Operation

1. General

The AB-200GE and AM-200GE comply with the GigEVision® standard and also GenICam™ with its Standard Feature Naming Convention (SFNC) ver.1.3. Functions described in this booklet are described based on this standard.For further information about the GigE Vision standard, please go to www.machinevisiononline.org and about GenICam, please go to www.genicam.org.

The AM-200GE is a 2/3 inch monochrome progressive scan CCD camera and the AB-200GE is the equivalent Bayer mosaic progressive scan CCD camera. Both have 2 million pixels resolution and utilize 2-tap output from the Kodak KAI-02050 sensor. They provide 40.6 frames per second (8-bit Mono/Bayer output) for continuous scanning with full 1600 x 1200 pixel resolution.

Both AM-200GE and AB-200GE are suitable for automated optical inspection applications, such as solid state device inspection or material surface inspection.

They incorporate various processing circuits such as LUT, FFC (Flat Field Compensation), blemish compensation and Bayer interpolation. The AM-200GE and AB-200GE work in continuous, single frame, and multi-frame modes for acquisition control together with timed and trigger width exposure controls. Both cameras also have pre-dump and PIV modes.

As an application programming interface, JAI provides an SDK (Software Development Kit). This SDK includes GigE Vision Filter Driver, JAI control tool, software documentation and code examples.
The JAI SDK can be downloaded from www.jai.com.
The latest version of this manual can be downloaded from www.jai.com
For camera revision history, please contact your local JAI distributor.

2. Camera nomenclature

The camera is available in the following versions:

AM-200GE
Where **A** stands for "Advanced" family, **M** stands for "Monochrome", 2**00** represents the resolution "2 million pixel" , 20**0** for the product dependent, and **GE** stands for "GigEVision" interface

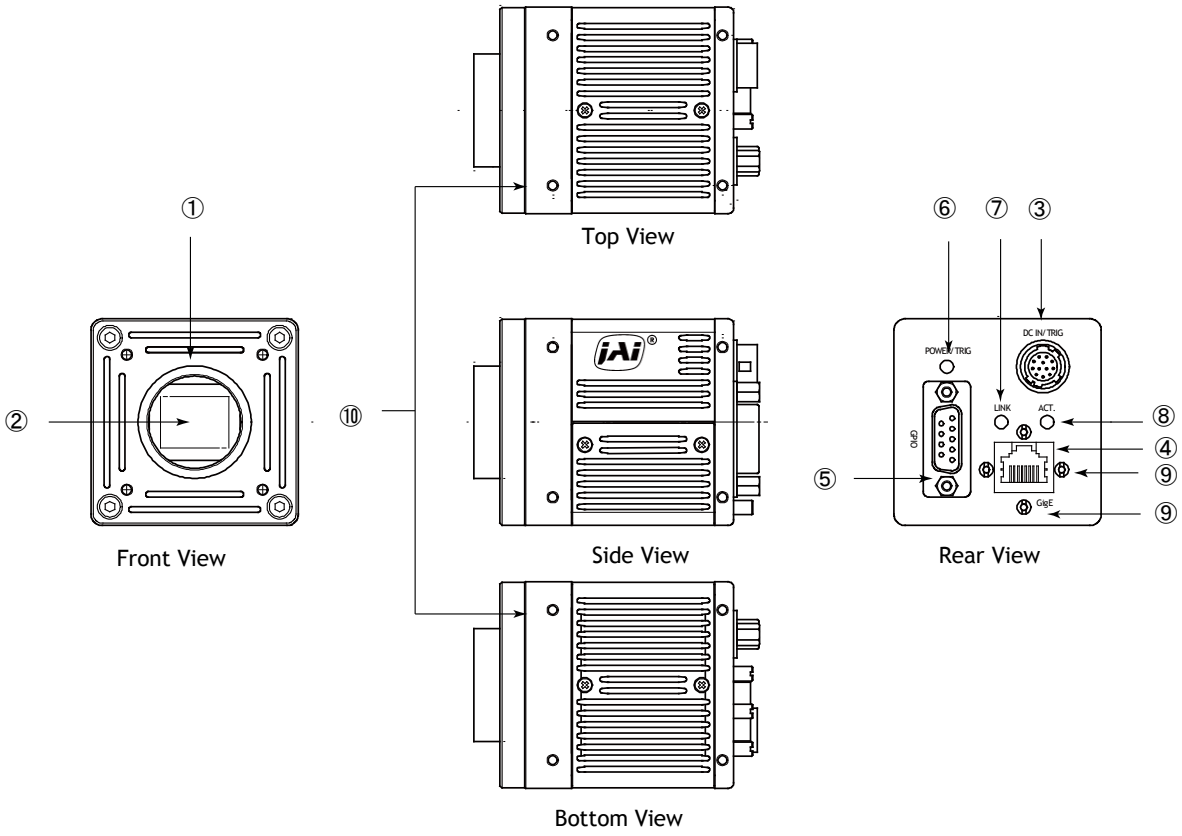
AB-200GE
Where **A** stands for "Advanced" family, **B** stands for "Bayer mosaic color", 2**00** represents the resolution "2 million pixel" , 20**0** for the product dependent, and **GE** stands for "GigEVision" interface

3. Main Features

- C3 Advanced series 2/3 ” progressive scan camera
- Monochrome and Bayer mosaic color versions
- 1600 (h) x 1200 (v) active pixels
- 5.5µm square pixels
- 57dB or more S/N for AM-200GE and 55dB or more for AB-200GE
- 8-bit, 10-bit or 12-bit output for monochrome and Bayer, or 8-bit output RGB color or YUV422 output for AB-200GE
- 40.6 frames/second with full resolution in continuous operation for monochrome or Bayer 8-bit output
- 19.2 frames/second for AB-200GE RGB output (in-camera interpolation) and 28.8 frames/second for AB-200GE YUV422 output
- Various readout modes, horizontal and vertical binning (AM-200GE only) and AOI (Area Of Interest) modes for faster frame rates
- -3dB to +24dB gain control for AM-200GE and 0dB to +24dB for AB-200GE
- 10µs (1/100,000) to 2 seconds exposure control in 1µs steps (Exposure/Timed control mode)
- Timed and trigger width for exposure control
- Pre-dump (RCT) and PIV modes for specific applications
- ALC to automatically control exposure for changing lighting conditions by combining auto gain control, auto shutter and auto iris functions
- Various pre-processing circuits are provided
  - Programmable LUT
  - Gamma correction from 0.45 to 1.0
  - Shading Correction
  - Bayer white balance with manual, one-push auto, or continuous (AB-200GE only)
  - Bayer color interpolation (AB-200GE only)
  - Blemish compensation
- Test pattern signal generator built in
- Auto iris lens video output with H-sync
- Setup by Windows XP/Vista/7 via serial communication

4. Locations and Functions

4.1. Locations and functions



1. Lens mount	Lens mount of C-mount type. *1)
2. CCD sensor	2/3 inch CCD
3. 12-pin connector	DC+12V, Trigger IN and EEN out
4. RJ-45 connector	GigE Vision interface with thumb screws
5. D-sub 9-pin connector	LVDS IN and TTL IN and OUT
6. LED	Power and trigger indications
7. LINK	Indication for Network connection
8. ACT	Indication for GigE communication
9.Holes for RJ-45 thumbscrews	Vertical type and horizontal type (*2)
10.Mounting holes	M3, max length 4.5mm (*3)

*1) Note: Rear protrusion on C-mount lens must be less than 10mm.

*2) Note: When an RJ-45 cable with thumb screws is connected to the camera, please do not excessively tighten screws by using a driver. The RJ-45 receptacle on the camera might be damaged. For security, the strength to tighten screws is less than 0.147 Newton meter (Nm). Tightening by hand is sufficient in order to achieve this.

*3) Note: The tripod adapter plate MP-41 can be used.

Fig. 1. Locations

4.2. Rear panel indicator

The rear panel mounted LED provides the following information:

- Amber : Power connected - initiating
- Steady green : Camera is operating in Continuous mode
- Flashing green : The camera is receiving external trigger

Ethernet connector indicates,

- Steady green : 1000 Base-T has been connected
- Flashing green : 100 Base/10Base have been connected (Note)
- Flashing amber : Network active in communication

Note: When 100BASE/10BASE are connected, the green is also flashing.
However, the video is not streamed through Ethernet.

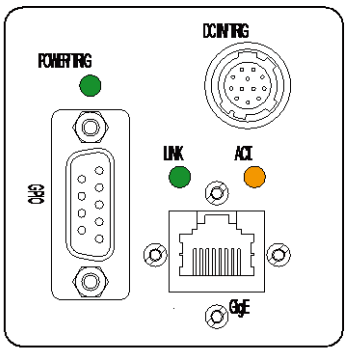


Fig.2 Rear Panel

5. Pin Assignment

5.1. 12-pin Multi-connector (DC-IN/Digital IO)

Type: HR10A-10R-12PB-01
(Hirose) male.
(Seen from rear of camera.)

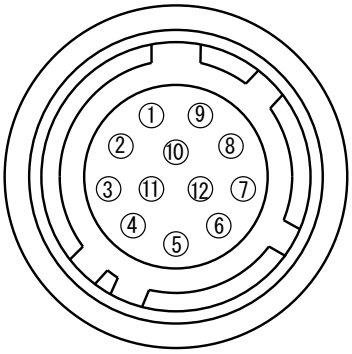
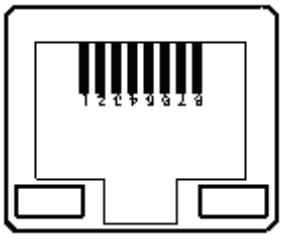


Fig. 3. 12-pin connector.

Pin no.	Signal	Remarks
1	GND	
2	DC input	+12V to +24V
3	Opt In 2(-) / GND (*1)	Line 6
4	Opt In 2 (+) / Iris video(*1)	
5	Opt In 1 (-)	Line 5
6	Opt In 1 (+)	
7	Opt Out 1 (-)-	Line 3
8	Opt Out 1 (+)	
9	Opt Out 2 (-)	Line 4
10	Opt Out 2 (+)	
11	DC input	+12V to +24V
12	GND	

*1) Default is Opt In 2. DIP switch SW901 changes to iris video output.

5.2. Digital Output Connector for Gigabit Ethernet



Type: RJ-45
HFJ11-1G02E-L21RL or equivalent

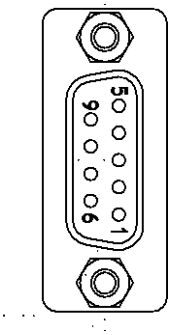
The AM-200GE AND AB-200GE cameras also accept industrial RJ-45 connectors with thumbscrews. This assures that the connector does not come undone in tough industrial environments.
Please contact the nearest JAI distributor for details on recommended industrial RJ-45 connectors.

Fig. 4. Gigabit Ethernet connector

The digital output signals follow the Gigabit Ethernet interface using RJ-45 conforming connector. The following is the pin assignment for the Gigabit Ethernet connector.

Pin No	In/Out	Name
1	In/Out	MX1+ (DA+)
2	In/Out	MX1- (DA-)
3	In/Out	MX2+ (DB+)
4	In/Out	MX3+ (DC+)
5	In/Out	MX3- (DC-)
6	In/Out	MX2- (DB-)
7	In/Out	MX4+ (DD+)
8	In/Out	MX4- (DD-)

5.3. D-Sub 9pin connector (For GPIO)



Type : DD-09SSG

Fig. 5. D Sub 9pin connector

No	I/O	Name	Note
1	I	LVDS In 1-	Line 8
2	I	LVDS In 1+	
3	I	TTL IN 1	Line 7 75ohm Termination (Note 1)
4	O	TTL Out 1	Line 1
5		GND	
6		NC	
7		NC	
8	O	TTL OUT 2	Line 2
9		GND	

Note1) Can be changed by DIP switch (SW900).

5.4. DIP switch

DIP switches are located on circuit boards. When the top cover is removed, please pay careful attention so that circuit boards are not damaged.

5.4.1 SW-900

This switch sets the 75 ohm trigger input termination to ON or OFF.
The factory default setting is OFF which is TTL level.

No	Functions	Setting	
		ON	OFF
1	**Trigger input termination**	**75 Ω**	**TTL**
2	NC		

The 75 ohm termination DIP switch is located the right side as looking from the lens when the top cover is removed.
The photo in the right shows the default setting.
In order to change to the 75 ohm termination, the switch in the front should be set downwards.

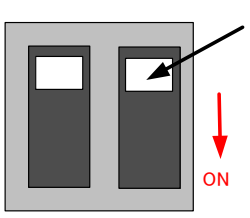
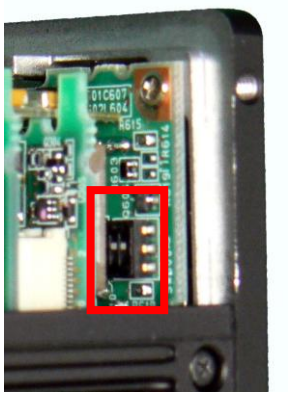


Fig.6. SW900

SW900

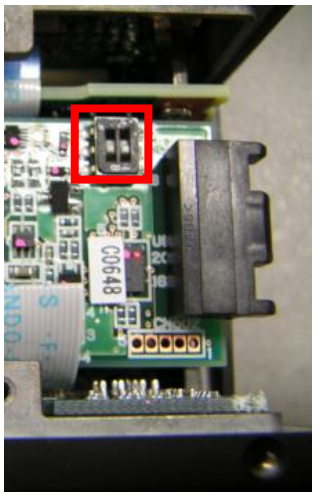


5.4.2 SW-500

This switch selects the ExposureActive signal. The factory default setting is TTL signal and it can be changed to the open collector signal.

No	Function	Setting	
		ON	OFF
	Exposure Active output select	Open Collector signal	TTL signal
2	NC	-	-

Sensor side



back side

SW500 is located in the upper board when the top cover is removed.

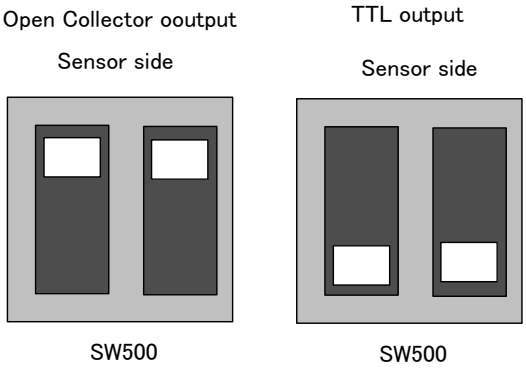
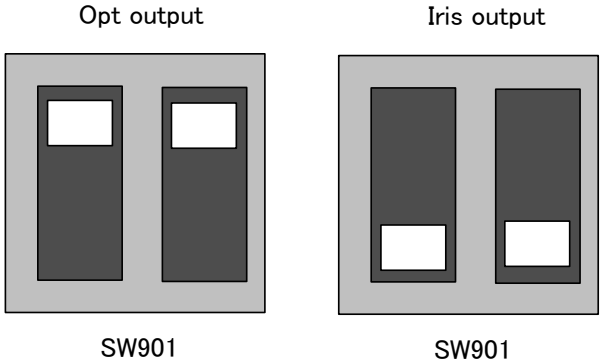


Fig. 7 SW500

5.4.3 SW-901

This DIP switch can select OPT IN or Iris video output through pin#3 and #4 of the HIROSE 12 pin connector. The default setting is OPT IN.

No	Functions	Setting	
		ON	OFF
1	OPT IN(+) / Iris video OUT select	Iris video	OPT IN (+)
2	OPT IN(-) / Iris video OUT select	GND for iris video	OPT IN (-)



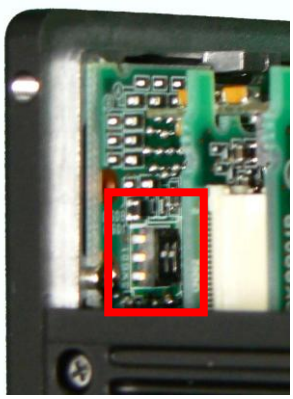


Fig.8 SW901

6. Input and output Interface

6.1. Digital Interface

In the AM-200GE AND AB-200GE, the input and output interfaces for Hirose 12P and D-Sub 9P are configured as follows.

6.1.1 LineSelector

The following input and output signals are configured on Line 1 through Line 8.

① Line 1(TTL out1)
② Line 2(TTL out2)
③ Line 3(Opt out1)
④ Line 4(Opt out2)
⑤ Line 5(Opt in1)
⑥ Line 6(Opt in2)
⑦ Line 7(TTL in1)
⑧ Line 8(LVDS in)

6.1.2 LineInverter

This function changes the polarity of the signal.

6.1.3 LineStatus

The user can ascertain the status of input and output signals.

6.1.4 LineSource

This function lets you designate the signal source to output through Line 1 to Line 4 as part of the LineSelector configuration. Each signal is selected from the following five signals.

① AcquisitionTriggerWait
② AcquisitionActive
③ FrameTriggerWait
④ FrameActive
⑤ ExposureActive
⑥ JAI_Acquisitionwait
⑦ Counter1Active
⑧ Timer1Active
⑨ UserOut0
⑩ UserOut1
⑪ UserOut2
⑫ UserOut3

6.1.5 LineMode

The current mode of signals (input or output) is displayed.

6.1.6 LineFormat

The interface of input and output circuits is displayed.

Output		Input	
TTL	Line 1	Opt	Line 5
TTL	Line 2	Opt	Line 6
Opt	Line 3	TTL	Line 7
Opt	Line 4	LVDS	Line 8

6.2. Opto-isolated Interface

The control interface of the C3 GigE Vision camera series has opto-isolated inputs and outputs, providing galvanic separation between the camera's inputs/outputs and peripheral equipment. In addition to galvanic separation, the opto-isolated inputs and outputs can cope with a wide range of voltages; the voltage range for inputs is +3.3V to +24V DC whereas outputs will handle +5V to +24V DC.
The figure at the right shows the functional principle (opto-coupler) of the opto-isolated inputs/outputs.

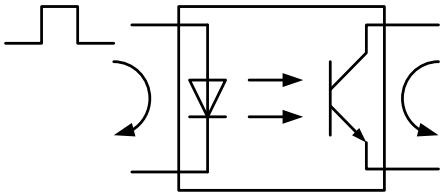


Fig.9 Opto-coupler

6.2.1 Recommended External Input circuit diagram for customer

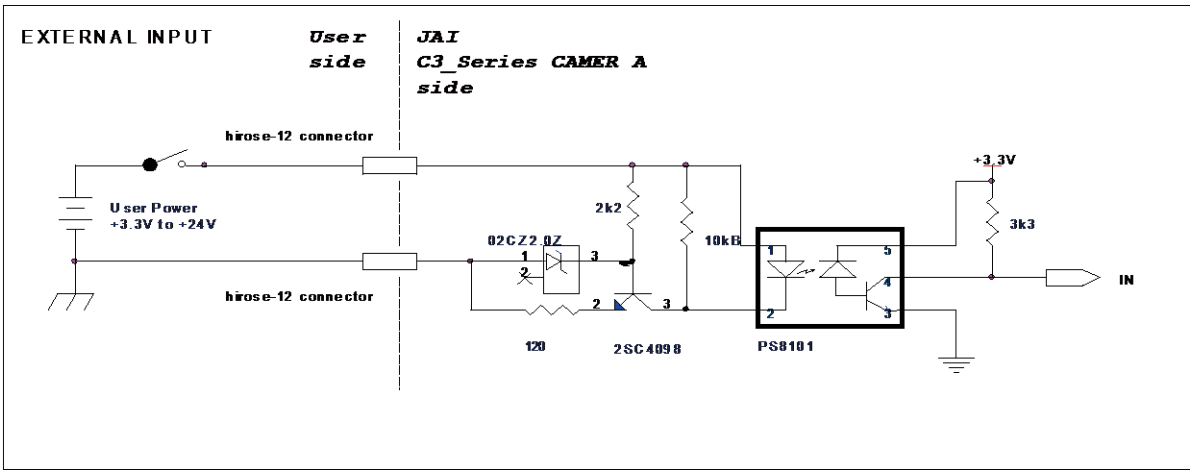


Fig.10 External Input Circuit, OPT IN 1 and 2

6.2.2 Recommended External Output circuit diagram for customer

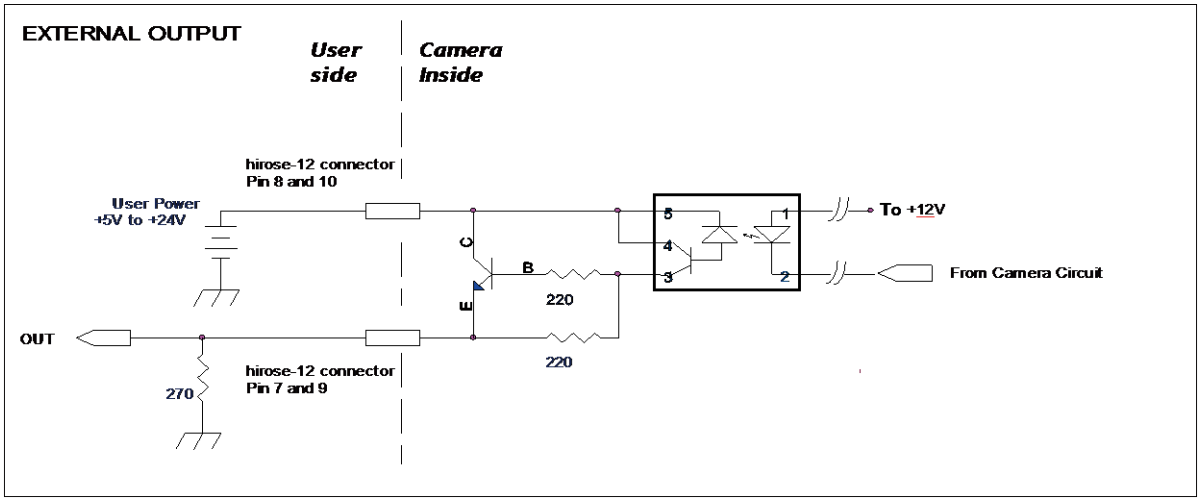
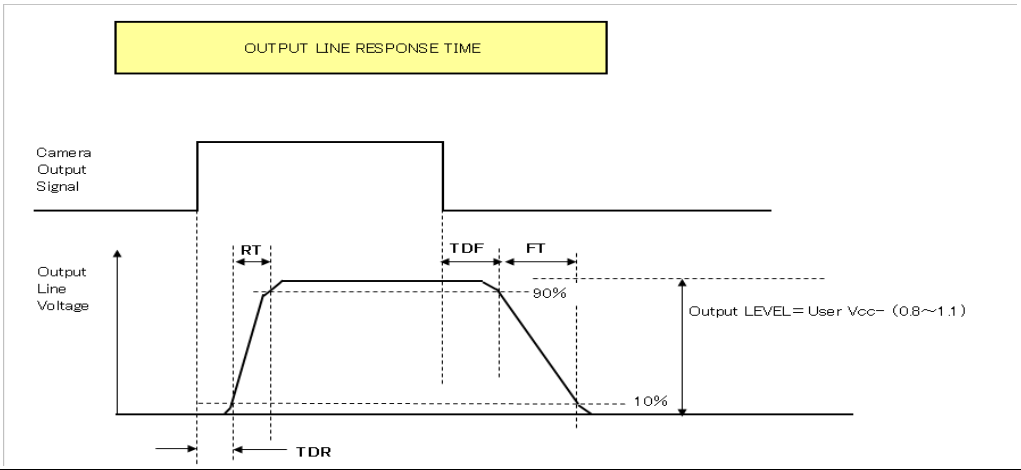


Fig.11 External Output Circuit, OPT OUT 1 and 2

6.2.3 Optical Interface Specifications

The relation of the input signal and the output signal through the optical interface is as follows.



	User Power (VCC)			
	3.3V	5V	12V	24V
Time Delay Rising TDR(μs)	0.54	0.54	0.62	0.68
Rising Time RT(μs)	1.2	1.2	2.0	3.0
Falling Delay Time FDR(μs)	1.5	1.5	2.4	2.1
Falling Time FT(μs)	3.6	3.4	4.5	6.8

Fig.12 Optical Interface Performance

6.3. Iris video output

This signal can be used for lens iris control in Continuous and pre-dump modes.
The signal is 1.0 V p-p (with H-sync) from 75 Ω without termination.

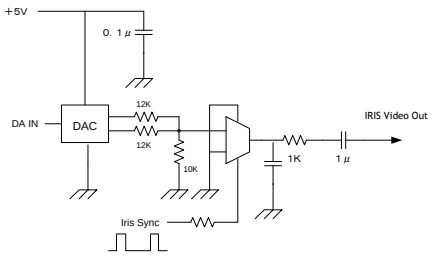


Fig. 13 Iris video output.

The iris video signal is composed to average the video level in the center area of each frame and can be output as a composite signal with H-sync. As shown in the following figure, each frame has its own video level which is averaged.

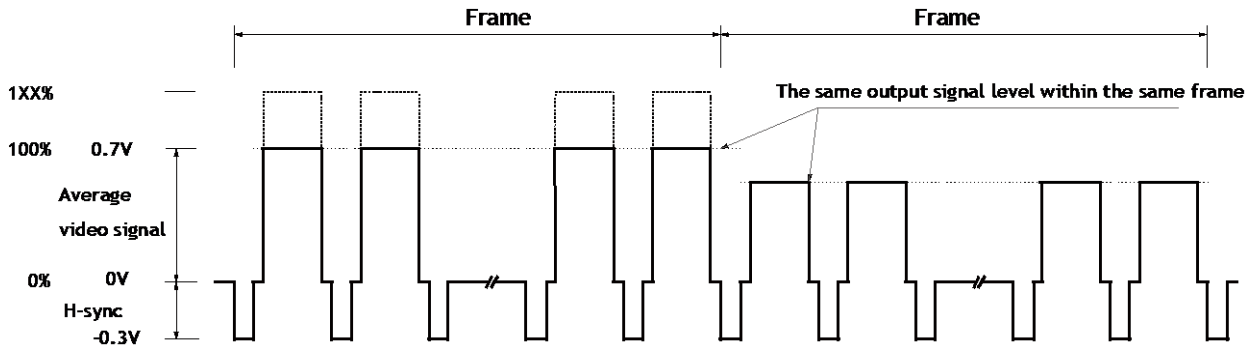


Fig.14 Iris signal details

The following parameters of this auto iris control signal output can be changed.

Auto Iris Control Signal Output:

ON : The auto iris control can be connected with AGC and ASC as ALC function

OFF : The auto iris control is not connected with AGC and ASC.

Iris Reverse Gain:

ON : The auto iris control signal is multiplied by the inverse of AFE gain (VGA gain). If ALC is used, this setting is recommended. Auto iris control signal is not affected by AGC gain.

OFF: The auto iris control signal is not multiplied by the inverse of AFE gain (VGA gain).

Iris State Control:

Video: Use the iris control in auto mode.

Close: Force the iris to close.

Open: Force the iris to open.

Iris Sync Level: Adjust the H sync level added to the video between 0 to 255.

Iris Control Gain:

0 – 255: Set a separate control gain for the auto iris control signal. If oscillation occurs when the auto iris diaphragm reaches the set point, this setting may reduce the phenomenon.

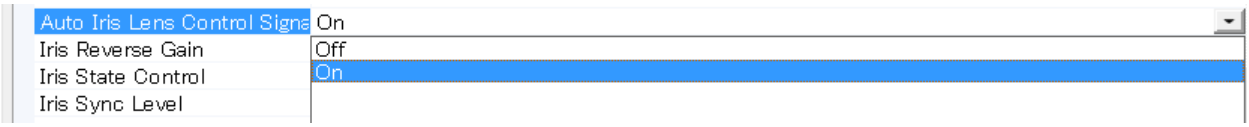
Iris Interpolate Gain (Note):

0 – 255: At frame rates below 20fps, the auto iris operation may appear “jumpy” as it rapidly moves from one level to the next.
This function prevents this so-called “hunting” phenomenon by interpolating new auto iris control levels between each frame, thereby smoothing the rate of the auto iris changes.

Iris Calculate Ratio (Note):

20 – 160: This function compensates Iris Interpolate Gain to allow for the varying diaphragm ranges of different auto iris lenses.
This can be helpful if the auto iris is not able to find the appropriate point by hunting when operating at frame rates of less than 20fps.

Note:
These interpolated controls are calculated based on the “Gain Auto Reference” value. If the system is operating with a frame rate of less than 20fps, the set point of the lens should match the value of “Gain Auto Reference”, even if ALC is being controlled by only the auto iris. Also, when using an auto iris lens with its own speed and level controls, it is recommended that these controls first be adjusted on the lens before using the camera controls above to avoid possible conflicts.



6.4. Trigger input

An external trigger input can be applied to the input selected Line Selector. The input is AC coupled. To allow long pulses the input circuit is designed as a flip-flop circuit. The leading and trailing edges of the trigger pulse activate the circuit.
The trigger polarity can be changed by Trigger Activation.
Trigger input level is 4 V ±2 V.

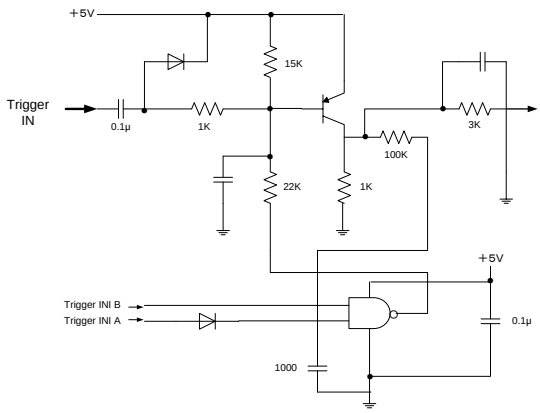


Fig.15 Trigger input circuit

Initial Trigger Activation Set:
If the TTL trigger signal is input through D-SUB 9 pin, there are several functions inside the camera using TTL. And each function has the setting of the trigger activation, the camera sets the initial processing in accordance with its priority. The initial Trigger Activation Set function, however, forces to set the input polarity after the power is ON.
Refer to 9.2.4.1 Initial Trigger Activation Set.

6.5. Exposure Active output

Exposure Active signal (positive) is found on Opt-out on Hirose 12P or TTL out on D-sub 9-pin connector. The output circuit is 75 Ω complementary emitter followers. Output level ≥3 V from 75Ω (no termination). It can be changed to the open collector signal.
When the open collector is used, the maximum current is 120mA. However, if a current of more than 50mA is flowed, it is necessary to use bigger diameter wires for connecting pins #8 and 9. If narrower-gauge wires are used, it may not work properly due to resistance issues.
This output can be changed to open collector signal by SW500.

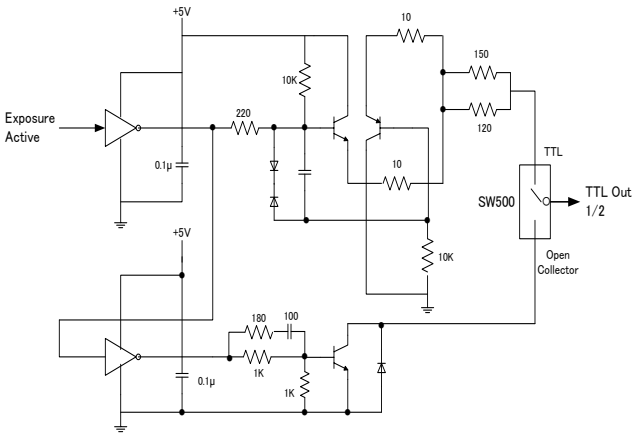


Fig.16 Exposure Active output

7. Video signal output

7.1. Video output image

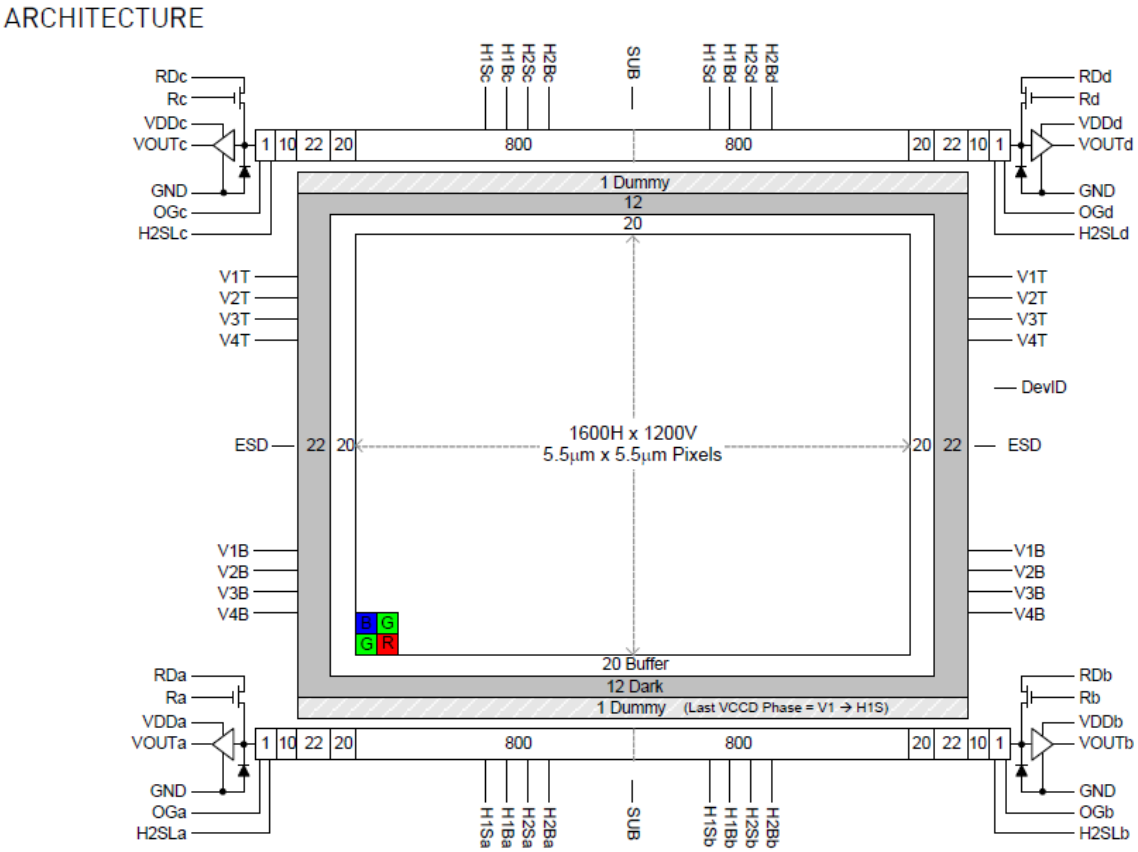


Figure 1: Block Diagram

Note: The following OB area can be transferred.
For vertical : 4 pixels for upper side
For horizontal : 16 pixels on right and left sides

Fig.17 CCD sensor layout

7.2. AOI (Area of Interest)

In the AM-200GE and AB-200GE, the output image size can be determined by setting the output area.

7.2.1 AOI parameters

In order to set the output area, 4 parameters including OffsetY, OffsetX, Width and Height should be specified.

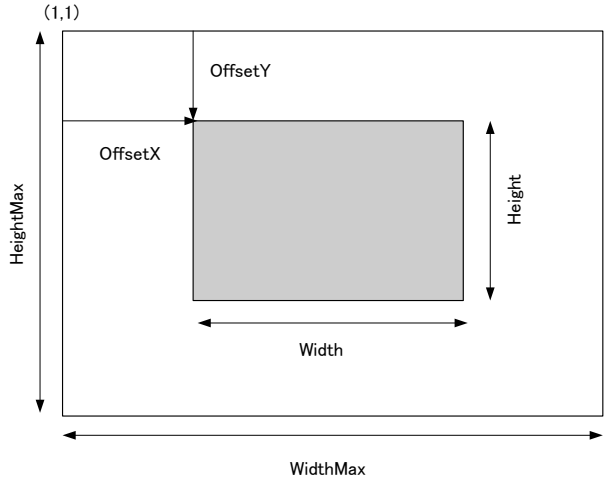


Fig.18 AOI setting

7.2.2 AOI setting details

In the AM-200GE and AB-200GE, AOI settings must consider the optical black areas when specifying the area to be transferred.

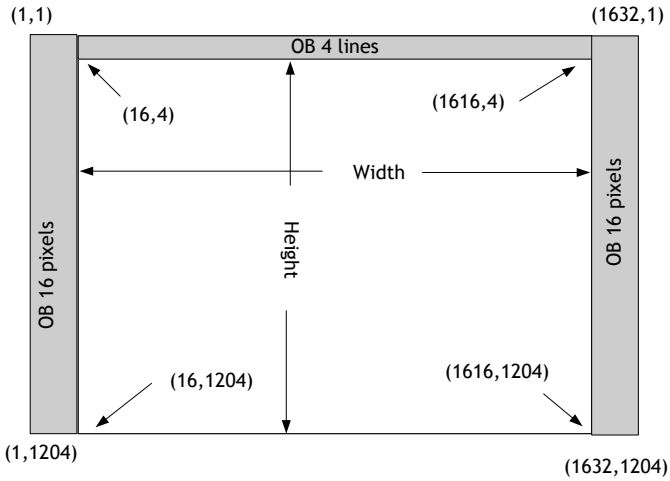


Fig.19 OB transfer

7.2.2.1 When only the image part is transmitted (OB is not transferred)

Offset X=16 (Note)
Offset Y=4
Width =1600
Height = Effective lines

Note: If the horizontal binning is x2, the value is 8.

7.2.2.2 When the full image plus the vertical OB is transmitted

Offset X=16(Note)
Offset Y=0
Width =1600
Height = Effective lines ＋4

Note: If the horizontal binning is x2, the value is 8.

7.2.2.3 When the full image plus the horizontal OB is transmitted

Offset X=0
Offset Y=4
Width =1632 (Note1)(Note2)
Height = Effective lines

Note1: When the horizontal OB is transferred, the width must be set at its maximum.
Note2: If the horizontal binning is used, the OB on both side is 8 and total 1616.

7.2.3 Frame rate calculation in the AOI mode

The frame rate in AOI mode depends on each setting of Offset, Height, Bit allocation or Binning control. In the following formula, the part labelled ($\underline{\quad}_{\text{round up}}$) has its decimal values rounded up.

7.2.3.1 Binning control setting : off or 2x1 (Binning Vertical=1)

In case of Offset Y < 4

$$\text{Frame line number} = ((1203 - (\text{Height} + (\text{Offset Y} - 4))) / 4)_{\text{rounddown}} + (\text{Height} - (4 - \text{Offset Y})) + 29$$

In case of Offset Y ≧ 4

$$\text{Frame line Number} = (\text{Offset Y} / 4)_{\text{roundup}} + ((1203 - (\text{Height} + (\text{Offset Y} - 4))) / 4)_{\text{rounddown}} + \text{Height} + 28$$

$$\text{Frame rate (Hz)} = 1 / (\text{Frame line number} \times 0.00002004)$$

Setting examples (8-bit output)

Area	Offset	Height		Frame rate (fps)
1/2	304	600	Continuous	64.05673
			Timed (EPS) (Smearless OFF)	
			Trigger Width	
1/4	454	300	Continuous	89.91026
			Timed (EPS) (Smearless OFF)	
			Trigger Width	
1/8	528	150	Continuous	112.8964
			Timed (EPS)	
			Trigger Width	

7.2.3.2 Binning control setting : 1x2 or 2x2 (Binning Vertical=2)

In case of Offset Y < 4

Frame line number = ((1203 – (((Height - (4 - Offset Y)) x 2) + ((Offset Y x 2) – 4))) / 4) $_{rounddown}$ + (Height - (4 - Offset Y)) + 24

In case of Offset Y ≧ 4

Frame line 数 = ((Offset Y / 4) x 2)$_{roundup}$ + ((1203 – ((Height x 2) + ((Offset Y x 2) - 4))) / 4) $_{rounddown}$ + Height + 22

Frame rate (Hz) = 1/ (Frame line 数 x 0.00002200)

Setting example (8-bit output)

Area	Offset	Height		Frame rate (fps)
1/2	154	300	Continuous	96.09841
			Timed (EPS) (SmearLess OFF)	
			Trigger Width	
1/4	228	150	Continuous	114.2074
			Timed (EPS) (SmearLess OFF)	
			Trigger Width	
/8	266	76	Continuous	125.9129
			Timed (EPS)	
			Trigger Width	

7.2.4 The relationship between LinePitch and Width

The setting range of LinePitch is changed according to PixelFormat setting.
LinePitch can be set as follows.

Mono8/Bayer8	: 8-1632, by 8 pixels step
Mono10/Bayer10_Packed	: 12-2448, by 12 pixels step
Mono10/12/bayer10/12	: 16-3264, by 16 pixels step
RGB8_Packed	: 24-4896, by 24 pixels step
YUV422_Packed	: 16-3264, by 16 pixels step

As for LinePitch and Width, if one is changed, the other will also be changed.
The relationship between LinePitch and width is;

Mono8/Bayer8	: Linepitch
Mono10/Bayer10_Packed	: Linepitch/1.5
Mono10/12/Bayer10/12	: Linepitch/2
RGB8_Packed	: Linepitch/3
YUV422_Packed	: Linepitch/2

7.3. In case of vertical binning and horizontal binning (Only for AM-200GE)

This function is available only for AM-200GE. In binning mode, adjacent pixels in the horizontal direction and/or vertical direction are combined and output as one pixel. The possible combinations are shown below.

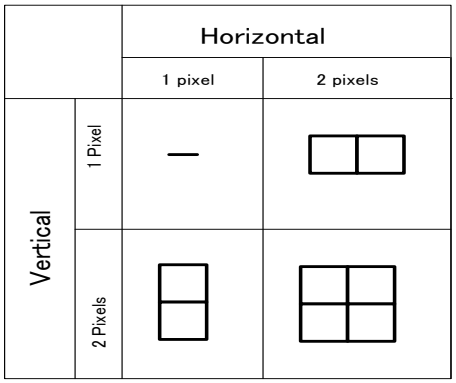


Fig. 20 Binning modes

Binning achieves a higher frame rate, as well as better sensitivity.
On the other hand, the resolution becomes less than the full frame readout.

H x V (Pixels)	Sensitivity	Spatial resolution	
		H direction	V direction
1 x 2	2 times	Unchanged	1/2
2 x 1	2 times	1/2	Unchanged
2 x 2	4 times	1/2	1/2

7.3.1 The relationship between Binning Horizontal and Width/LinePitch

If Binning Horizontal is set at 1 or 2, Width/LinePitch is changed accordingly.
Binning Horizontal = 1 Width is 1632 as the maximum
Binning Horizontal = 2 Width is 816 as the maximum

Note: If Binning Horizontal is reset to 1 after setting to 2, the maximum value is not changed. It is necessary to set manually.

7.3.2 The relationship between Binning Vertical and Height

If Binning Vertical is set at 1 or 2, Height is changed accordingly.
Binning Vertical = 1 Height is 1204 as the maximum
Binning Vertical = 2 Height is 604 as the maximum

Note: If Binning Vertical is reset to 1 after setting to 2, the maximum value is not changed. It is necessary to set manually.

7.4. Digital video output (Bit allocation)

Although the AM-200GE and AB-200GE are digital cameras, the image is generated by an analog component, the CCD sensor. The table and diagram below show the relationship between the analog CCD output level and the digital output.

CCD out			Analog Out (Equivalent)	Digital Out		
				8bit	10bit	12bit
Black		0%	Setup 3.6%, 25mV	8LSB	32LSB	128LSB
AM-200GE	350mV	100%	700mV	222LSB	890LSB	3560LSB
AB-200GE	290mV					
AM-200GE	404mV	115%	808mV	255LSB	1023LSB	4095LSB
AB-200GE	334mV					

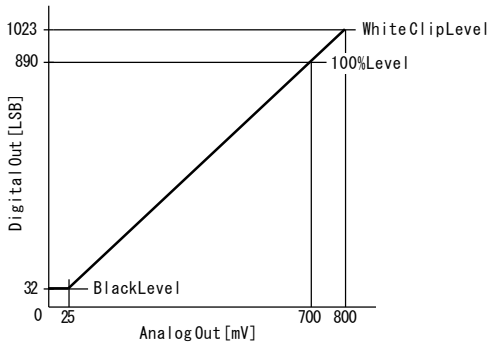


Fig.21 Bit allocation

7.5. Bayer output pattern

The AB-200GE starts with GRG on odd lines and BGB on even lines as shown below.
If AOI is used, Offset Y can be set every 2 lines and therefore, it always starts with a GRG sequence.

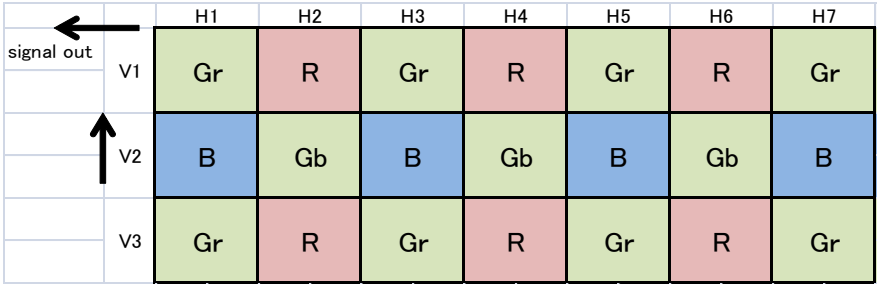


Fig. 22 Bayer sequence

7.6. Pixel format and pixel type

In the GigE Vision Interface, GVSP (GigE Vision Streaming Protocol) is used for an application layer protocol relying on the UDP transport layer protocol. It allows an application to receive image data, image information and other information from a device.
As for the sensors in the AM-200GE AND AB-200GE, the following pixel types supported by GVSP are available.
With regard to the details of GVSP, please refer to the GigE Vision Specification available from the AIA (www.machinevisiononline.org).

Model	Pixel Type supported
AM-200GE	Mono8, Mono10, Mono10_Packed, Mono 12, Mono12_Packed
AB-200GE	BayGR8, BayGR10, BayGR12, BayGR10_Packed, BayGR12_Packed,RGB8_PACKED, YUV422_PACKED

7.6.1 GVSP_PIX_MONO8 (8bit output)

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

7.6.2 GVSP_PIX_MONO10 (10bit output)

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

7.6.3 GVSP_PIX_MONO10_Packed (10bit output)

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

7.6.4 GVSP_PIX_MONO12 (12bit ourput)

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

7.6.5 GCSP_PIX_MONO12_Packed (12bit output)

Y0												Y1												Y2												Y3											
4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11	4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11

7.6.6 GCSP_PIX_BAYERGR8 (8bit output)

Odd Line

G0								R1								G2							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

Even Line

B0								G1								B2							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

7.6.7 GVSP_PIX_BAYERGR10 (10bit output)

Odd Line

G0								G0								R1								R1							
0	1	2	3	4	5	6	7	8	9	X	X	X	X	X	X	0	1	2	3	4	5	6	7	8	9	X	X	X	X	X	X

Even Line

B0								B0								G1								G1							
0	1	2	3	4	5	6	7	8	9	X	X	X	X	X	X	0	1	2	3	4	5	6	7	8	9	X	X	X	X	X	X

7.6.8 GVSP_PIX_BAYERGR10_Packed

Odd Line

G0												R1																			
2	3	4	5	6	7	8	9	0	1	X	X	0	1	X	X	2	3	4	5	6	7	8	9	2	3	4	5	6	7	8	9

Even Line

B0												G1																			
2	3	4	5	6	7	8	9	0	1	X	X	0	1	X	X	2	3	4	5	6	7	8	9	2	3	4	5	6	7	8	9

7.6.9 GVSP_PIX_BAYERGR12 (12bit output)

Odd Line

G0								G0								R1								R1							
0	1	2	3	4	5	6	7	8	9	10	11	X	X	X	X	0	1	2	3	4	5	6	7	8	9	10	11	X	X	X	X

Even Line

B0								B0								G1								G1							
0	1	2	3	4	5	6	7	8	9	10	11	X	X	X	X	0	1	2	3	4	5	6	7	8	9	10	11	X	X	X	X

7.6.10 GVSP_PIX_BAYERGR12_Packed

Odd Line

G0												R1											
4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11

Even Line

B0												G1											
4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11

7.6.11 GVSP_PIX_RGB8_PACKED (24bit) (Interpolation)

1Byte 2Byte 3Byte

R	R	R	R	R	R	R	R	G	G	G	G	G	G	G	G	B	B	B	B	B	B	B	B
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

7.6.12 GVSP_PIX_ YUV422_PACKED (16bit)

1Byte 2Byte 3Byte 4Byte

U	U	U	U	U	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	V	V	V	V	V	V	V	V	Y	Y	Y	Y	Y	Y	Y	Y
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

7.6.13 The relationship between PixelFormat and PixelSize.

The pixel format and pixel size are related and if one is changed, the other is automatically changed.

AM-200GE		AB-200GE	
Pixel format	**Pixel size**	**Pixel format**	**Pixel size**
Mono8	Bpp8	BayerGR8	Bpp8
Mono10	Bpp16	BayerGR10	Bpp16
Mono10_Packed	Bpp12	BayerGR10_Packed	Bpp12
Mono12	Bpp16	BayerGR12	Bpp16
Mono12_Packed	Bpp12	BayerGR_Packed12	Bpp12
		RGB8_PACKED	Bpp24
		YUV422_PACKED	Bpp16

7.7 YUV output

The AB-200GE has a YUV output, as well as an ordinal RGB interpolated output.
The conversion formula is as follows and cannot be controlled externally.

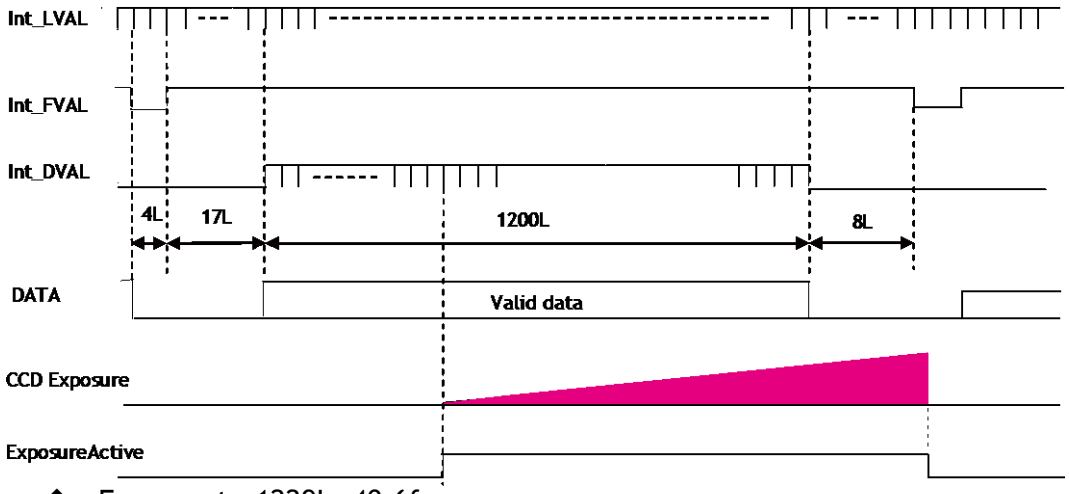
Y = 0.299*R + 0.587*G + 0.114*B
Cb = 0.5*B – 0.169*R -0.331*G +128
Cr = 0.5*R – 0.419*G – 0.0813*B + 128

While RGB output is 24-bit (8 bits per color), YUV takes advantage of the human visual system's lower acuity for color variations than for luminance.
The color information (chrominance) is sub-sampled at half the rate of the brightness component (luminance). Thus, YUV can be compressed into 16-bit output for a faster full color frame rate that is visually perceived as close to RGB, albeit with lower actual color precision.

7.8. Video output timing

7.8.1 Vertical timing (8bit, 10 bit or 12bit for Bit allocation)

7.8.1.1 If the binning control is OFF or 2x1, AOI default setting



- Frame rate:1229L, 40.6fps

Fig.23 Vertical timing (AOI default)

7.8.1.2 If the binning control is OFF or 2x1, AOI setting

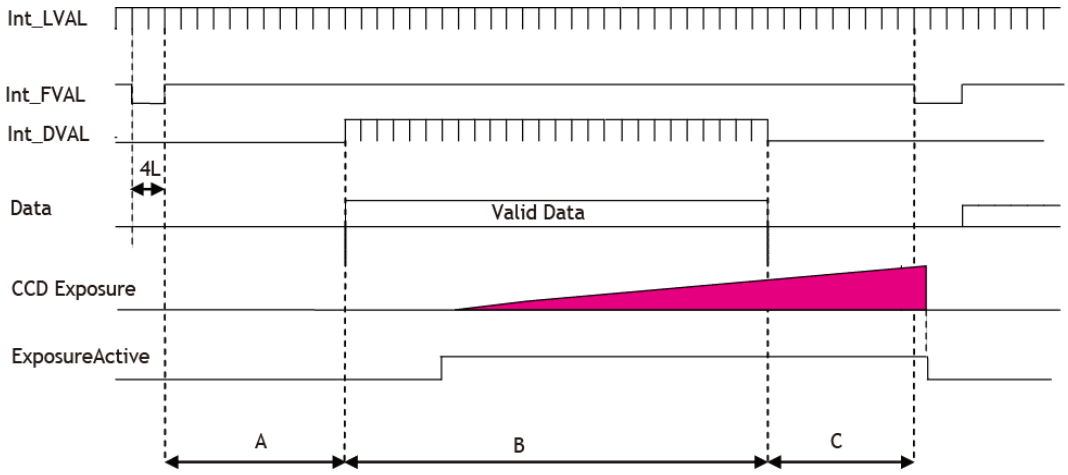
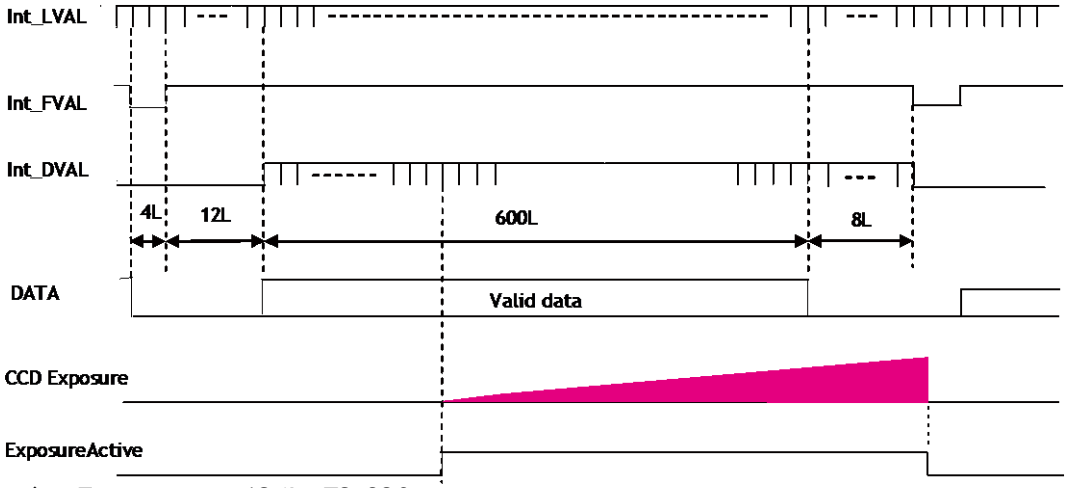


Fig.24 Vertical timing for partial scanning (AOI)

Frame rate examples when the start line and the end line are set as follows

Offset	HEGHT	A (L)	B (L)	C (L)	Total line (L)	Acquisition Frame rate (fps)
204	800	67	800	58	929	53.71388
304	600	92	600	83	779	64.05673
454	300	130	300	121	555	89.91026
528	150	148	150	140	442	112.8964

7.8.1.3 If the binning control is 1x2 or 2x2, AOI default setting



◆ Frame rate: 624L, 72.83fps

Fig.25 Vertical timing for the vertical binning

7.8.1.4 If the binning control is 1x2 or 2x2, AOI setting

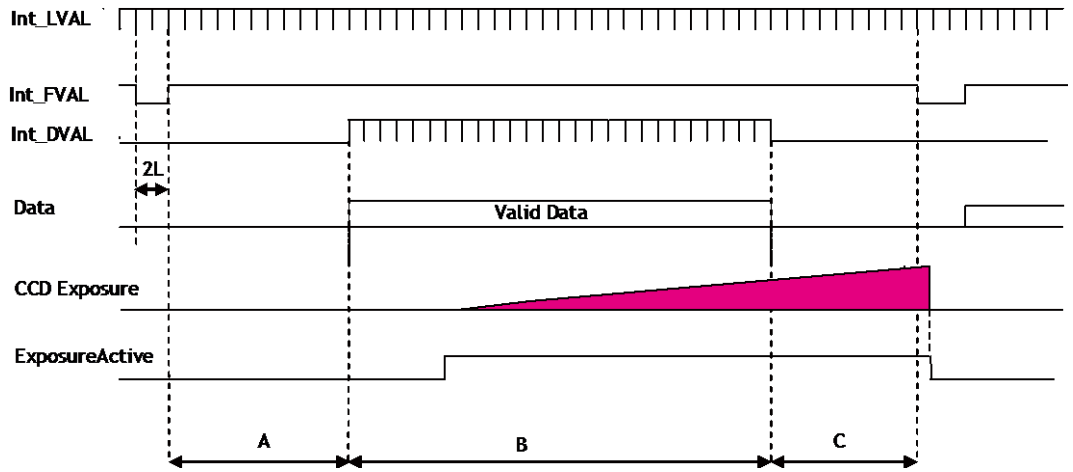
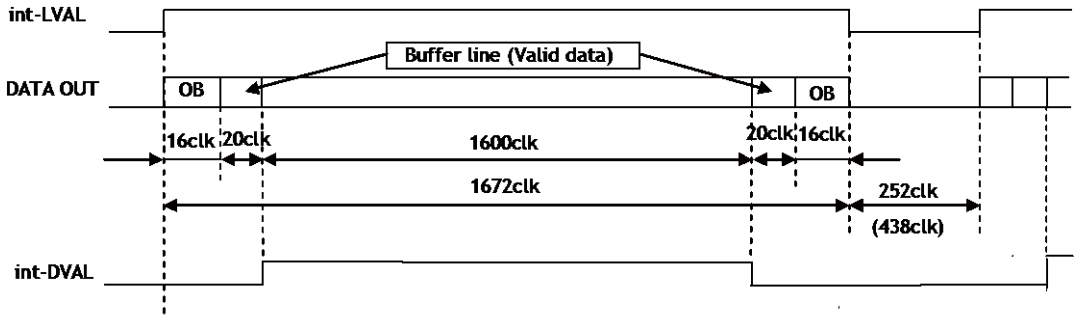


Fig.26 Vertical timing (Vertical binning, AOI setting)

Offset	HEGHT	A (L)	B (L)	C (L)	Total line (L)	Acquisition Frame rate (fps)
104	400	62	400	58	524	86.91118
154	300	87	300	83	474	96.09841
228	150	124	150	121	399	114.2074
266	76	143	76	139	362	125.9129

7.8.2 Horizontal timing

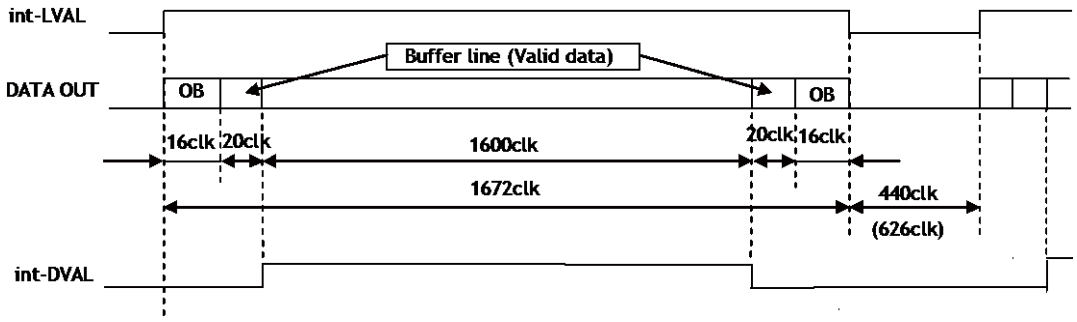
7.8.2.1 If the binning control is OFF or 2x1



1LVAL 962clk = 20.04μs 1clk=20.83ns
(Exposure start line 1LVAL 1055 clk = 21.98μs)

Fig.27 Horizontal timing (Vertical binning OFF)

7.8.2.2 If the binning control is 1x2 or 2x2



1LVAL 1056clk = 22.0μs 1clk=20.83ns

(Exposure starting line 1LVAL 1149 clk = 23.94μs)

Fig.28 Horizontal timing (Vertical binning ON)

6.4.3 DVAL output if the Binning control is set to 2=2x1 or 3=2x2

If the Binning control is set to 2=2x1 or 3=2x2, DVAL is output in one pixel period within the effective output period. Data is output by adding two pixels in horizontally as described below.

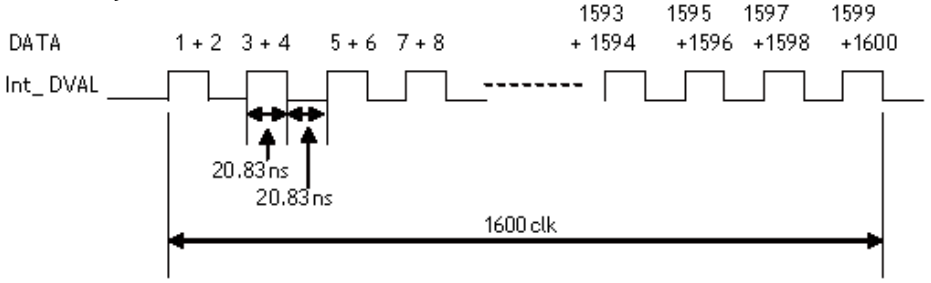


Fig.29 DVAL in the vertical binning

7.8.2.3 LVAL-LOW level period

1. When waiting for a trigger signal or at the exposure start line, LVAL-LOW period varies as shown in the following table.

Binning Control	LVAL-LOW period		LVAL cycle	
	Ordinary	Exposure start	Ordinary	Exposure start
OFF, 2x1	138clk	231clk(1st) 165clk(2nd)	962ck 20.04 us	1055ck 21.98 us
1x2, 2x2	232clk	325clk(1st) 300clk(2nd)	1056ck 22.0 us	1149ck 23.94 us

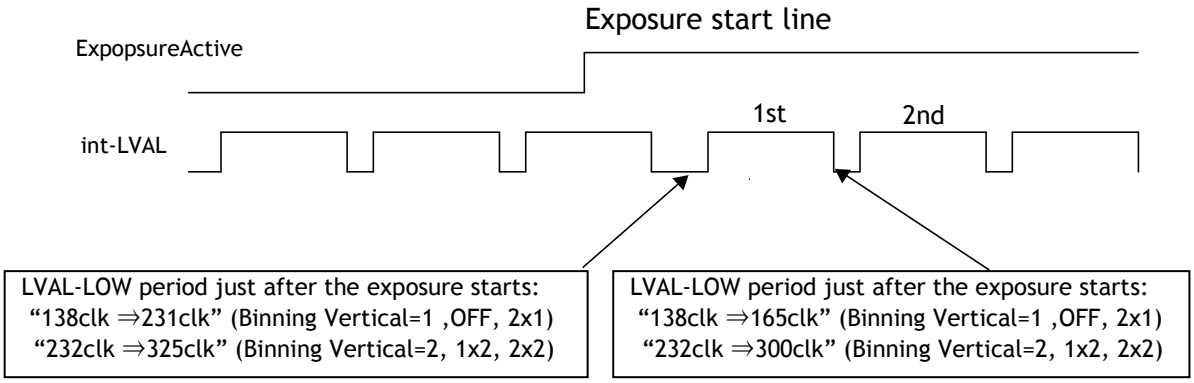


Fig.30 LVAL-LOW period varies

2. When the trigger control mode is set to ON and Overlap is set to Readout, LVAL-LOW period is 1LVAL as the maximum.

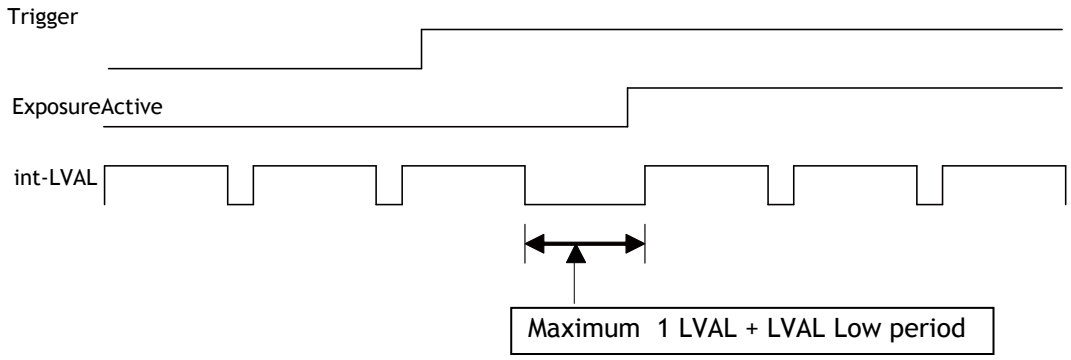


Fig.31 LVAL-LOW period if Overlap is set to Readout

8. Network configuration

➲ **For details of the network settings, please refer to the "Getting Started Guide" supplied with the JAI SDK.**

8.1. GigEVision Standard interface

The AM-200GE / AB-200GE is designed in accordance with the GigE Vision standard. Digital images are transmitted over Cat5e or Cat6 Ethernet cables. All camera functions are also controlled via the GigE Vision interface.

The camera can operate in Continuous mode, providing an endless stream of images. For capturing individual images related to a specific event, the camera can also be triggered. For precise triggering, it is recommended to use a hardware trigger applied to the Hirose 12-pin connector. It is also possible to initiate a software trigger through the GigE Vision interface. However, when using a software trigger, certain latency inherent to the GigE interface must be expected. This latency, which manifests itself as jitter, greatly depends on the general conditions and traffic on the GigE connection. The frame rate described in this manual is for the ideal case and may deteriorate depending on conditions.

When using multiple cameras (going through a switch and/or a single path) or when operating in a system with limited transmission bandwidth the Delayed Readout Mode and Inter-Packet Delay functions can be useful.

8.2. Equipment to configure the network system

8.2.1 PC

The PC used should have the following performance or better

1) Recommended CPU	: Core2 Duo 2.4GHz or better, Better than Core2 Extreme
2) Recommended memory	: 2Gbyte or more
3) Video card	: Better than PCI Express Bus Ver.1.0 x16 VRAM should be better than 256MByte, DDR2
4) Other	: The resident software should not be used

8.2.2 Cables

GigEVision configures the system by using 1000BASE-T.
In the market, CAT5e (125MHz), CAT6 (250MHz) and CAT7 (600MHz) cables are available for 1000BASE-T. There are crossover cables and straight through cables available. Currently, as most equipment
complies with Auto MDI/MDI-X, please use straight through cables. (Among crossover cables, a half crossover type exists, which the Ethernet will recognize as 100BASE-T).

8.2.3 Network card (NIC)

The network card should comply with 1000BASE-T and also have the capability of JUMBO FRAMES. When the jumbo frame size is set at a larger number, the load on the CPU will be decreased. Additionally, as the overhead of the packet is decreased, the transmission will have more redundancy.

JAI confirms the following network cards.

NIC Manufacture	Type	PCI-X Bus	PCI-Express Bus	
Intel	PRO/1000MT Server Adapter	√	–	32bit or 64bit 33/66/100/133 MHz
Intel	PRO/1000MT Dual Port Server Adapter	√	–	32bit or 64bit 33/66/100/133 MHz
Intel	PRO/1000GT Quad Port Server Adapter	√	–	32bit or 64bit 66/100/133 MHz
Intel	PRO/1000PT Server Adapter	—	√ (x1)	2.5Gbps uni-directional 5Gbps bi-directional
Intel	Pro/1000 CT Desktop adaptor	—	√ (x1)	2.5Gbps uni-directional 5Gbps bi-directional
Intel	Gigabit ET2 Quad port Server Adapter	—	√ (x4)	10Gbps uni-directional 20Gbps bi-directional
Intel	Gigabit ET Dual port Server Adapter	—	√ (x4)	10Gbps uni-directional 20Gbps bi-directional
Intel	Gigabit EF Dual port Server Adapter	—	√ (x4)	10Gbps uni-directional 20Gbps bi-directional

8.2.4 Hub

It is recommended to use the metal chassis type due to the shielding performance. As the hub has a delay in transmission, please note the latency of the unit.

8.3. Recommended Network Configurations

Although the AM-200GE and AB-200GE conforms to Gigabit Ethernet (IEEE 802.3) not all combinations of network interface cards (NICs) and switches/routers are suitable for use with the GigE Vision compliant camera.
JAI will endeavor to continuously verify these combinations, in order to give users the widest choice of GigE components for their system design.

➲ **For details of the network settings, please refer to the "Getting Started Guide" supplied with the JAI SDK.**

8.3.1 Guideline for network settings

To ensure the integrity of packets transmitted from the camera, it is recommended to follow these simple guidelines:

1. Whenever possible use a peer-to-peer network.
2. When connecting several cameras going through a network switch, make sure it is capable of handling jumbo packets and that it has sufficient memory capacity.
3. Configure inter-packet delay to avoid congestion in network switches.
4. Disable screen saver and power save functions on computers.
5. Use high performance computers with multi-CPU, hyper-thread and 64-bit CPU, etc.
6. Only use Gigabit Ethernet equipment and components together with the camera.
7. Use at least Cat5e and preferably Cat6 Ethernet cables.
8. Whenever possible, limit the camera output to 8-bit.

8.3.2 Video data rate (network bandwidth)

In the GigE Vision Interface, it is important to know the packet data volume in order to configure the system. the following table shows the reference value for each output at Normal Mode (AcquisitionMode Continuous, FrameTrigger OFF).

Model	Pixel Type	Frame Rate	Packet size (Packet size is 1500)
AM-200GE	MONO8	40.6Frame/s	663Mbps
	MONO10_PACKED MONO12_PACKED	38.4Frame/s	939Mbps
	MONO10 MONO12	28.8Frame/s	939Mbps
AB-200GE	BAYGR8	40.6Frame/s	662Mbps
	BAYGR10_PACKED BAYGR12_PACKED	38.4Frame/s	939Mbps
	BAYGR10 BAYGR12	28.8Frame/s	939Mbps
	RGB8_PACKED	14.5Frame/s	709Mbps
	YUV422Packed	28.8Frame/s	939Mbps

*1) The above data is if OB transfer mode is ON.
*2) If Jumbo Frames are not used, the frame rate except MONO8 and BAYGR8 will be reduced by maximum 2%. Depending on Pixel Type, if Jumbo frames are used, the packet size may be automatically optimized to a smaller size.

8.3.2.1 Exposure function

During sensor readout, the next exposure will start

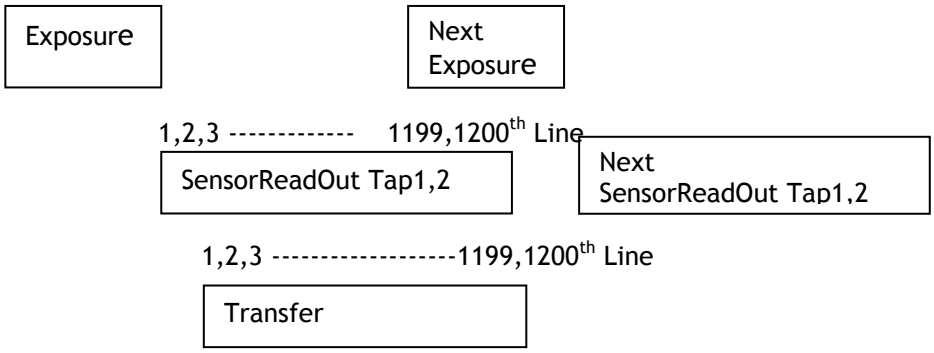


Fig. 32 Exposure behaviour

8.3.3 Note for setting packet size

The packet size is set to 1428 as the factory default. Users may enter any value for the packet size and the value will be internally adjusted to an appropriate, legal value that complies with the GenICam standard. The packet size can be modified in the GigE Vision Transport Layer Control section of the camera control tool.

Regarding data transfer rate, a larger packet size produces a slightly lower data transfer rate. The AM-200GE and AB-200GE can support a maximum of 16020 byte packets provided the NIC being used has a Jumbo Frames function with a setting of a 16020 bytes or larger.

Caution: Do not set the packet size larger than the maximum setting available in the NIC or switch to which the camera is connected . Doing so will cause output to be blocked.

The usable packet size for each output is shown in the following table.

Output	Usable packet size	
8bit	36 + 8 x n	34 ≤ n ≤ 3488
10bit_Packed, 12bit_Packed	36 + 12 x n	31 ≤ n ≤ 320
10bit,12bit	36 + 16 x n	29 ≤ n ≤ 296
RGB 8bit	36 + 24 x n	25 ≤ n ≤ 258
YUV422	36 + 16 x n	29 ≤ n ≤ 296

8.3.4 Calculation of Data Transfer Rate

In order to calculate the data transfer rate, the following parameters and formula are required.

Setting parameter

Item	Unit	Symbol
Image Width	[pixels]	A
Image Height	[pixels]	B
Bits per Pixel	[bits]	C
Frame Rate	[fps]	D
Packet Size	[Bytes]	E
Number of Packets (including Data Leader & Trailer Packet)	[packets]	G
Data Transfer Rate	[Mbit/s]	J

Fixed value

Item	Unit	value
Data Leader Packet Size	[Bytes]	90
Data Trailer Packet Size	[Bytes]	64

Formula to calculate Data Transfer Rate

$$J = \{90+64+(E+18)*(G-2)\} *8*D/1000000$$

Where, $G=ROUNDUP\{A*B*C/8/(E-36)\}+2$

The following table shows Bits per Pixel (Item C) which depends on the pixel format.

Pixel format	Bit
RGB8,bayerGR8	8
Mono10_Packed,Mono12_Packed	12
Bayer10_Packed, ayer12_Packed	12
Mono10, Mono12	16
Bayer10, Bayer12	16
RGB8_Packed	24
YUV422Packed	16

Calculation example: AM-200GE/AB-200GE Pixel type Mono/Bayer8

Item	Unit	Symbol	Setting
Image Width (Max)	[pixels]	A	1632
Image Height (Max)	[pixels]	B	1204
Bits per Pixel	[bits]	C	8
Frame Rate	[fps]	D	40.6
Packet Size	[Bytes]	E	1500
Number of Packets (including Data Leader & Trailer Packet)	[packets]	G	
Data Transfer Rate	[Mbit/s]	J	

G=ROUNDUP {(1632 x 1204 x 8 / 8 / (1500-36)) + 2 = 1343+ 2 = 1345
J={90+62+(1500+18)x(1345-2)} x 8 x 40.6 / 1000000 = 663 Mbit/s

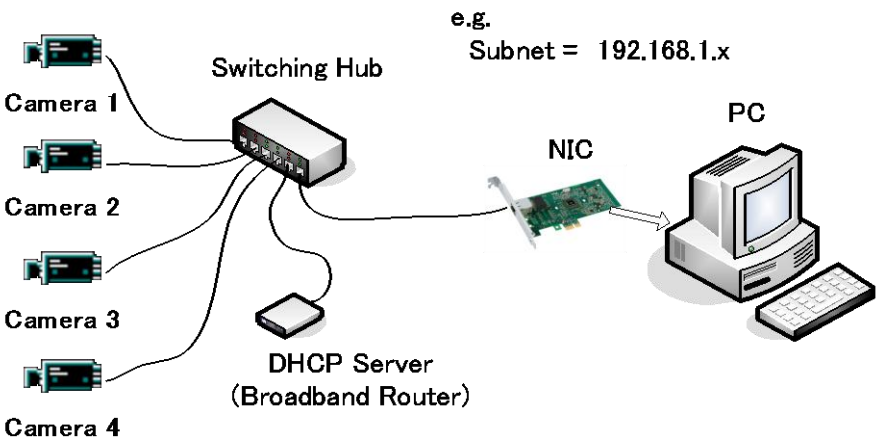
8.3.5 Simplified calculation (Approximate value)

A simple way to calculate the approximate data transfer rate is the following.
Transfer data = image width (pixel) x Image Height (pixel) x depth per pixel (depending on the pixel format) x frame rate / 1,000,000 (convert to mega bit)

In the case of the AM-200GE and AB-200GE with the full image and Mono 8bit pixel format;
The data transfer rate = 1632 x 1204 x 8 x 40.6 / 1000000 = 639 Mbit/s

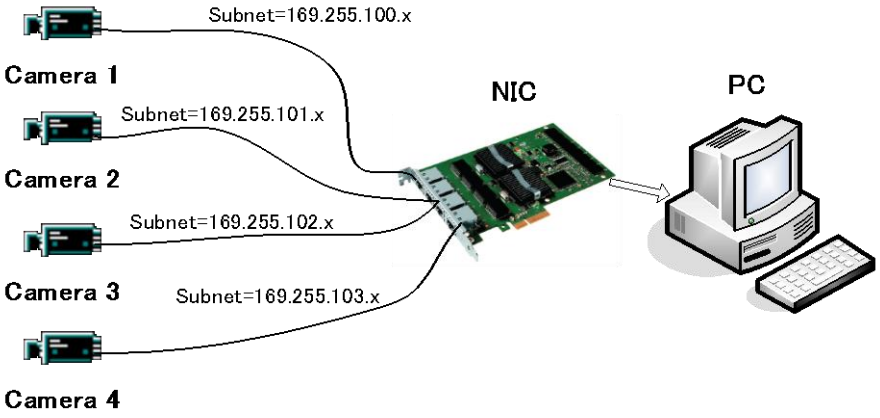
8.4. GigE camera connecting examples

8.4.1 Using a switching hub for 1 port



- All cameras and NIC belong to the same subnet
- The accumulated transfer rate for all cameras should be within 800Mbps
- The packet size and the packet delay should be set appropriately in order for the data not to overflow in the switching hub.

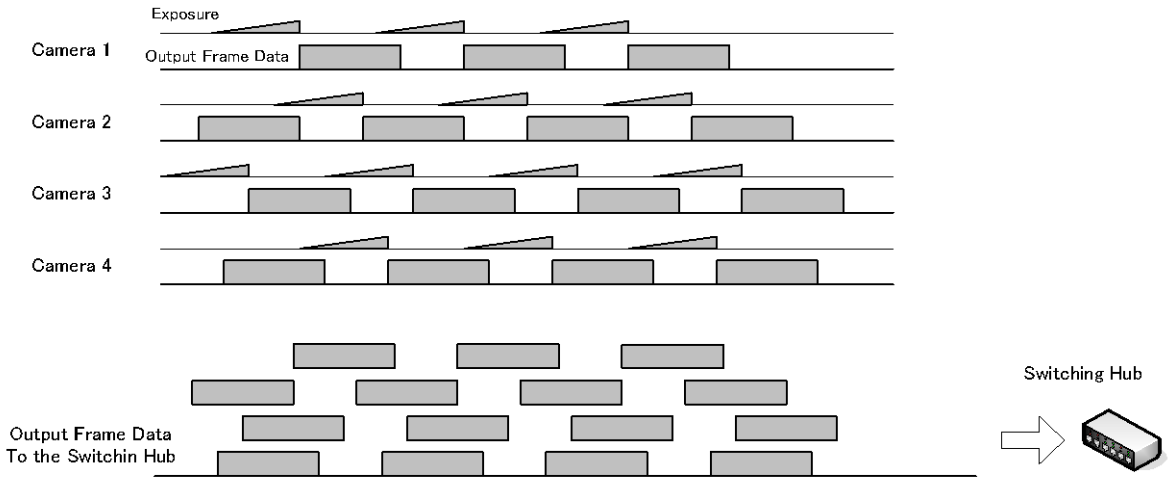
8.4.2 Connecting a camera to each port of a multi-port NIC



- This is the example for using a 4-port NIC
- The pair of the connecting camera and the NIC constructs one subnet. As for the IP configuration, it is appropriate to use the persistent IP.
- In this case, each camera can use the maximum 800Mbps band width. However, the load for the internal bus, CPU and the application software become heavy, so a powerful PC will most likely be required.

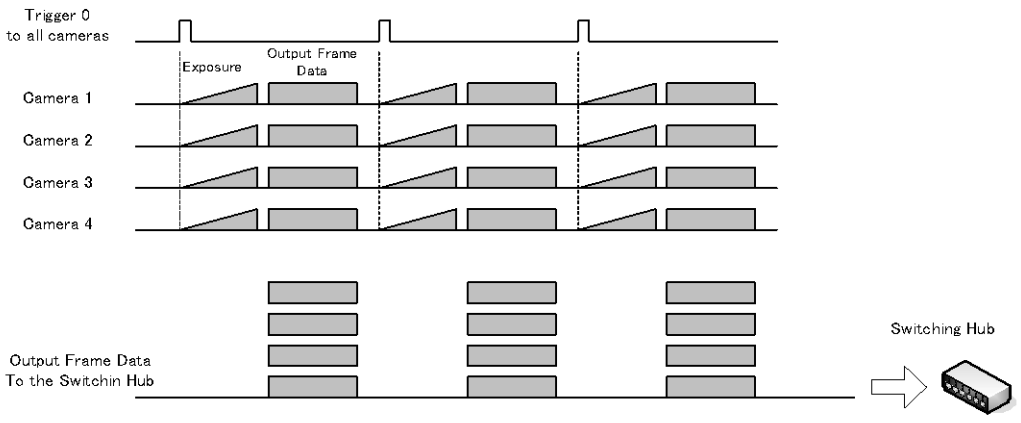
8.4.3 The data transfer for multiple cameras

8.4.3.1 If delayed readout is not used in continuous mode



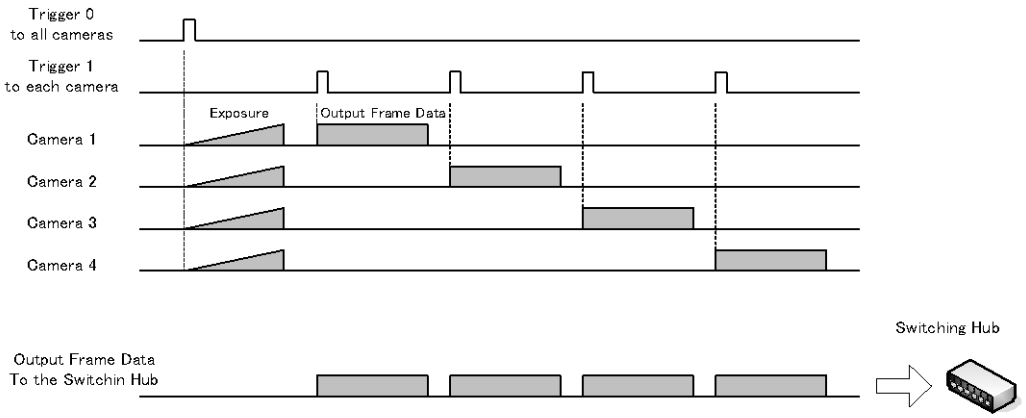
- The packet delay should be set larger. The data traffic is controlled by the buffer of the hub. It is necessary to check the buffer value of the unit.

8.4.3.2 If delayed readout is not used in trigger mode



- The packet delay should be set larger. The data traffic is controlled by the buffer of the hub. It is necessary to check the buffer value of the unit.

8.4.3.3 If delayed readout is used



- The packet delay should be set smaller, and the packet delay trigger controls the data traffic. If the camera has a pulse generator, it can control the data traffic.

9. Core functions

➲ **The function naming of the AM-200GE and AB-200GE complies with GenICam SFNC ver.1.3.**

Most of the camera's core operation is controlled by a combination of standard GenICam features related to acquisition, triggering, and exposure. Additional control is provided via built-in counter, timer, and event functions.

9.1. Acquisition function

Before using trigger and exposure controls, various acquisition controls must be set. The operation of the camera depends on the interrelationship of all three feature sets.

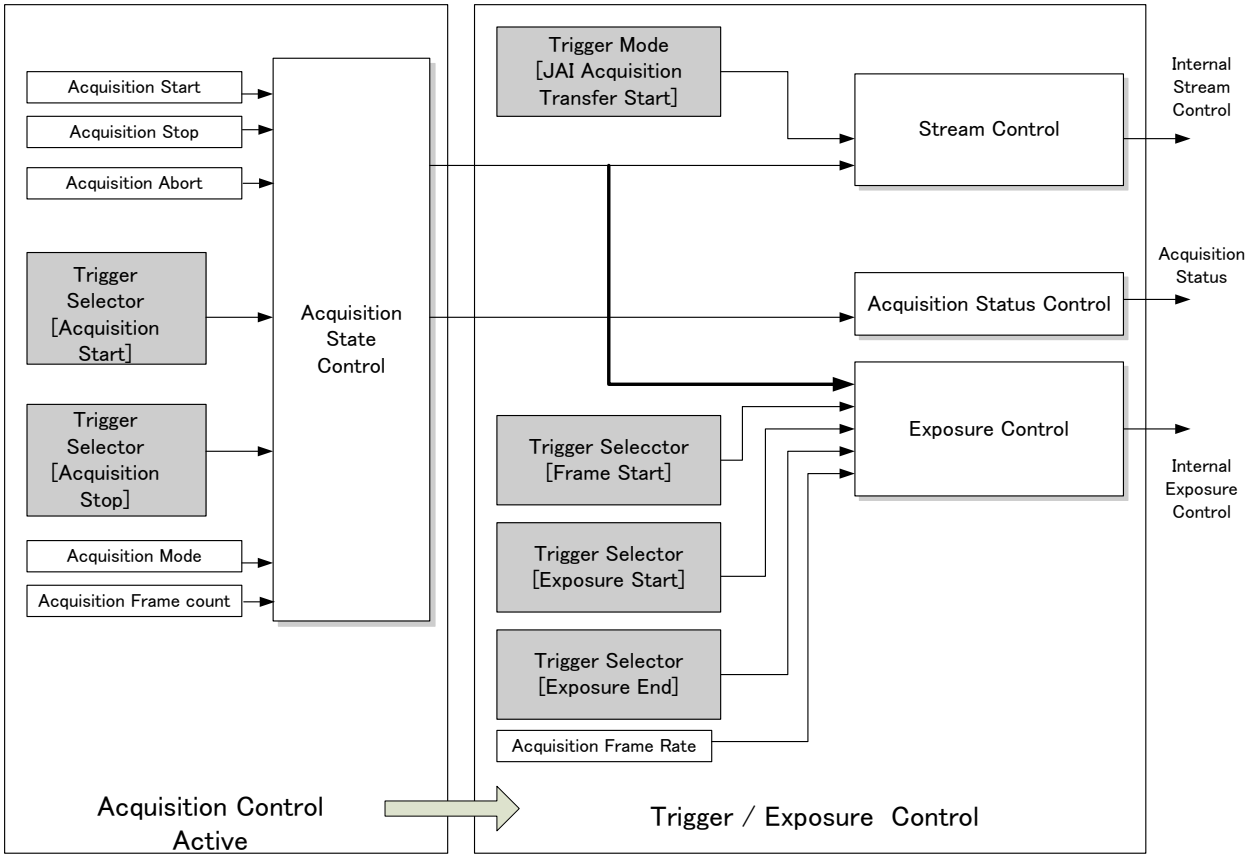


Fig.34 Acquisition control, Trigger/Exposure control work flow

9.1.1 Basic image acquisition flow

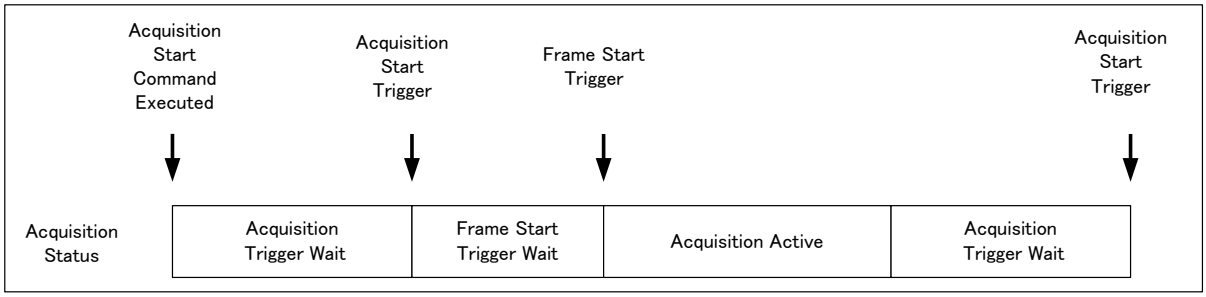
The basic commands for acquiring images are as follows:

Acquisition mode	To determine the number of the frame to be captured
Trigger Selector	
Acquisition Start Trigger	Select if the acquisition start is controlled externally
Acquisition End	Select if the acquisition end is controlled externally
Trigger Selector	
Frame start	Select if the acquisition of the frame is controlled externally.

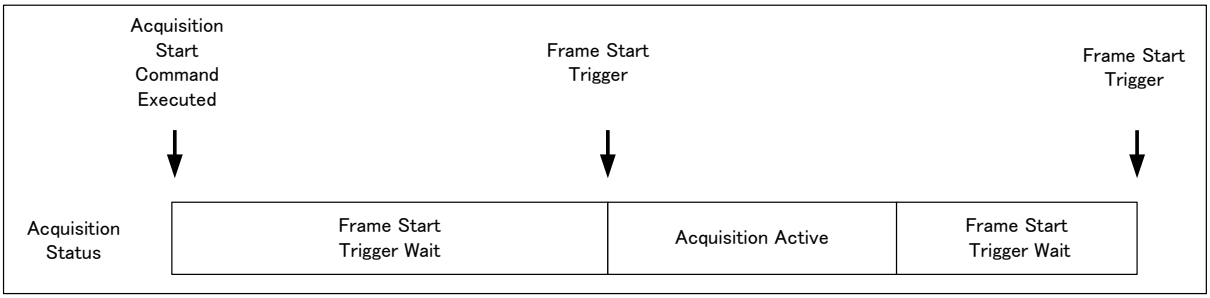
Exposure mode To set the exposure method

The flow of these commands is shown below.
The following drawings are based on the conditions that the Acquisition mode is Single and the Trigger selector is Frame Start.

If the acquisition start is set at ON (The acquisition is controlled externally)



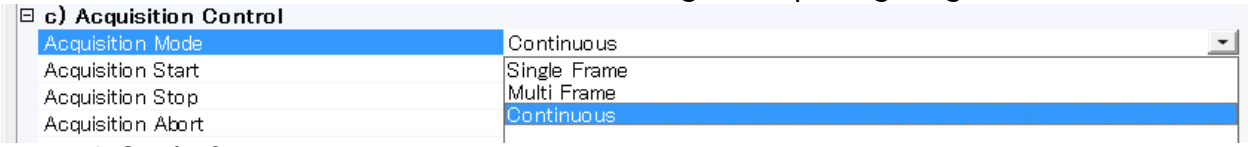
If the acquisition start is set at OFF (The acquisition is controlled internally)



The following sections provide the details for each command set.

9.1.2 Acquisition mode

The AM-200GE and AB-200GE has three settings for capturing images.



① Single frame
AcquisitionStart command outputs one frame. Then the acquisition is stopped.

② MultiFrame
AcquisitionStart command outputs frames which are set by AcquisitionFrameCount. After the set frames are output, the acquisition is stopped.

③ Continuous
AcquisitionStart command outputs frames until AcquisitionEnd is initiated.

9.1.2.1 Single Frame

In single frame mode, executing the AcquisitionStart command causes one frame to be captured. After one frame is captured, this operation is automatically stopped. In order to restart the capture, it is necessary to input the AcquisitionStart command again. BlockID is not reset until AcquisitionEnd is input and is incremented when the AcquisitionStart command is called.
In case of PIV operation, this is not working.

◆ Normal single frame operation

1) AcquisitionStart command is input
2) AcquisitionActive becomes “TRUE” (accepts capture)
3) 1 frame is output
4) AcquisitionActive becomes “FALSE” (stop capturing)

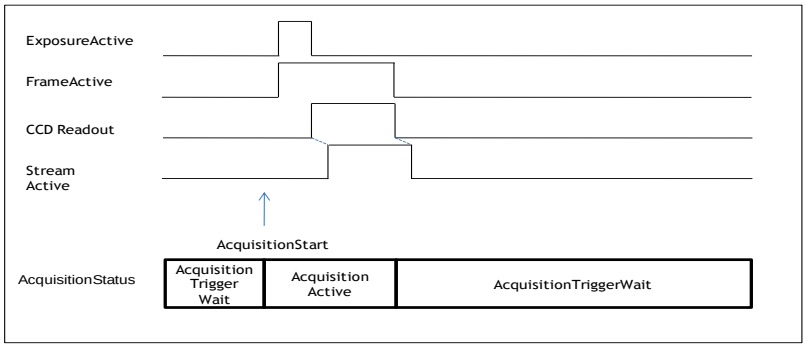


Fig.35 Single frame timing

This drawing shows a case where the trigger is “OFF”. If the trigger is ON, FrameActive becomes “TRUE” on the different timing of AcquisitionActive.

◆ Forcing acquisition to stop

While AcquisitionActive is “TRUE”, if AcquisitionEnd or AcquisitionAbort is initiated, AcquisitionActive becomes “FALSE” (stop capturing).

9.1.2.2 MultiFrame

In this mode, the AcquisitionStart command captures the number of frames which are specified by AcquisitionFrameCount. AcquisitionFrameCount can be set in the range of 1 to 255 frames. After all frames are captured , this operation is automatically stopped. In case of PIV operation, this has to be set to an even number.

◆ Normal multi-frame operation

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

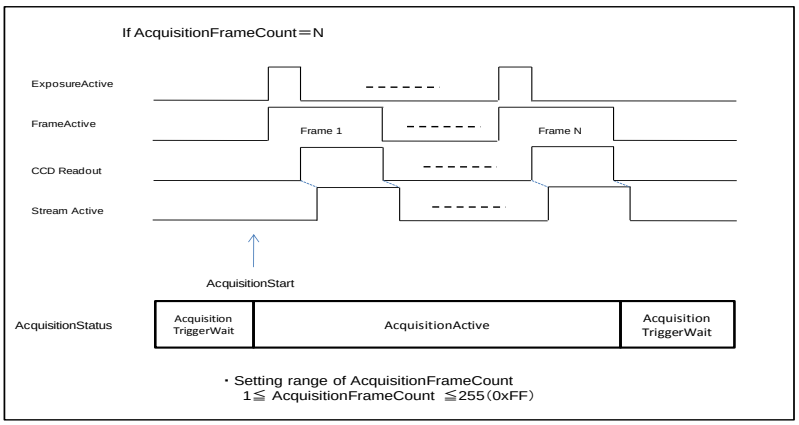


Fig.36 MultiFrame timing

This diagram shows a case where the trigger is “ON”. If the trigger is OFF, FrameActive becomes “TRUE” at the same timing as AcquisitionActive.

◆ Forcing acquisition to stop

While AcquisitionActive is “TRUE”, if AcquisitionEnd or AcquisitionAbort is initiated, AcquisitionActive becomes “FALSE” (stop capturing).
Once the operation is set to “FALSE”, the internal FrameCount is reset.

9.1.2.3 Continuous mode

In this mode, when the AcquisitionStart command is set, the image is continuously output at the current frame rate. This is the default setting for the AM-200GE and AB-200GE.

1) AcquisitionStart command is input
2) AcquisitionTriggerWait becomes effective
3) AcquisitionActive becomes “TRUE”
4) Images begin outputting continuously
5) AcquisitionEnd command is sent
6) AcquisitionActive becomes “FALSE”. At this moment, the output stops.

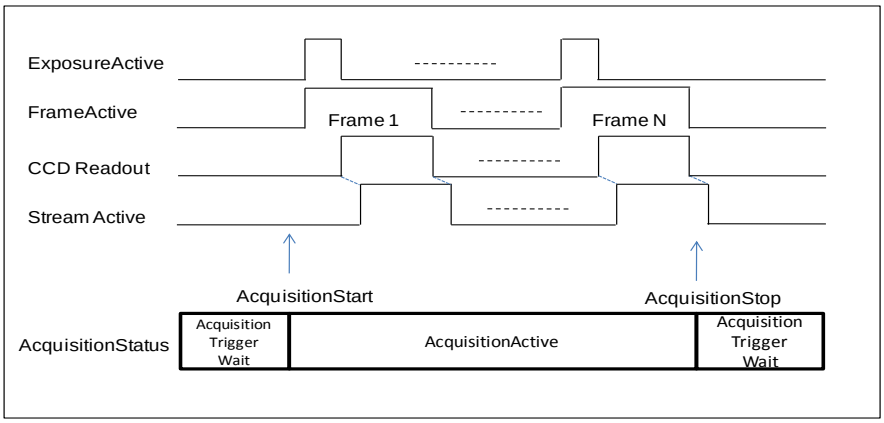


Fig.37 Continuous timing

This drawing shows a case where the trigger is “ON”. If the trigger is OFF, FrameActive becomes “TRUE” at the same timing as AcquisitionActive.

9.1.3 AcquisitionAbort

AcquisitionAbort forces capture to stop if the AcquisitionAbort command is set while AcquisitionTriggerWait is effective or during exposure. The exact behaviour depends on the status of acquisition and readout:

Condition 1 - While reading out from CCD:
CCD readout and streaming continue. After they are completed, AcquisitionActive becomes “FALSE” (stop capturing).
At this moment, if AcquisitionStart is set, restart the capturing.

Condition 2 – Acquisition is active, but CCD readout is not yet initiated:
After the exposure is completed, the output is not initiated.
AcquisitionActive becomes “FALSE”.

Condition 3 - Awaiting a trigger:
AcquisitionActive immediately becomes "FALSE" (capturing is not possible).

9.1.4 AcquisitionFrameCount

If Acquisition Mode is set to MultiFrame, AcquisitionFrameCount can set the number of frames to be captured each time the AcqusitionStart command is input.
Setting range is 1 to 255 frames.

9.1.5 AcquisitionFrameRate

Please also refer to the chapter 7.2.3 Frame rate calculation in the AOI mode.

1) In the trigger OFF mode (self-running mode), it is possible to set the exposure period longer than the number of lines required for CCD drive in the designated area of interest (AOI).
2) The number of lines set by AcquisitionFrameRate determines the frame period.
3) The range of lines which can be set by AcquisitionFrameRate is the shortest period to 0.5 seconds. The shortest period is dictated by the number of lines required for the desired AOI readout.
4) AcquisitionFrameRate cannot be used if the trigger mode is ON.
5) If the exposure time is longer than the frame rate, the exposure time has priority and the frame rate might be reduced.

9.1.6 AcquisitionStatus

AcquisitionStatus can show the operating status of the following signals set by AcquisitionStatusSelector.
Each function is:

AcquisitionTriggerWait :	Effective if waiting for a trigger
AcquisitionActive :	Effective if capture is allowed
AcquisitionTransfer :	Effective while the data is transferring
FrameTriggerWait :	Effective if waiting for FrameTrigger
FrameActive :	Effective during FrameEffective period
FrameTransfer :	Effective while the data is transferring
ExposureActive :	The longest exposure period is provided if R, G and B channel exposure times are different.
JAIAcquisitionWait:	When the status of the stream becomes waiting, then it becomes active.

The following diagrams show different scenarios for Exposure Mode and Trigger Mode and their effect on AcquisitionStatus.

① **If ExposureMode=OFF**

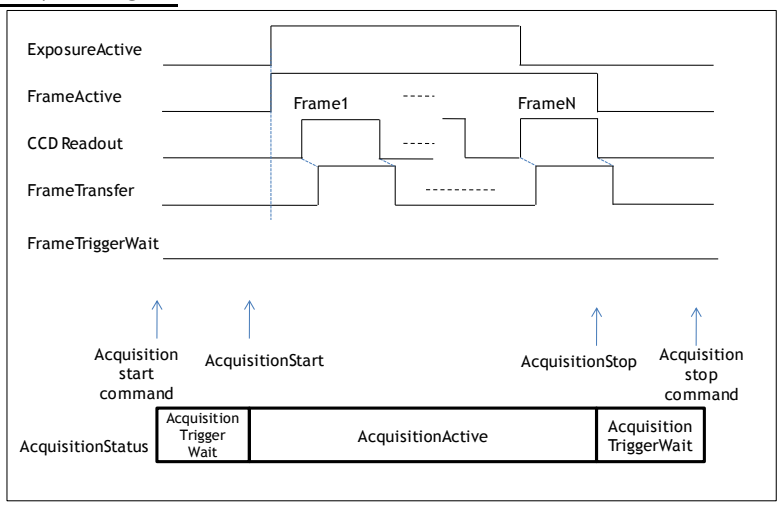


Fig.38 Acqusition Status

② **If ExposureMode=On, Trigger Mode=OFF**

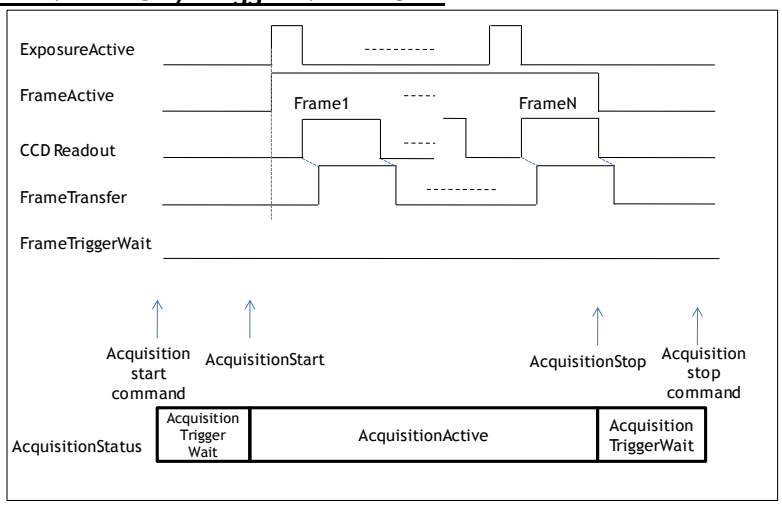


Fig.39 Acquisition Status

③ **If ExposureMode=On, Trigger Mode =ON**

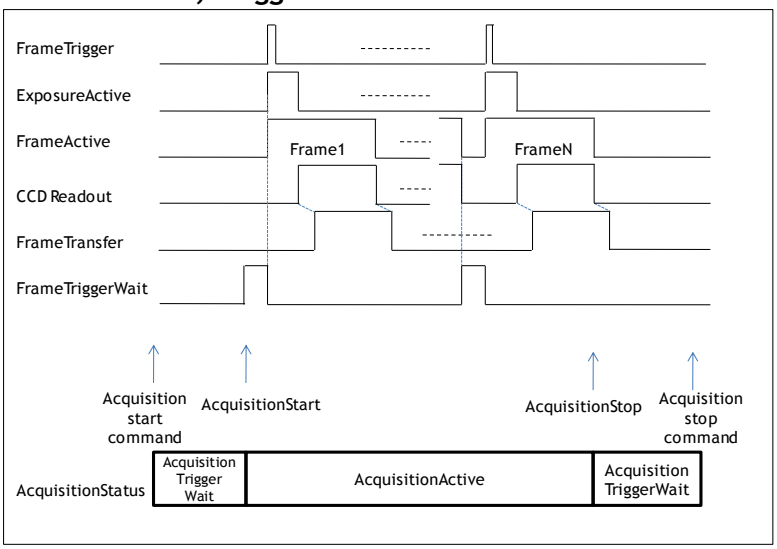
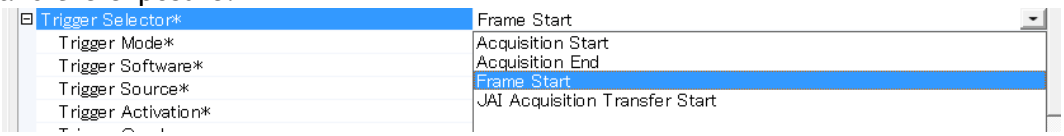


Fig.40 Acqusiition Status

9.2. Trigger Control

9.2.1 TriggerSelector(TriggerMode)

This is the function to set the trigger operation. This will set how to control the output and the exposure.



Acquisition Start	Acquisition	Set the capture start externally
Acquisition End	Acquisition	Set the capture stop externally
Frame Start	Trigger	Set the frame start externally
JAI Acquisition Transfer Start	Stream	Set the stream start externally

9.2.1.1 Acquisition

This is the trigger function to control the output. This controls AcquisitionStart and AcquisitionEnd. A description of the configuration process is as follows:

◆ AcquisitionStart trigger: Set whether the capture start is to be controlled externally or not.

TriggerMode On : After AcquisitionStart command is input, input the signal selected by AcquisitionStart trigger as the trigger, and make AcquisitionActive effective.

TriggerMode Off : AcquisitionStart command is input. It makes AcquisitionActive effective regardless of AcquisitionStart trigger.

◆ AcquisitionEnd trigger: Set whether the end of the capture is to be controlled externally or not.

TriggerMode On : While AcquisitionActive is effective, input the signal selected by AcquisitionEnd as the trigger, and make AcquisitionActive invalid.

TriggerMode Off : AcquisitionStart command is input. It makes AcquisitionActive invalid regardless of the trigger source.

Note: Refer also to section 9.1.1

9.2.1.2 Exposure

These commands are used for setting the exposure control.
FrameStart is used for trigger input.
If ExposureMode is set to Timed or TriggerWidth except OFF, the combination of the ExposureMode setting and FrameStart setting will determine the type of exposure and whether triggering is OFF or ON.
The following table shows the combination and the operation.

TriggerSelector / ExposureMode	Frame Start	Operation	Previous JAI trigger name (for reference)
OFF	OFF or ON	Trig OFF(Free run) No Exposure Control	Trigger OFF
Timed	OFF	Trig OFF(Free run) Exposure Control Is possible	Trigger OFF
	ON	Trig On	EPS
TriggerWidth	OFF	Trig OFF(Free run) No Exposure Control	Trigger OFF
	ON	Trig On	PWC

◆ FrameStart trigger : Set whether the start of the frame is to be controlled externally or not.

TriggerMode On : While AcquisitionActive is effective and ExposureMode is set at Timed or TriggerWidth, start exposure using the signal selected by FrameStart trigger.

TriggerMode Off : While AcquisitionActive is effective, self-running operation takes place.

9.2.1.3 Stream control

The signal readout from the CCD can be stored in the frame memory and the stream control determines the timing of the readout as the stream. This can be compared to delayed readout in the previous model.

◆ JAI Acquisition Transfer Start: Set the start of the stream externally.

Trigger Mode ON : When AcquisitionActive is active, the stream is output by JAI Acquisition Transfer Start.

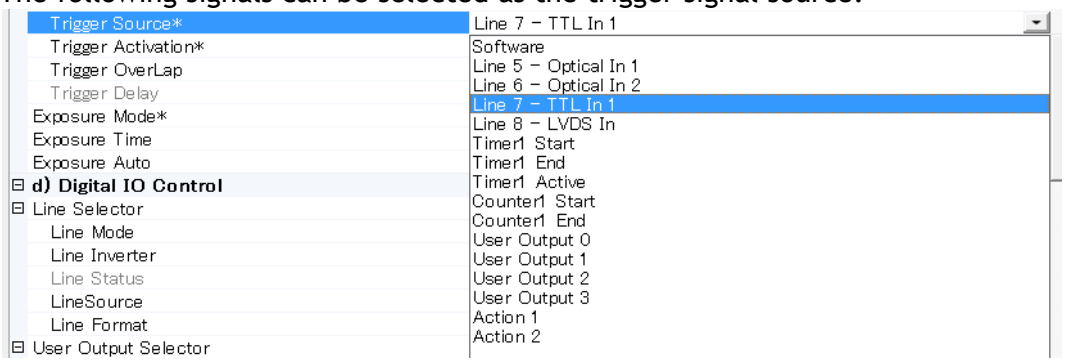
Trigger Mode OFF: If AcquisitionActive is active status, the stream can be output.

9.2.2 Triggersoftware

This is one of the trigger sources and is the software trigger command.
This has one command signal to each of the 6 items of TriggerSelector.
To use this function, TriggerSource must be set at TriggerSoftware.

9.2.3 Triggersource

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



9.2.4 TriggerActivation

This determines the behaviour of the trigger.

RisingEdge : Initiate at the signal rising edge
FallingEdge : Initiate at the signal falling edge
LevelHigh : Initiate during the signal high level
LevelLow : Initiate during the signal low level

Note: When TriggerWidth is used, TriggerActivation should be set at either LevelHigh or LevelLow.

	RisingEdge	FallingEdge	LevelHigh	LevelLow
Timed	○	○	×	×
TrigegrWidth	×	×	○	○
Timed-JAI PIV	○	○	×	×
Timed-JAI Pre-Dump	○	○	×	×

9.2.4.1 Initial Trigger Activation Set

The hardware used as TTL input through D-SUB 9 pin for GPIO, is designed as the circuit to minimize the influence of noise. Therefore, the input polarity is set at either Hi-Active or Low-Active and on every time if High or Low is selected, the input polarity is automatically changed. However, just after the power is ON, it is not possible to recognize the initial status on TTL signal, it is determined by the trigger activation setting of function used TTL signal and initialized accordingly.
However, as there are several functions used TTL signal and each has own trigger activation setting, the camera initializes according to its priority.
The initial Trigger Activation Set function forces to set the input polarity after the power is ON and the user can always use the fixed setting regardless of its priority.
The following is the selection.

Hi-Active: At the first time if the power is ON, detect the "LOW to HIGH" of the TTL input.
Low-Active: At the first time if the power is ON, detect the "HIGH to LOW" of the TTL input.
Auto(Default): At the first time if the power is ON, use the trigger activation setting of the first priority function.

The following table shows the priority of the trigger activation at AUTO setting.

Priority	Function
1	Acquisition Start Trigger
2	Acquisition End Trigger
3	Frame Start Trigger
4	JAI Acquisition Transfer Start
5	Timer Trigger Source(Timer1)
6	Counter Trigger Source(Counter1)
7	Counter Event Source(Counter1)
8	Counter Reset Source(Counter1)

9.2.5 TriggerOverlap

This function is used to set whether the trigger can be accepted during the data readout in cases where FrameStart trigger or ExposureStart trigger are "ON".

OFF: While the CCD reads out the data, the trigger cannot be accepted. This works as LVAL asynchronous operation.

ReadOut: While the CCD reads out the data, the trigger can be accepted. In this mode, if the trigger is input during CCD readout, it works as LVAL synchronous and if the trigger is input while the CCD is not reading out, it works as LVAL asynchronous. This is the same behaviour as LVAL SYNC/ASYNC auto detection.

Note: During synchronous reset, a jitter of up to 1 LVAL will occur from trigger input to exposure start and end. During asynchronous reset, there is no jitter.

9.2.6 Triggerdelay

This function delays the trigger signal against the trigger input.
Step is 1usec/Step.
The setting range is 16bit and from 0 to 65,535usec.

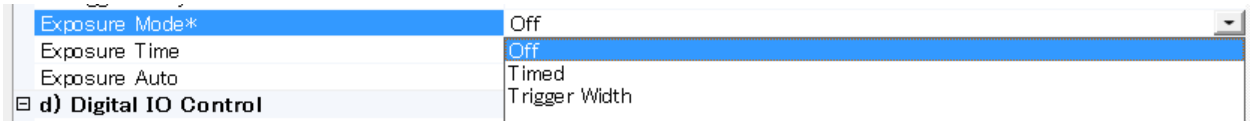
	Trigger delay
AcquisitionStart	×
AcquisitionEnd	×
FrameStart	○
JAIAcquisitionTransferStart	×

9.3. Exposure Control

This is the function to manage the exposure settings.

9.3.1 Exposure Mode

The exposure mode can be selected from the following choices.



Off : No exposure control.

Timed : The exposure time is to be set in microseconds. If FrameStart in TriggerSelector is"OFF", the exposure is controlled in Free Run. If FrameStart in TriggerSelector is "ON", this functions as the EPS mode.

Note: JAI Pre-Dump or JAI PIV can be available by using TriggerOption.

TriggerWidth : This mode controls the exposure time by the pulse width. If FrameStart in TriggerSelector is "OFF", The camera operates in Free Run. If FrameStart in the TriggerSelector is "ON", this functions as the PWC mode.

The following is the table for the combination of ExposureMode and TriggerControl

and its function.

TriggerSelector / ExposureMode	Frame Start	Operation	Previous JAI trigger name (for reference)
OFF	OFF or ON	Trig OFF(Free run) Exposure controllable	Trigger OFF
Timed	OFF	Trig OFF(Free run) Exposure control is possible	Trigger OFF
	ON	Trig On	EPS
TriggerWidth	OFF	Trig OFF(Free run) No Exposure control	Trigger OFF
	ON	Trig On	PWC

9.3.2 ExposureTime

This is effective only if ExposureMode is set to "Timed".
This command can set the exposure time.
The setting can be done in 1μs / step.

Minimum: 10μs
Maximum: 2sec - 194μs (1.999806sec)

9.3.3 ExposureAuto

This is auto exposure control function and is effective only in the "Timed" mode.
The reference video level is controlled by JAI AGC Reference.
ExposureAuto includes OFF, Once and Continuous modes.

The following detailed settings are aslo possible.

ExposureAuto speed: The reaction speed can be controlled
ExposureAuto Max: Set the maximun expsoure time
ExposureAuto Min: Set the minimum expsoure time
GainAutoReference: Set the reference video level for operation
ALC channel area Set the portion of the image to be used for exposure control

Note: Please also refer to section 11.1. ALC

9.4. Counter function

This function can count up the internal pulse counts.

9.4.1 CounterSelector

The AM-200GE and AB-200GE has one counter.
The counter function is activated by setting ConterEventSource, CounterResetSource or StartSource.

9.4.2 CounterEventSource

CounterEventSource can be selected from the following signals.
CounterEventSource works as the trigger to start the count up.

① Off
② AcquisitionTrigger
③ AcquisitionStart
④ AcquisitionEnd

⑤ FrameStart
⑥ Line 1(TTL out1)
⑦ Line 2(TTL out2)
⑧ Line 3(Opt out1)
⑨ Line 4(Opt out2)
⑩ Line 5(Opt in1)
⑪ Line 6(Opt in2)
⑫ Line 7(TTL in1)
⑬ Line 8(LVDS in)

9.4.3 CounterEventActivation

This selects the timing for when the counter starts up.
RisingEdge： The counting starts at the signal rising edge.
FallingEdge：The counting starts at the signal falling edge.

9.4.4 CounterResetSource

The reset source can be selected from the following signals.
The reset source works as the trigger to reset the counter.
① Off
② Software
③ Line 1(TTL out1)
④ Line 2(TTL out2)
⑤ Line 3(Opt out1)
⑥ Line 4(Opt out2)
⑦ Line 5(Opt in1)
⑧ Line 6(Opt in2)
⑨ Line 7(TTL in1)
⑩ Line 8(LVDS in)
⑪ Action1
⑫ Action2

9.4.5 CounterResetActivation

This selects the timing for resetting the counter.
RisingEdge： The counter is reset at the signal rising edge.
FallingEdge：The counter is reset at the signal falling edge.

9.4.6 CounterReset

This is the command to reset the counter.

9.4.7 CounterValue

This can read the counter value or set the default value when the counter starts.

9.4.8 CounterDuration

This can set the CounterCompleted value of the counter.
The counter can be set in 16bit.

9.4.9 CounterStatus

This shows the counter status.
CounterIdle： The counter is not operating.

	The CounterTriggerSource is “Off”.
CounterTriggerWait：	When the counter is waiting for the start trigger
CounterActive：	The counter is operating.
CounterCompleted：	When the counting value reaches CounterDuration
CounterOverflow：	If the counter counts past the maximum value

Note: The counter itself counts up to its maximum value.

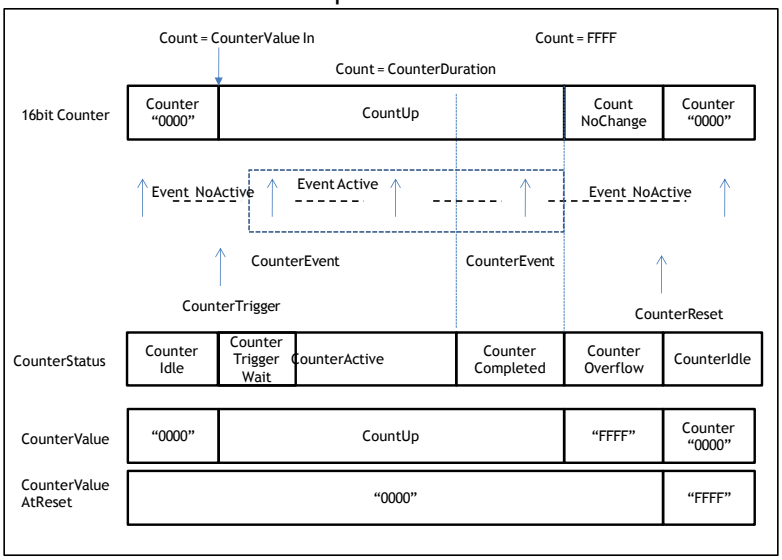


Fig.40 Counter Status

9.4.10 CounterTriggerSource

This is used to select the counter trigger from the following signals.
The counter trigger is the trigger that starts the count up.

① Off
② AcquisitionTrigger
③ AcquisitionStart
④ AcquisitionEnd
⑤ FrameTrigegr
⑥ FrameStart
⑦ FrameEnd
⑧ Line 1(TTL out1)
⑨ Line 2(TTL out2)
⑩ Line 3(Opt out1)
⑪ Line 4(Opt out2)
⑫ Line 5(Opt in1)
⑬ Line 6(Opt in2)
⑭ Line 7(TTL in1)
⑮ Line 8(LVDS in)
⑯ Action1
⑰ Action2

9.4.11 CounterTriggerActivation

This selects the timing for starting the count up.

RisingEdge： The counter starts at the signal rising edge.
FallingEdge：The counter starts at the signal falling edge.

9.5. Timer Control

9.5.1 TimerSelector

There is one internal timer. The timer function starts if the start trigger, TimerDelay and TimerDuration are set.

9.5.2 TimerDuration

This is used to set the maximum value of the timer.
The internal timer counter can be set in 16bit.

9.5.3 TimerDelay

This can set the period to start the timer. This results in the delay of the timer start.
The internal delay counter can be set in 16bit.

9.5.4 TimerValue

This can set the default value of the timer and read the current setting value.

9.5.5 TimerStatus

This checks the current status of the timer and provides one of the following.

TimerIdle :	When the timer is not operating. When TimerTriggerSource is OFF.
TimerTriggerWait :	When the timer is waiting for the start trigger
TimerActive :	When the timer is operating
TimerCompleted :	When the timer reaches its maximum value

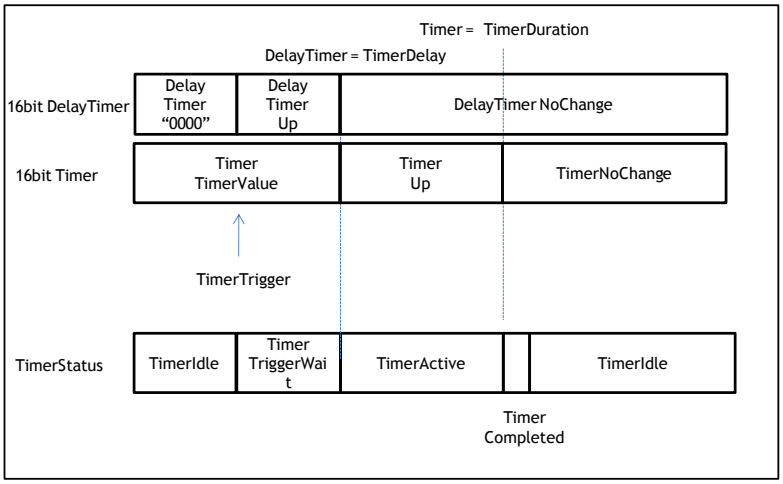


Fig.41 Timer Status

9.5.6 TimerTriggerSource

The start trigger signal to the timer can be selected from the following list.

① Off
② AcquisitionTrigger
③ AcquisitionStart
④ AcquisitionEnd
⑤ FrameTrigger
⑥ FrameStart
⑦ FrameEnd

⑧ Line 1(TTL out1)
⑨ Line 2(TTL out2)
⑩ Line 3(Opt out1)
⑪ Line 4(Opt out2)
⑫ Line 5(Opt in1)
⑬ Line 6(Opt in2)
⑭ Line 7(TTL in1)
⑮ Line 8(LVDS in)
⑯ Timer1End
⑰ Action1
⑱ Action2

9.5.7 TimerTriggerActivation

The timing of the start trigger to the timer can be selected from the following.
RisingEdge： The timer starts at the signal rising edge.
FallingEdge：The timer starts at the signal falling edge.

9.6. Event Control

9.6.1 EventSelector

The event can be selected from the following list.
AcquisitionTrigger、FrameStart、FrameEnd、、Line1RisingEdge、Line1FallingEdge、Line2RisingEdge、Line2FallingEdge、Line3RisingEdge、Line3FallingEdge, Line4RisingEdge、Line4FallingEdge、Line5RisingEdge、Line5FallingEdge、Line6RisingEdge、Line6FallingEdge、Line7RisingEdge、Line7FallingEdge、Line8RisingEdge、Line8FallingEdge

9.7. ActionControl

ActionControl is used to activate the specific functions of multiple cameras on the same network at the same time. For instance, it can be used to trigger multiple cameras at the same time.

ActionControl appears as two inputs (Action 1, Action 2) and is connected with 6 Triggers, CounterReset of the counter, CounterTrigger and Timer.
If ActionControl is used, the input source to the trigger should be set to Action 1 or Action 2 in advance.

9.7.1 ActionDeviceKey

Set the same value to cameras which are operated at the same time.

9.7.2 ActionSelector

Select Action 1 or Action 2.

9.7.3 ActionGroupMask

Set the mask value for grouping Action 1 operation.

9.7.4 ActionGroupKey

Set the key (value) to operate Action 1.

10. Operation modes

This camera can operate in the following functions.

1. ***Continuous***
2. ***Timed (Seamless OFF)(EPS)***
3. *Timed (Seamless ON)*
4. *Trigger Width (**PWC**)*

The followings are JAI Custom modes.

5. *Pre-Dump (**RCT**)*
6. ***Particle Image Velocimetry (PIV)***
7. ***Sequential trigger***
8. ***Delayed Readout trigger***
9. *ROI readout*
10. *OB transfer readout*

10.1. Continuous mode (Free run)

For applications not requiring asynchronous external triggering, this mode should be used. In this mode it is possible to use a lens with a video controlled iris. As for the timing, please refer to chapter 7.7 “Video output timing”. In continuous mode, exposure time can be controlled by the frame rate or by the electronic shutter. The following examples describe the GenICam settings used to configure the camera for continuous operation.

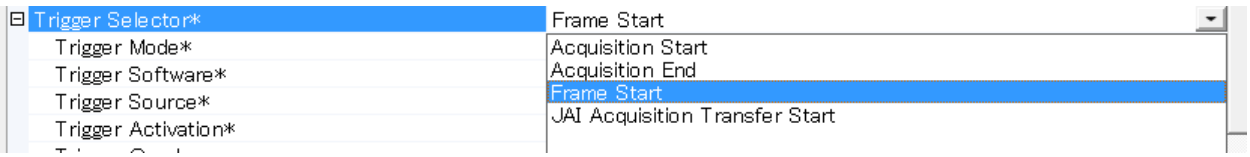
To use this mode:

Acquisition mode	: Continuous
Trigger selector	: Frame Start
Trigger mode	: OFF
Exposure mode	: OFF or Timed

Note: If ExposureMode is set to Timed, the exposure can be controlled.

or

Acquisition mode	: Continuous
Trigger selector	: Frame Start
Trigger mode	: ON
Exposure mode	: OFF



- Line number of a frame

Full scan	1229L
1/2 Partial	929L
2/3 partial	779L
1/4 Partial	554L
1/8 Partial	442L
1/2 V Binning (AM-200GE only)	622L

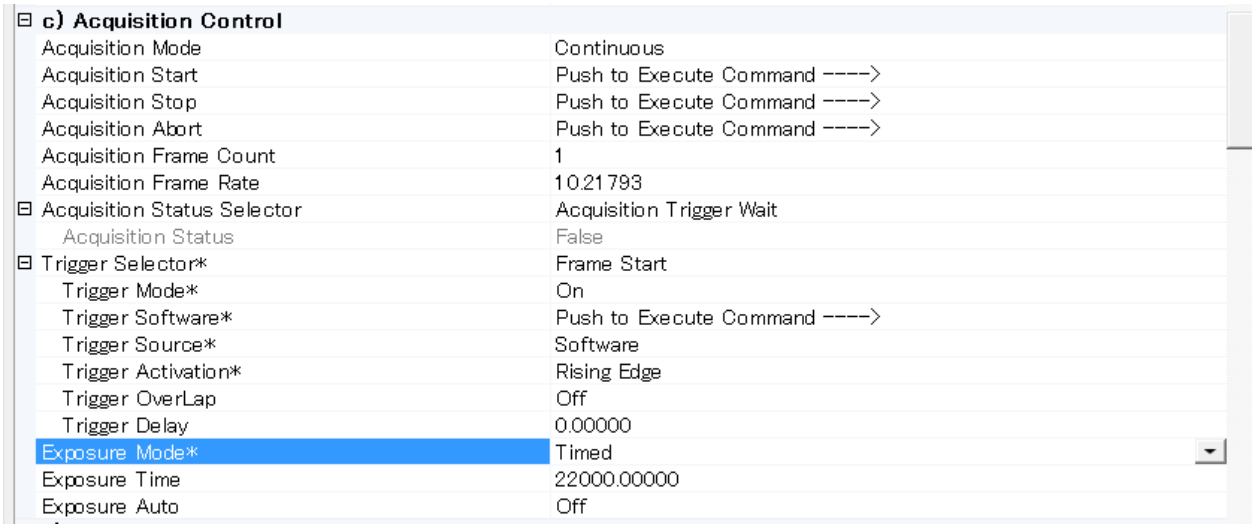
The above is figures if the pixel format is MONO8 or Bayer 8

10.2. Trigger operation with "timed" exposure (Previously called EPS)

An external trigger pulse initiates the capture, and the exposure time (accumulation time) is set in advance.

To use this mode:

Acquisition mode : Continuous, Single Frame, Multi Frame
Acquisition Frame Count : Required number (if Multi Frame is selected)
Trigger Selector : Frame Start
Trigger Mode : On
Trigger Source : Select from the pull down menu
Trigger Overlap : OFF or Read out
Exposure Mode : Timed



Important notes on using this mode

- Trigger pulse >2 LVAL to <1 FVAL)
- The following table shows minimum trigger interval in synchronous accumulation mode

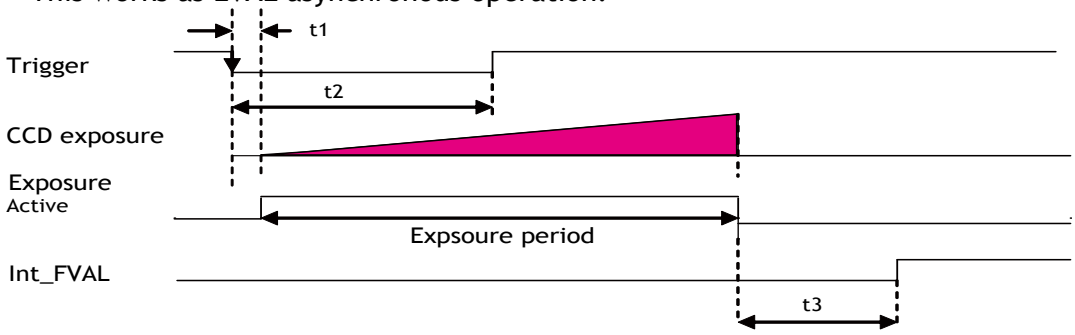
Full scan	1231L
1/2 Partial	931L
2/3 partial	781L
1/4 Partial	556L
1/8 Partial	444L
1/2 V Binning (AM-200GE only)	626L

The above is figures if the pixel format is MONO8 or Bayer 8

In case of asynchronous mode, the exposure time should be added to the above table.

10.2.1 TriggerOverlap = OFF

This works as LVAL asynchronous operation.

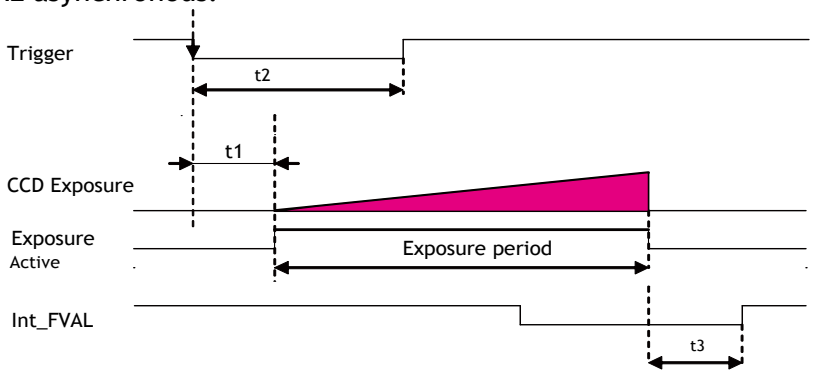


Binning Control	t1	t2	t3
OFF, 2x1	4.55μs ± 0.05μs	2L (min)	2.5L ～ 3.5L
1x2, 2x2	6.7μs ± 0.05μs	2L (min)	2.5L ～ 3.5L

Fig.42 TriggerOverlap=OFF（Timed）

10.2.2 TriggerOverlap = Read out

In this mode, if the trigger is input during CCD readout, it works as LVAL synchronous and if the trigger is input while the CCD is not reading out, it works as LVAL asynchronous.

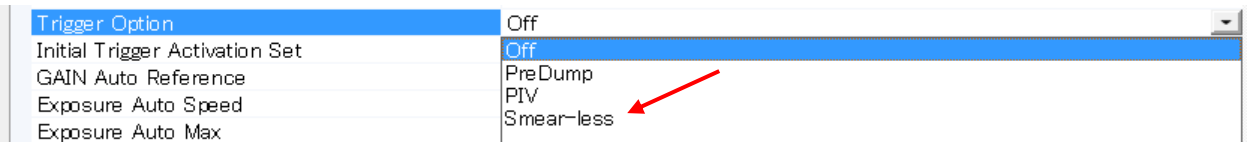


Binning Control	t1	t2	t3
OFF, 2x1	24.6μs ± 0.05μs	2L (min)	3L
1x2, 2x2	28.6μs ± 0.05μs	2L (min)	3L

Fig.43 TriggerOverlap = READOUT (Timed)

10.2.3 SmearLess ON

In this mode, in addition to the trigger setting for “Timed”, the trigger option should be set at smearless. The timing is the same as Timed(Pre-Dump). Please refer to 10.4. Pre-dump mode (so-called RCT) (JAI Custom)



In this mode, Trigegr OverLap can be set only OFF.

■ Minimum trigger interval

Full scan	1560L
1/2 Partial	1260L
2/3 partial	1110L
1/4 Partial	886L
1/8 Partial	773L

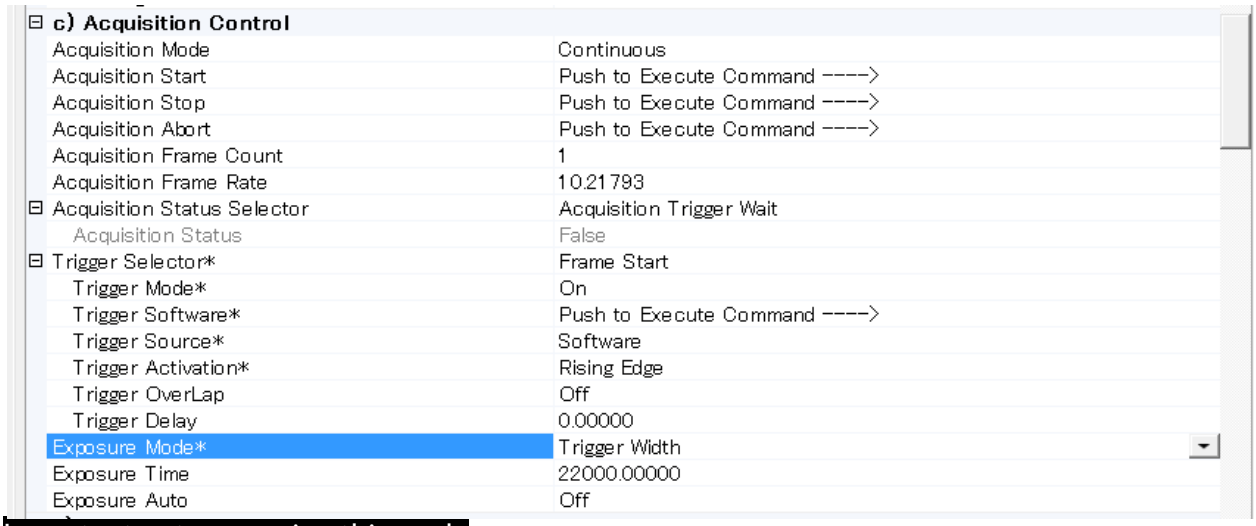
The above is figures if the pixel format is MONO8 or Bayer 8

10.3. Trigger operation by "TriggerWidth" (Previously called PWC)

In this mode the accumulation time is equal to the trigger pulse width. Here it is possible to have a long time exposure. The minimum active period of the trigger is 2L and the minimum trigger interval is shown in the following table.

To use this mode:

Acquisition mode : Continuous, Single Frame, Multi Frame
Acquisition Frame Count : Required number (if Multi Frame is selected)
Trigger Selector : Frame Start
Trigger Mode : On
Trigger Source : Select from the pull down menu
Trigger Overlap : OFF or Read out
Exposure Mode : Trigger Width



Important notes on using this mode

■ Trigger pulse width >2 LVAL to <2 seconds

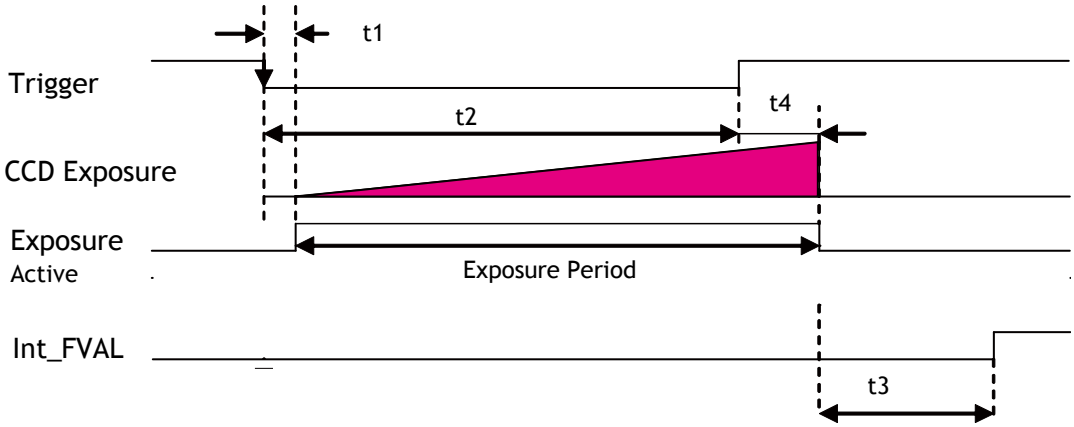
■ The following table shows minimum trigger interval in synchronous accumulation mode

Full scan	1233L
1/2 Partial	933L
2/3 Partial	783L
1/4 Partial	559L
1/8 Partial	446L
1/2 V Binning (AM-200GE only)	626L

The above is figures if the pixel format is MONO8 or Bayer 8
In case of asynchronous mode, the exposure time should be added to the above table.

10.3.1 TriggerOverlap = OFF

This works as LVAL asynchronous operation.

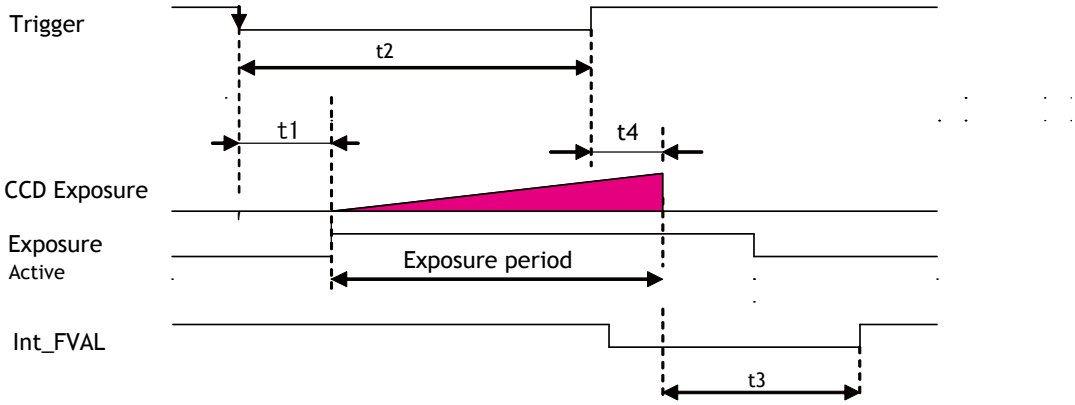


Binning Control	t1	t2	t3	t4
OFF, 2x1	4.08μs ± 0.05μs	2L (min)	2.5L ～ 3.5L	30.15μs ± 0.05μs
1x2, 2x2	6.3μs ± 0.05μs	2L (min)	2.5L ～ 3.5L	21.28μs ± 0.05μs

Fig.44 Trigger OberLap = OFF (Trigger width)

10.3.2 TriggerOverlap = Read out

In this mode, if the trigger is input during CCD readout, it works as LVAL synchronous and if the trigger is input while the CCD is not reading out, it works as LVAL asynchronous.



Binning Control	t1	t2	t3	t4
OFF, 2x1	24.12μs ± 0.05μs	2L (min)	3.5L(70.78μs)	51.51μs ± 0.05μs
1x2, 2x2	28.31μs ± 0.05μs	2L (min)	3.5L(70.78μs)	53.4μs ± 0.05μs

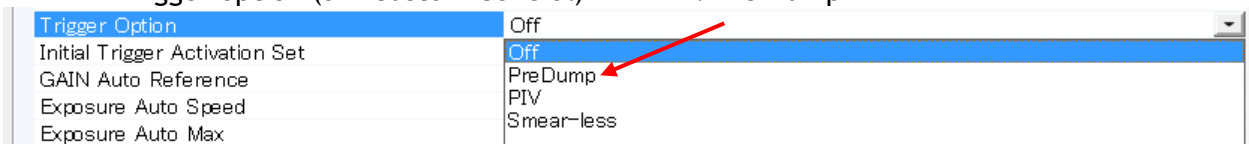
Fig. 45 Trigger OverLap = READOUT (Trigger width)

10.4. Pre-dump mode (so-called RCT) (JAI Custom)

Until the trigger is input, the camera operates continuously. At this moment, the video signal, FVAL and LVAL are output but DVAL is not output. When the trigger is input, the fast dump is activated to read out the electronic charge very quickly, after which the accumulation and the readout are performed. This fast dump period is 14.325ms. When the accumulated signal against the trigger is read out, FVAL , LVAL and DVAL are output too.

To use this mode;

Acquisition Mode : Multi
Acquisition frame Count : 2
Trigger selector : Frame Start
Trigger mode : ON
Exposure Mode : Timed
Trigger option (JAI Custom Control) : Pre Dump



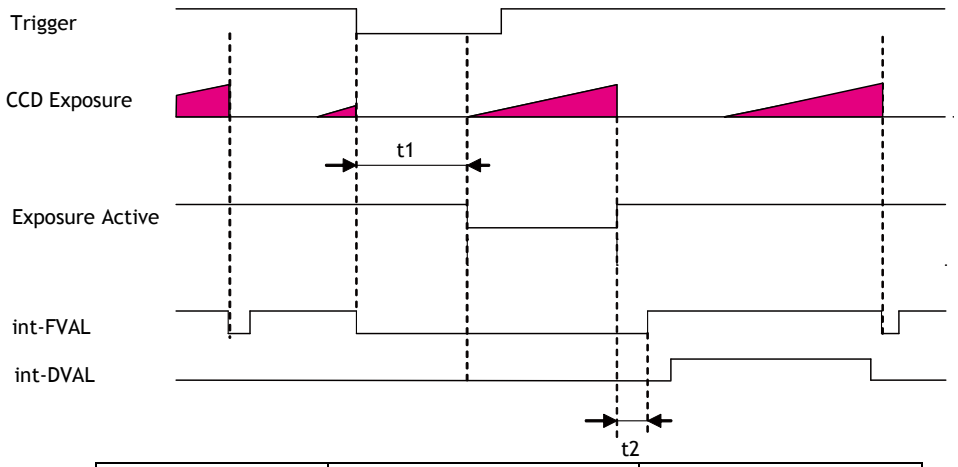
In this mode, Trigger Overlap is automatically set to OFF.

Important notes on using this mode

- The following table shows minimum trigger interval in asynchronous accumulation mode

Full scan	1560L
2/3 Partial	1260L
1/2 Partial	1110L
1/4 Partial	886L
1/8 Partial	773L

The above is figures if the pixel format is MONO8 or Bayer 8



Binning Control	t1	t2
OFF, 2x1	6.587ms ± 0.05μs	2.5L ～ 3.5L
1x2, 2x2	6.587ms ± 0.05μs	2.5L ～ 3.5L

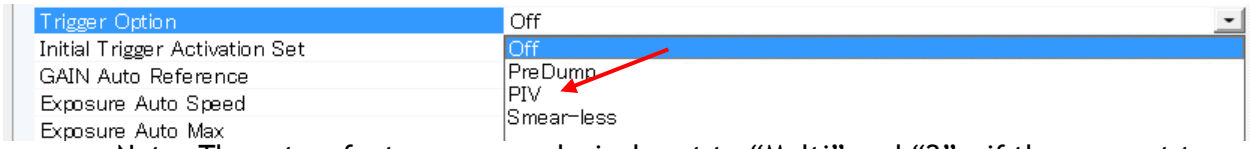
Fig.46 Pre-dump mode timing

10.5. PIV (Particle Image Velocimetry) (JAI Custom)

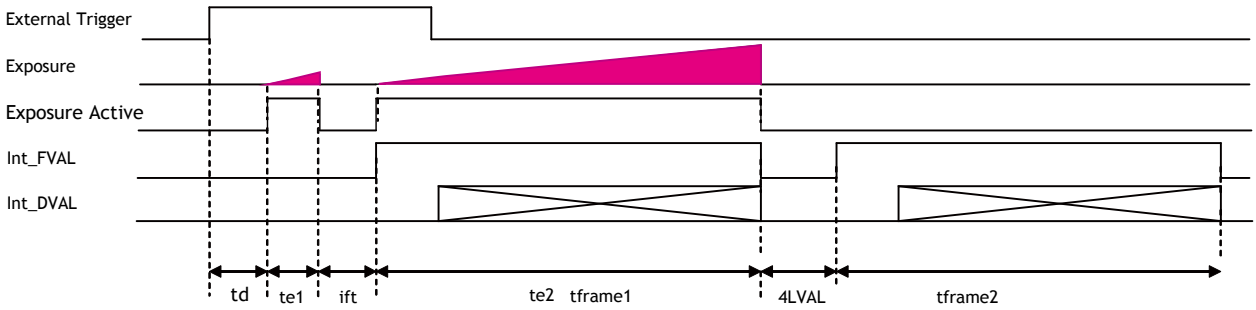
The Particle Image Velocimetry mode can be used in applications where 2 images must be taken with a very short time interval. It can only be used with strobe flash as illumination. The first accumulation time is 10μsec to 98.05ms. Then, the second exposure will be taken. The accumulation is LVAL asynchronous. The first strobe is activated in the first exposure duration and the second strobe is taken during the first frame being readout. In this way, two strobe pulses produce two video outputs.

To use this mode:

Acquisition Mode	: Multi (note)
Acquisition Frame Count	: 2 or even number (Note)
Trigger selector	: Frame Start
Trigger mode	: ON
Exposure mode	: Timed
Trigger option (JAI Custom Control)	: PIV



Note: These two features are exclusively set to “Multi” and “2” , if they are set to others.
In this mode, Trigger Overlap is automatically set to OFF.



time name	description	time
td	Exposure beginning delay	4.4us
te1	First exposure time period	10us ～ 31.04ms
te2	Second exposure time	24.63ms (frame rate)
itf	Inter framing time	6.64us
tframe1	First Frame read out	24.63ms max
tframe2	Second Frame read out	24.63ms max

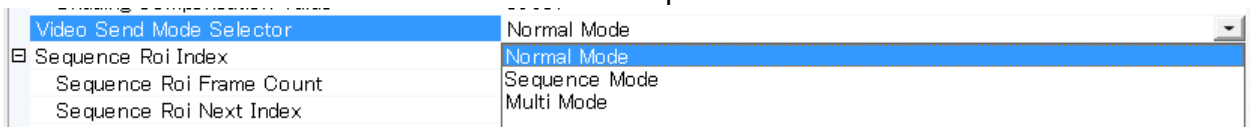
Fig.47 PIV mode

10.6 Other JAI custom mode

10.6.1 Video Send Mode

The Video Send Mode is the function to select how the image information will be read out from the camera.

Normal : Ordinary operation
Sequence Mode : Sequence Trigger Mode:
Multi Mode : Multi ROI operation



10.6.1.1 Normal: Ordinal operation

In this mode, the stream is output without any control.

10.6.1.2 Sequence Trigger Mode

This mode allows the user to define a preset sequence of up to 10 images, each with its own ROI, Exposure time and Gain values. As each trigger input is received, the image data within the preset sequence is output as described below.

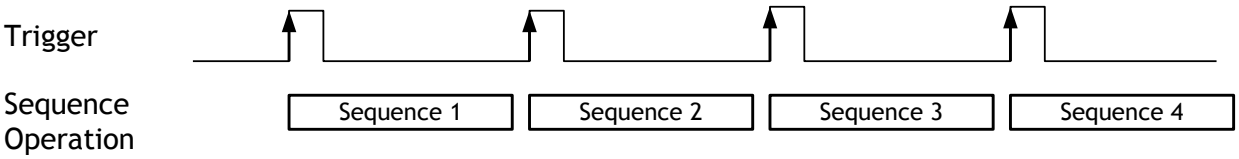


Fig.44 Sequential Trigger Mode

This function is effective when the video send mode selector is set at the Sequence Trigger Mode.
In Sequence Trigger Mode, the following parameters can be set.

Sequence ROI index: The index (ID) to which the settings will be applied
Sequence ROI FrameCount: The number of frames to capture at this index
Sequence ROI Next index: Indicate the next index (ID) in the sequence
Sequence ROI Width: Set the horizontal readout width
Sequence ROI Height: Set the vertical readout lines
Sequence ROI Offset X: Set the horizontal offset
Sequence ROI Offset Y: Set the vertical offset
Sequence ROI Gain: Set the gain
Sequence ROI Exposure Time: Set the exposure time

The following default settings can be modified by the user to define a sequence.

Index	ROI					Exposure time	Gain	Frame count	Next Index
	Width	Height	Offset X	Offset Y	Frame count				
0	1600	1200	16	4	0	24501	1	1	0
1	1600	1200	16	4	0	24501	1	1	0
2	1600	1200	16	4	0	24501	1	1	0
3	1600	1200	16	4	0	24501	1	1	0
4	1600	1200	16	4	0	24501	1	1	0
5	1600	1200	16	4	0	24501	1	1	0
6	1600	1200	16	4	0	24501	1	1	0
7	1600	1200	16	4	0	24501	1	1	0
8	1600	1200	16	4	0	24501	1	1	0
9	1600	1200	16	4	0	24501	1	1	0

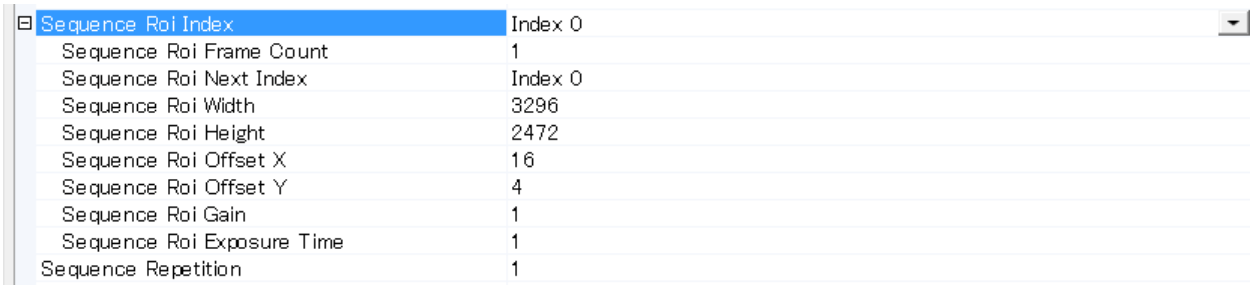
The other necessary register for the Sequence Trigger Mode is Sequence Repetition. It sets the number of times the sequence will repeat in the range of 1 to 255 or indefinitely (Sequence Repetition = 0).

Note: If the Binning Horizontal/Vertical mode is changed from OFF to ON after ROI size is set. the area setting value is reduced to 1/2, however, if the Binning Horizontal/Vertical mode is changed from ON to OFF, the area setting value is not changed. Please reset by manually.

To use this mode:

Acquisition mode : Single Frame
Trigger Selector : Frame Start
Trigger Mode : On
Trigger Source : Select from the pull down menu
Trigger Overlap : OFF or Read out
Exposure Mode : Timed, Trigger Width

For each sequence,



The following table shows the minimum trigger interval in asynchronous accumulation mode. In the sequential mode, only asynchronous mode is functional. Therefore, the trigger timing should be set so that the timing is not in synchronous mode.

- The conditions for this table are that shutter speed should be set the same for all sequences. If the shutter speed is different, the difference of exposure time should be added. It is recommended to set the exposure time in order of the shortest to the longest one.
- Do not input the trigger just after the sequence is reset. It requires at least 500ms delay.

In sequential mode, the exposure should be adjusted so that the LVAL async mode can always function.

Minimum interval of the trigger pulse (note: V binning is AM-200GE only)

Readout mode	FULL	2/3 AOI	1/2 AOI	1/4 AOI	1/8 AOI	V Binning
Minimum frame line	1231	931	781	556	444	624

The above is figures if the pixel format is MONO8 or Bayer 8

10.6.1.3 Multi ROI Mode

A maximum of 5 preset ROI images can be taken from one image.
Using this function, the total data can be smaller than a full frame.

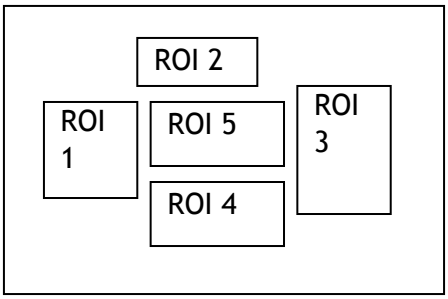


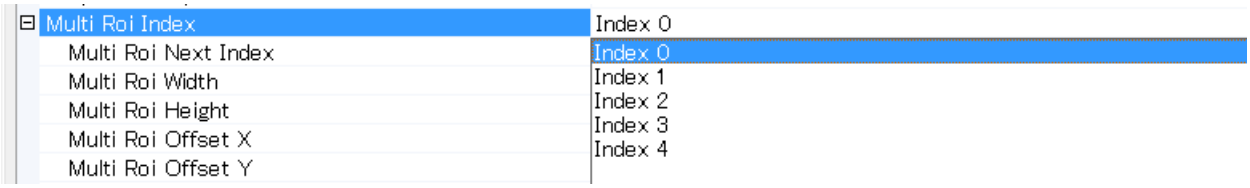
Fig 49. Multi ROI

If the Video Send Mode Selector is set to Multi Mode, this function becomes effective.
In the Multi ROI Mode, the following items can be set.

Note: If the Binning Horizontal/Vertical mode is changed from OFF to ON after ROI size is set. the area setting value is reduced to 1/2, however, if the Binning Horizontal/Vertical mode is changed from ON to OFF, the area setting value is not changed. Please reset by manually.

Multi ROI Index :	This is the index (0-4) to which the setting will be applied
Multi ROI Next Index :	Indicate the next index to read out
Multi ROI Width :	Set the horizontal readout width
Multi ROI Height :	Set the vertical readout lines
Multi ROI Offset X :	Set the horizontal offset
Multi ROI Offset Y:	Set the vertical offset

Each ROI can be overlapped.



10.6.2 Delayed Readout Mode (JAI Custom Control)

If multiple cameras need to be simultaneously triggered by one trigger pulse, this function can be used in order for the Ethernet bandwidth to accommodate the added traffic without conflicts. Refer to the chapter 8.4 too.

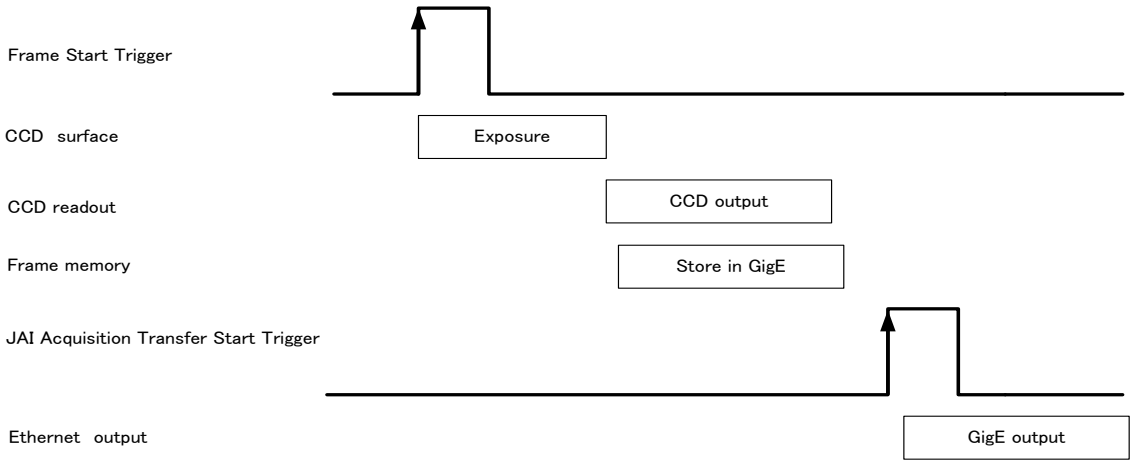


Fig.50 Delayed Read Out

This function can be set by the following;

Set the necessary parameters of the trigger setting to capture the image and set JAI_AcqusitionTransferStart in Trigger Selector to ON, then the readout can be controlled by the external trigger signal which is selected in JAI_AcqusitionTransferStart.

Trigger settings:

⊟ Trigger Selector*	Frame Start
Trigger Mode*	On
Trigger Software*	Push to Execute Command ---->
Trigger Source*	Line 7 - TTL In 1
Trigger Activation*	Rising Edge
Trigger OverLap	Off
Trigger Delay	0

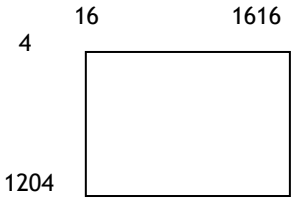
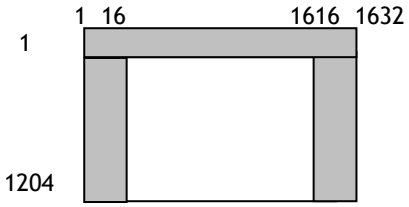
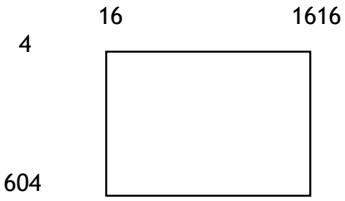
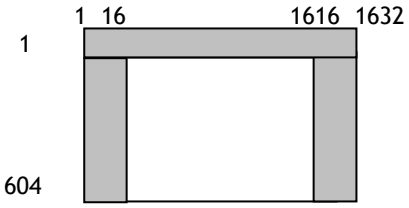
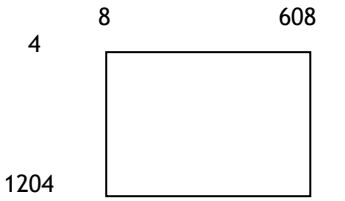
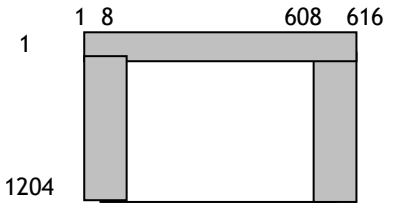
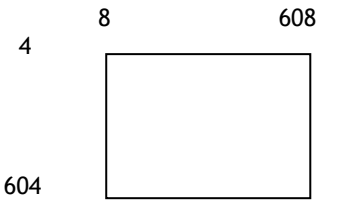
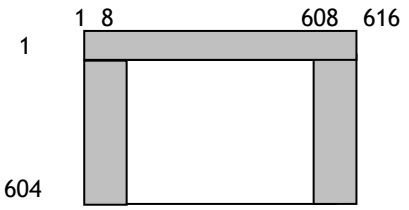
Readout settings:

⊟ Trigger Selector*	JAI Acquisition Transfer Start
Trigger Mode*	On
Trigger Software*	Push to Execute Command ---->
Trigger Source*	Line 7 - TTL In 1
Trigger Activation*	Rising Edge
Trigger OverLap	Off
Trigger Delay	

10.6.3 OB transfer

It is possible for the user to decide whether the optical black (OB) portion of the image will be transferred or not. The optical black part can be used for black reference in the application software. The default setting is only for the image.

The following table shows the total image size transferred at each condition.

	Normal	When OB is transferred
Binning Vertical=1 Binning Horizontal=1		
Only for AM-200GE Binning Vertical=2 Binning Horizontal =1		
Only for AM-200GE Binning Vertical=1 Binning Horizontal =2		
Only for AM-200GE Binning Vertical=2 Binning Horizontal =2		

10.6.3.1 Vertical OB transferred

Set as follows.
Offset X=16(Note)
Offset Y=0
Width =1600
Height = Effective lines ＋4
Note: If Binning Horizontal is set to x2, Offset X should be 8.

10.6.3.2 Horizontal OB transferred

Set as follows.
In this case, the width should be set at maximum.
Offset X=0
Offset Y=4
Width =1632(Note)
Height = Effective lines
Note: If Binning Horizontal is set to x2, the width is 1616 due to 8 pixels OB on both sides.

10.6.3.3 OB transfer is not activated

Set as follows.
Offset X=16 (Note)
Offset Y=4
Width =1600
Height = Effective lines
Note: If Binning Horizontal is set to x2, offset X should be 8.

10.7. Mode and function matrix table

The following table shows the possible combinations of mode and function.
○ for effective and × for invalid

Trigger Mode	Binning Vert ※	Binning Hori ※	Exposure Time	AOI	Multi ROI	Sequence ROI	ALC		Auto Exposure /Gain	Over lap
							AIC	AGC/ ASC		
Exposure OFF Trigger OFF	1	○	×	○	×	×	○	○	×	×
	2	○	×	○	×	×	○	○	×	×
Timed Trigger OFF	1	○	○	○	×	×	○	○	○	×
	2	○	○	○	×	×	○	○	○	×
Timed Trigger On (EPS)	1	○	○	○	○	○	×	×	×	○
	2	○	○	○	○	○	×	×	×	○
TriggerWidth (PWC)	1	○	×	○	○	×	×	×	×	○
	2	○	×	○	○	×	×	×	×	○
Timed-JAI_PreDump (RCT)	1	○	○	○	○	×	○	○	○	×
	2	×	×	×	×	×	×	×	×	×
Timed-JAI_PIV	1	○	×	○	×	×	×	×	×	×
	2	×	×	×	×	×	×	×	×	×

※Only for AM-200GE

11. Other functions

11.1. ALC

In the AM-200GE and AB-200GE, auto gain, auto shutter and auto iris functions can be combined to provide a wide ranging automatic exposure control from dark to bright or vice versa.
The functions are applied in the sequence shown below and if one function is disabled, the linkage between the other two is maintained.

In order to make ALC function effective,
set the Auto Iris Lens Control Signal Output to “ON”. The auto iris function is worked together with AGC and Exposure Auto.

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

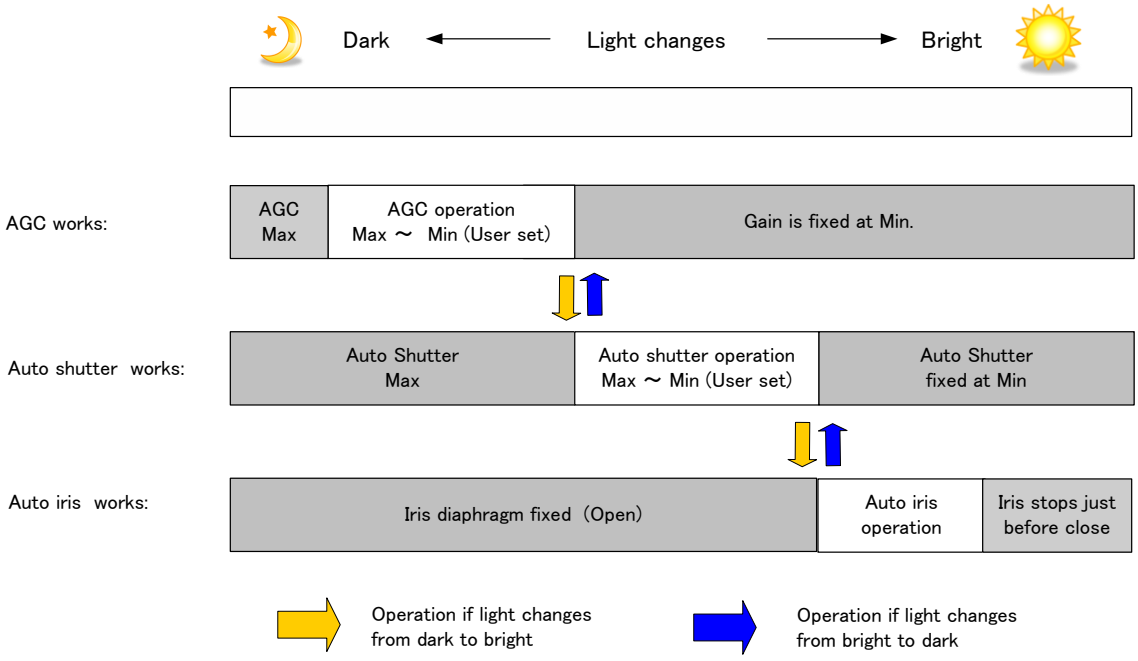


Fig.51 ALC function concept

GainAutoReferecne will determine the target video level for AGC, Auto Shutter and/or Auto iris. For instance, if GainAutoReference is set to 100% video level, AGC, Auto Shutter and/or Auto iris will function to maintain 100% video level.

■ Please note that ALC function is available only for the continuous mode.

11.2 Black level control

This function adjusts the setup level.
This can be adjusted from -256 to 255 LSB in the 10bit output.

11.2.1 Black level control relations

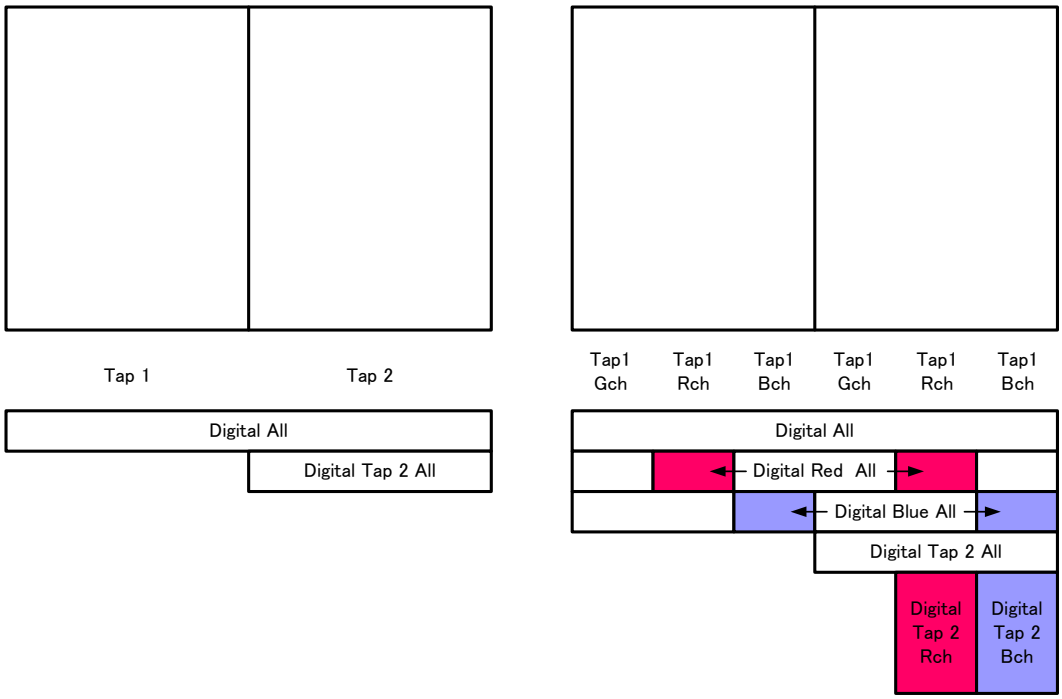


Fig.52 Black level control relations

11.2.2 Black Level Selector

The following parameters can be set.
AM-200GE :
DigitalAll/Tap2All
AB-200GE :
DigitalAll/DigitalRed/DigitalBlue/Tap2All/Tap2Red/Tap2Blue

11.2.3 Black Level

Each parameter can be adjusted in the following range.
AM-200GE :
DigitalAll : -1024～+1023
Tap2All : -512～ +511
AB-200GE :
DigitalAll : -1024～+1023
DigitalRed : -512～ +511
DigitalBlue : -512～ +511
Tap2All : -512～ +511
Tap2Red : -512～ +511
Tap2Blue : -512～ +511

11.2.4 Black Level Auto

The tap balance can be adjusted. Use lens cap for adjustement.
OFF: Adjust manually
Once : Adjust only one time

11.3. Gain control

11.3.1 Gain control relations

In the gain control, there are several parameters to be set. AnalogueALL can be used as the master gain control. DigitalGain and TapGain are set by multiplying as follows.

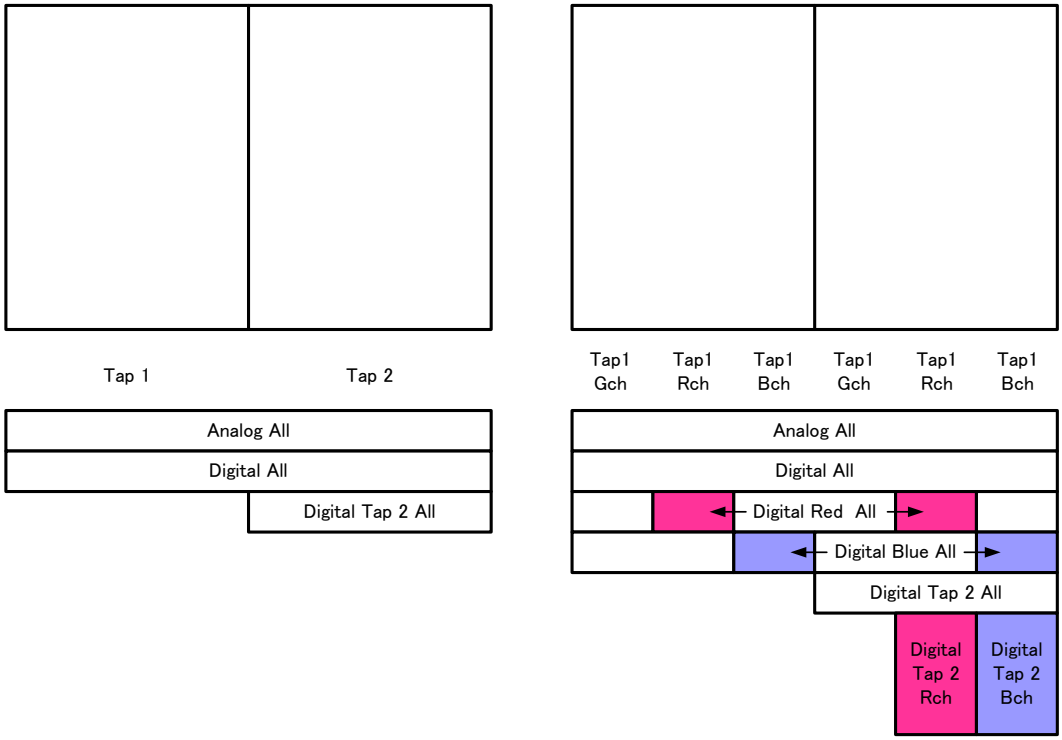


Fig.53 Gain control relations

11.3.2 Gain Control

The AM-200GE can adjust the gain level from -3dB to +24dB using 0dB as the reference (Factory default). In the AB-200GE, the master gain can be adjusted from 0dB to +24dB and R and B gains can be adjusted in the range of -7dB to + 10dB using the master gain as the reference.

The AM-200GE and AB-200GE has the resolution of x0.00012/step using both analog gain (0.00359db/step) and digital gain. In the AB-800CL, blue and red channels can adjust in x0.00012/step by using digital gain.
Refer to the following drawing.

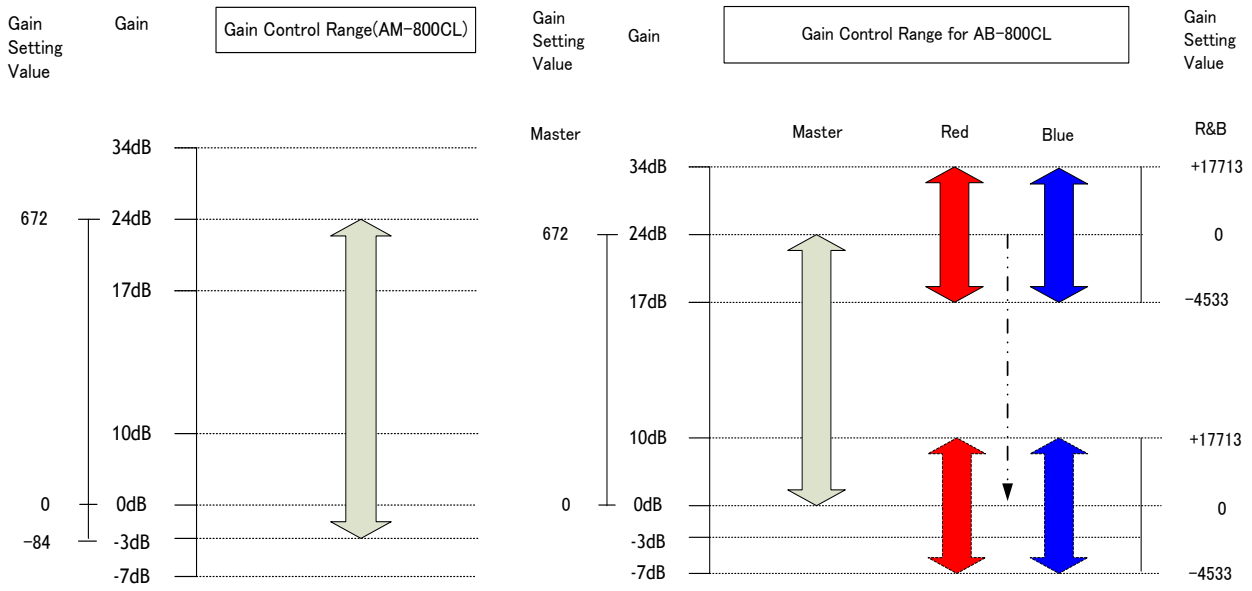


Fig. 54 Gain control

The following is the formula for calculating digital gain (magnification) for red or blue.
Digital gain = (Gain value + 8192) / 8192

11.3.3 Gain selector

The following parameters can be set.

AM-200GE :
AnalogAll/DigitalAll/Digital Tap2

AB-200GE :
AnalogALL/DigitalAll/DigitalTap2All/DigitalRedAll/DigitalBlueAll/DigitalTap2Red/
DigitalTap2Blue

11.3.4 Gain

Each parameter can be adjusted in the following range.

AM-200GE:
AnalogAll : 0.7079～16 /
DigitalAll : 0.7079～1.4125/
Digital Tap2All : 0.8912～1.1220
AB-200GE:
AnalogAll : 1.0～16/
DigitalAll : 0.7079～1.4125/
Digital Tap2All : 0.8912～1.1220/
Digital Red : 0.4466～3.1623/
Digital Blue : 0.4466～3.1623/
Digital Tap2Red : 0.8912～1.1220/
Digital Tap2Blue : 0.8912～1.1220

11.3.5 Gain Raw

Each parameter can be adjusted in the following range.

AM-200GE:

AnalogAll : -84 ～ 672 /
DigitalAll : -2393～+3379/
Digital Tap2All : -891～+1000

AB-200GE:

AnalogAll : 0 ～ 672/
DigitalAll : -2393～+3379/
Digital Tap2All : -891～+1000/
Digital Red : -4533～17713/
Digital Blue : -4533～17713/
Digital Tap2Red : -891～+1000/
Digital Tap2Blue : -891～+1000

11.3.6 Gain Auto

This function works only in the FrameTrigger OFF and Pre-dump modes.
In JAI AGC Reference, the brightness level can be controlled.
In Gain Auto, there are three modes.

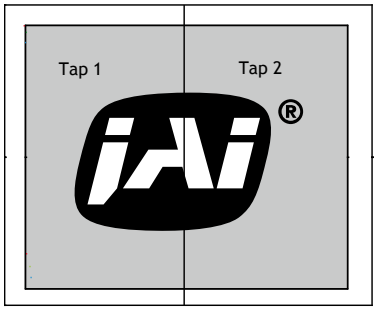
OFF : Gain auto is disabled
Once : The gain auto control is done only when it is enabled.
Continuous : The gain auto control is always active.

The detailed settings are:

GainAuto speed	: Set the reaction speed of auto gain
GainAuto Max	: Set the maximum level of the gain auto control
GainAuto Min	: Set the minimum level of the gain auto control
Gain Auto Reference	: Set the target level of video. For instance, set 100% of the video as the reference video level
ALC Channel area	: Set the portion of the image to be used for gain auto control

11.4. Tap Balance

The Tap control function adjusts automatically or manually the OFFSET and the gain differences between the left and right taps. The sensor used in the AM-200GE and AB-200GE divides the effective image area into 2 areas as shown in the gain control or black control sections of this manual.
The reference tap for all adjustments is Tap ”1”.



11.4.1 Gain Auto Balance

This feature selects the tap balance mode.

OFF : Use for the manual setting
Once : Use for adjusting once
Continuous : Use for adjusting continuously

11.4.2 Automatic Tap Balance

Using Tap "1"(left) as the reference, adjust automatically Tap"2"(right) for black level and gain level.
This is effective only when the gain auto balance is set at Continuous.

11.4.3 Manual Tap Balance

Using Tap "1"(left) as the reference, adjust manually Tap "2"(right) for black level and gain level.
This is effective only when the gain auto balance is set at OFF.

11.4.4 Once Tap Balance

Using Tap "1"(left) as the reference, adjust Tap "2"(right) for black level and gain level once.
This is effective only when the gain auto balance is set at Once.

11.5. Exposure auto (Auto Shutter)

The exposure can be automatically controlled .
This function works only in the exposure mode, "Timed".
In the JAI AGC Reference, the brightness level can be controlled.
In Exposure Auto, there are three modes.

OFF : Exposure auto is disabled
Once : The exposure control is done only when it is enabled.
Continuous : The exposure control is always active.

The detailed settings are:

ExposureAuto speed : Set the reaction speed of exposure control
ExpsoureAuto Max : Set the maximum level of the exposure control
ExposureAuto Min : Set the minimum level of the exposure control
Gain Auto reference : Set the target level of video.
For instance, set 100% of the video as the reference video level
ALC Channel area : Set the portion of the image to be used for exposure control

11.6. Balance Ratio (Only for AB-200GE)

This is the function to set the white balance.
This adjusts both red channel and blue channel to get proper white balance.
The adjusting range is -7dB (0.446 times) to +10dB (3.162 times).

11.6.1 Balance Ratio

The value can be set in the following range:

R ch/ B ch : 0.446 times to 3.162 times

The formula is R gain/G gain or B gain / G gain.

After setting these parameters, the result is applied to Digital RedAll and Digital BlueAll.

11.6.2 Balance Ratio Auto

Thefollowing modes are available.

OFF	: Manual adjustment
Once	: One-time auto white balance
Continuous	: Always tracking

11.7. Blemish compensation

The AM-200GE and AB-200GE have a blemish compensation circuit. This function compensates blemishes on the CCD sensor (typically pixels with extremely high response or extremely low response). This applies to both monochrome and color versions. Pixels that fulfill the blemish criteria can be compensated by adjacent pixels on both columns and, in the case of the AB-200GE, the defective pixels can be compensated by the same Bayer color pixels in the nearest adjacent columns on both sides. The number of pixels that can be compensated is up to 512 pixels .
The built-in compensation circuit for the AM-200GE and AB-200GE uses compensation data collected in the factory and can be turned ON or OFF. The default setting is OFF. Users can recalibrate the high response blemishes (White) and store for use. However, the low response (Black) can be used only with the factory default setting.

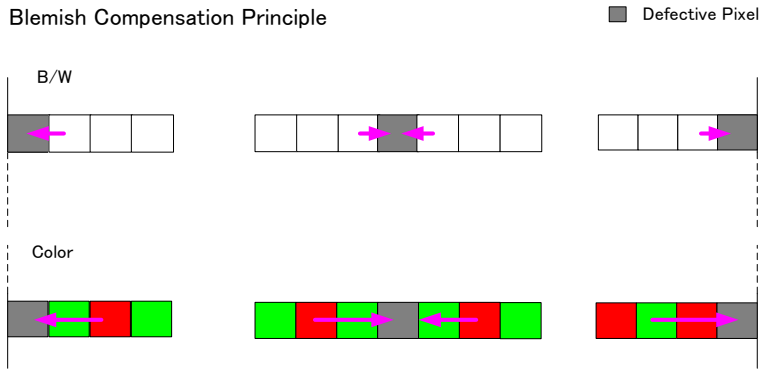


Fig. 55 Blemish compensation

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

11.8. LUT

This function can be used to convert the input to the desired output characteristics. The Look-Up Table (LUT) has 512 points for setup and each point has a 9-bit gain value. The output level can be created by multiplying the gain data by the input level. In the AB-200GE, the same LUT characteristic is applied independent of the color value.
If input data is not in the LUT, the weighted mean average data from upper point and the lower point are used.
Video output = Video input x LUT value

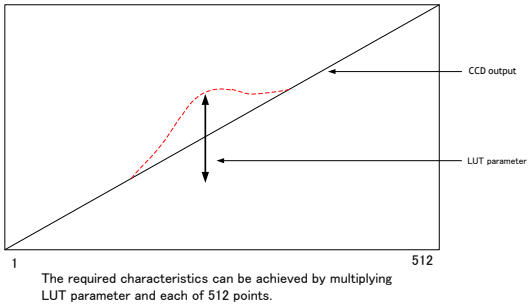
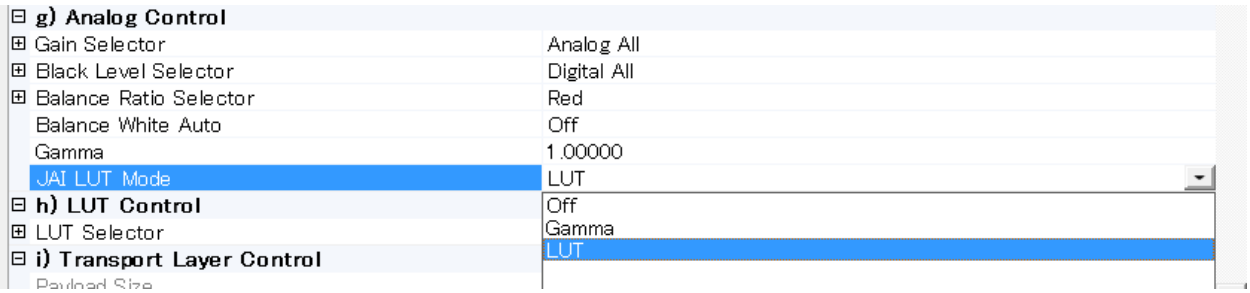
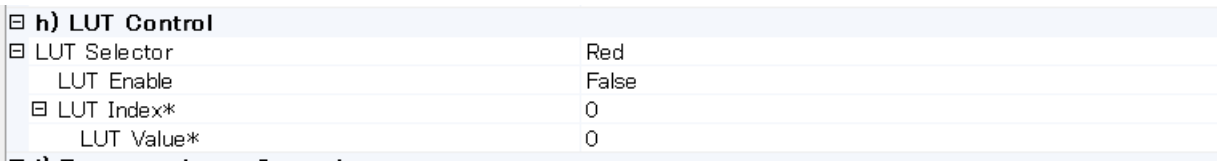
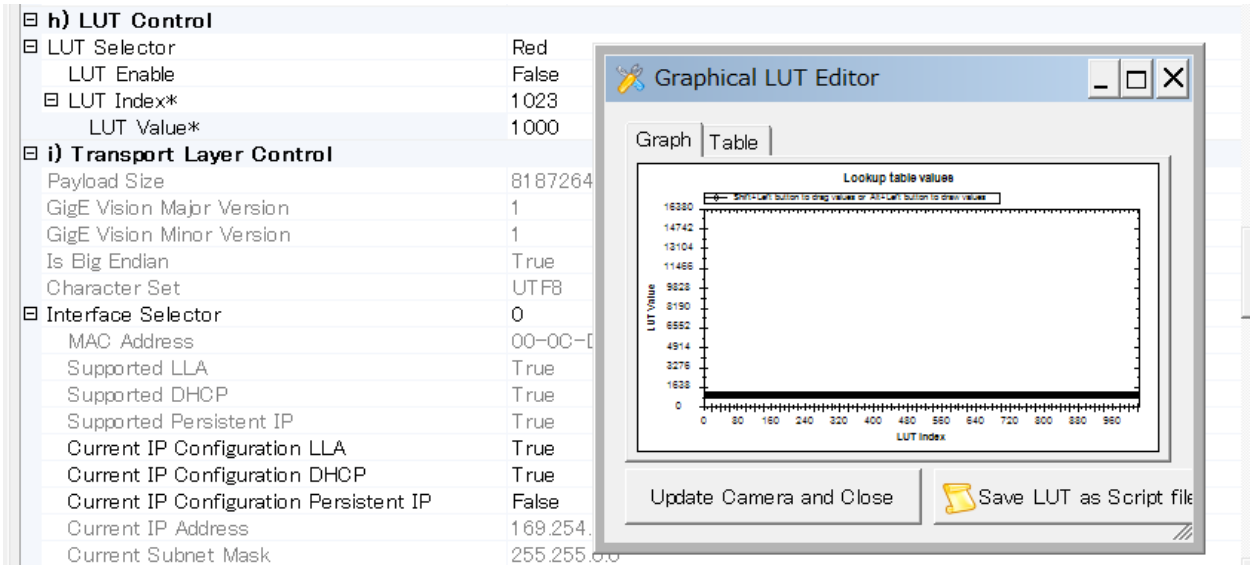


Fig. 56 LUT concept drawing

In order to use LUT control, set:
JAI LUT mode : LUT
LUT Enable : True







By clicking the Processing tab, the following settings screen can be accessed.
This screen includes Look-up table settings and image transformation settings.

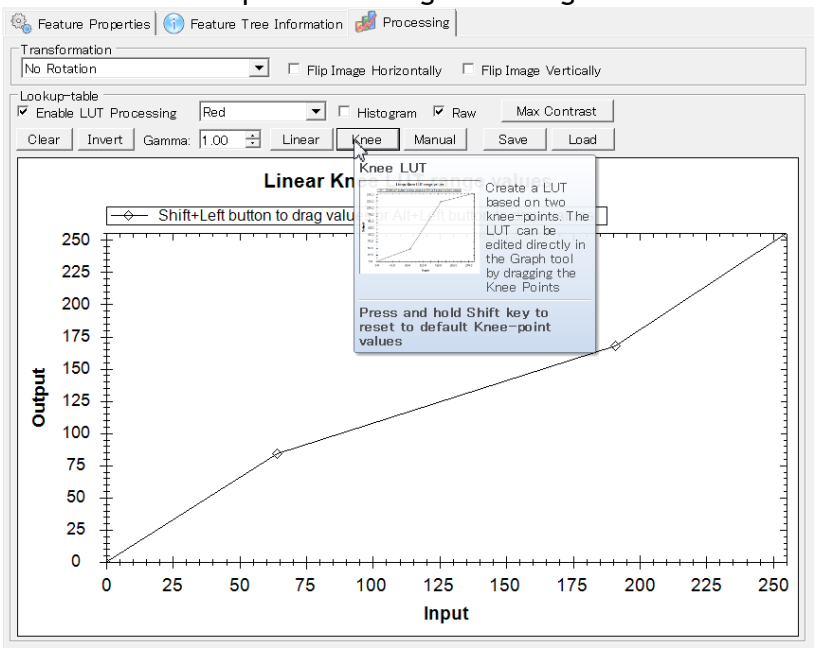
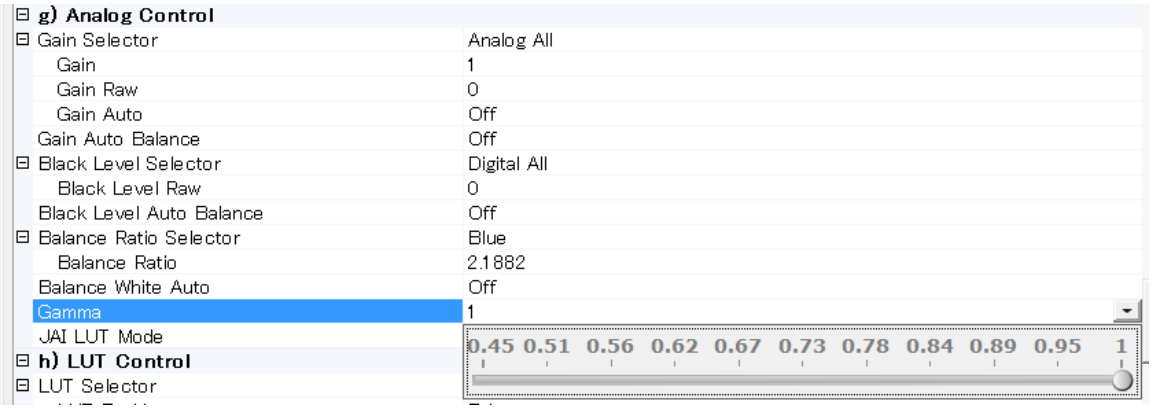


Fig. 57 Look up table values

11.9 Gamma

This command is used for setting the required gamma characteristics.
In order to use Gamma, set;
JAI LUT Mode : Gamma



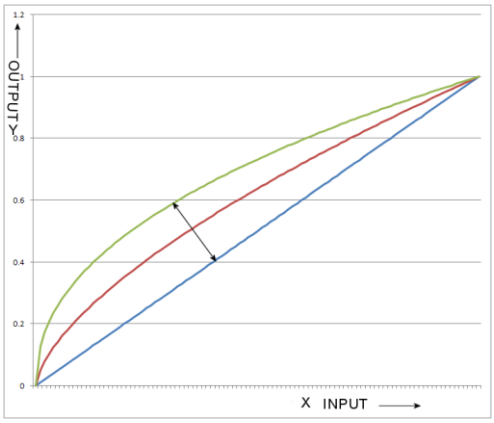
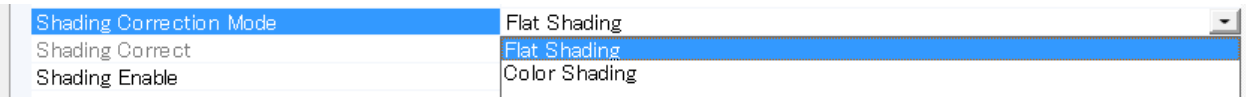


Fig. 58 Gamma compensation

11.10. Shading Correction

This function compensates for shading caused by the lens or the light source used. There are two methods of correction.



Flat shading correction:
The method to compensate the shading is to measure the highest luminance level in the image and use that data as the reference. Luminance levels of other areas are then adjusted so that the level of the entire area is equal. The block for compensation is 128pixels(H) x 128 pixels(V) and the complementary process is applied to produce the compensation data with less error.

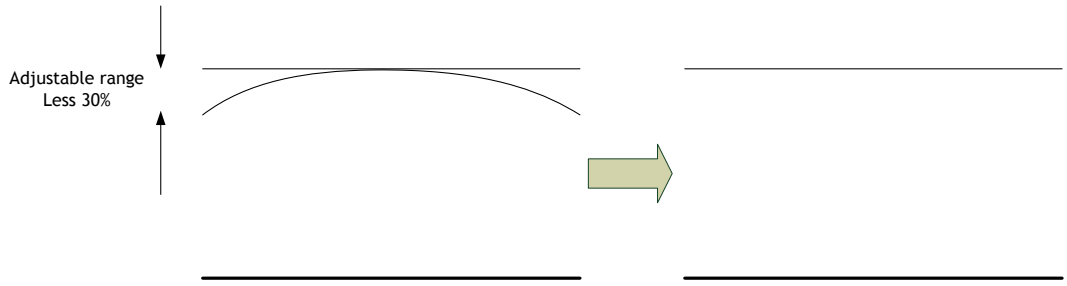


Fig. 59 Flat shading correction concept drawing

Color shading correction(For AB-200GE only):
In this case, R channel and B channel are adjusted to match with G channel characteristics. The block for compensation is 128pixels(H) x 128 pixels(V) and the complementary process is applied to produce the compensation data with less error.

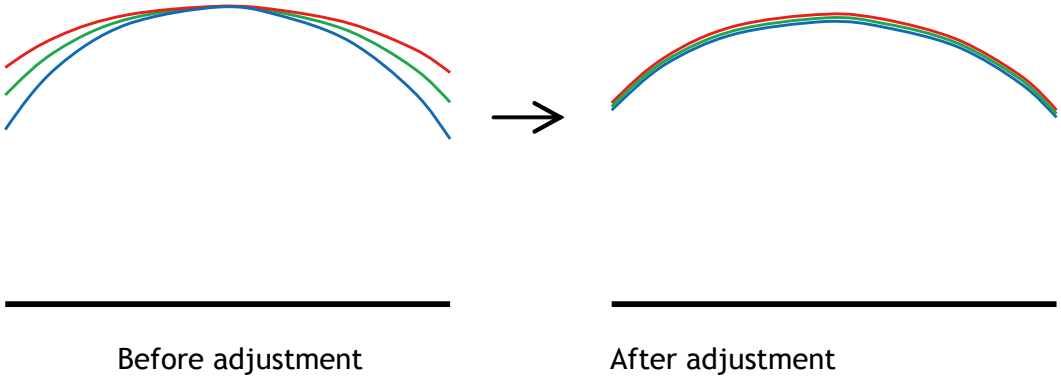


Fig.60 Color shading correction concept drawing

11.11. Bayer color interpolation (Only for AB-200GE)

This function is available only for AB-800CL. The AB-800CL uses a CCD with an RGB Bayer pattern. If the Bayer color interpolation is not used, the following RAW data can be output.

B	Gb	B	Gb	B	Gb	B	Gb	B	Gb
Gr	R	Gr	R	Gr	R	Gr	R	Gr	R
B	Gb	B	Gb	B	Gb	B	Gb	B	Gb
Gr	R	Gr	R	Gr	R	Gr	R	Gr	R

Fig. 61 Bayer pattern

The RAW data contains only luminance information for each color and outputs as a monochrome signal. The Bayer color interpolation can complement lacking color information on each pixel and output RGB color data as the result. Color interpolation compensates for the lack of color information by using information from adjacent pixels. The following is the concept drawing for the color interpolation process.

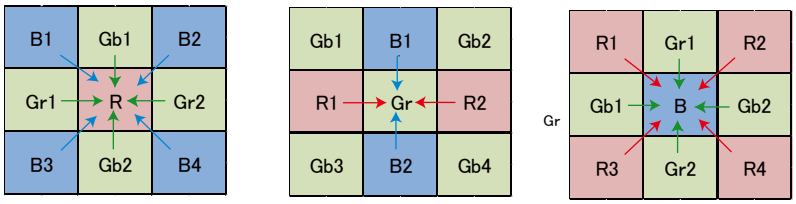
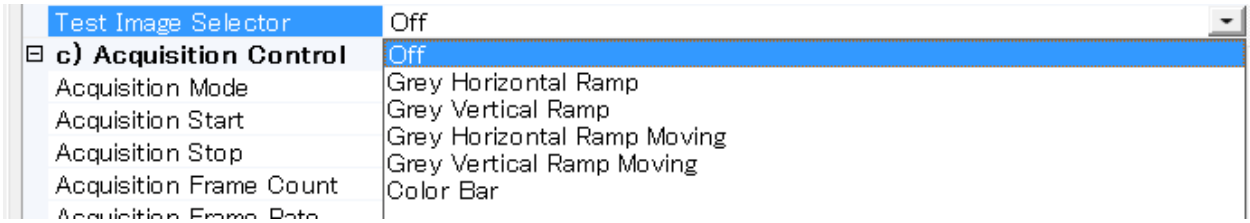


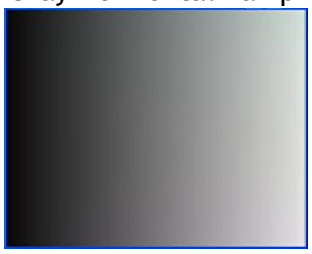
Fig. 62 Color interpolation concept drawing

11.12. Test Image selector

One of the following signals can be output through GigE interface.

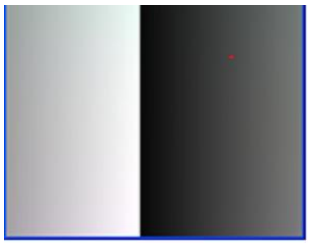


Gray Horizontal Ramp



Gray Vertical Ramp

Gray Horizontal Ramp Moving



Gray Vertical Ramp Moving

Color Bar (AB-200GE only)

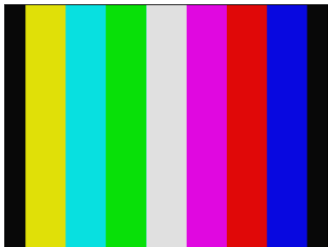


Fig. 63 Test pattern

11.13. Temperature sensor

This function reads out the temperature inside the camera.
The measuring range : -55 to +125°C
Resolution : 0.0625 °C

The following table shows examples of values which can be read out by the TMPO command.

TEMPERATURE (°C)	DIGITAL OUTPUT(1) (BINARY)	HEX
150	0100 1011 0000 0111	4B07
125	0011 1110 1000 0111	3E87
25	0000 1100 1000 0111	0C87
0.0625	0000 0000 0000 1111	000F
0	0000 0000 0000 0111	0007
–0.0625	1111 1111 1111 1111	FFFF
–25	1111 0011 1000 0111	F387
–55	1110 0100 1000 0111	E487

The display resolution in the JAI camera control tool is 1 °C.

12. Examples of operation using JAI Control Tool

Note: In this section, the pictures of AMAB-800GE are used.

For more details regarding the JAI control Tool, please refer to the Operation manual provided in the JAI SDK.

12.1. About GenICam™ SFNC1.3

The AM-200GE and AB-200GE are designed as conforming to GenICam SFNC1.3. GenICam SFNC stands for GenICam Standard Feature Naming Convention. By defining the standard cases and the standard features, general-purpose software can control cameras from any manufacturers which conform to the GenICam standard.

JAI, in the past, used traditional feature names in order to maintain naming continuity with previous cameras. However, starting with the AM-200GE AND AB-200GE and after, JAI GigE Vision cameras will now fully comply with GenICam SFNC feature names.

Accordingly, terminologies used for functions may be different from those used with previous models. Refer also to chapter 9. Core functions.

12.2. Examples of camera operation

The following explains the operation of the camera using the GenICam SFNC 1.3 Control Tool.

12.2.1 Operational cautions

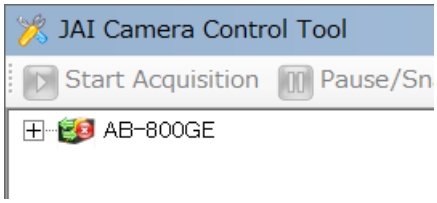
1. Features shaded gray in the Features Properties cannot be set.
2. If the image size is to be changed, image capturing should first be stopped before setting the size parameters.

12.2.2 Connecting camera(s)

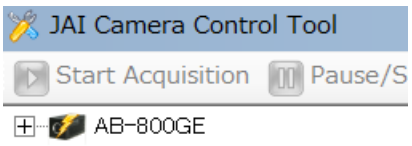
Connect the camera to the network. If the connection is established, start the JAI Control Tool. The model name of the connected camera and icon will be displayed on the screen.

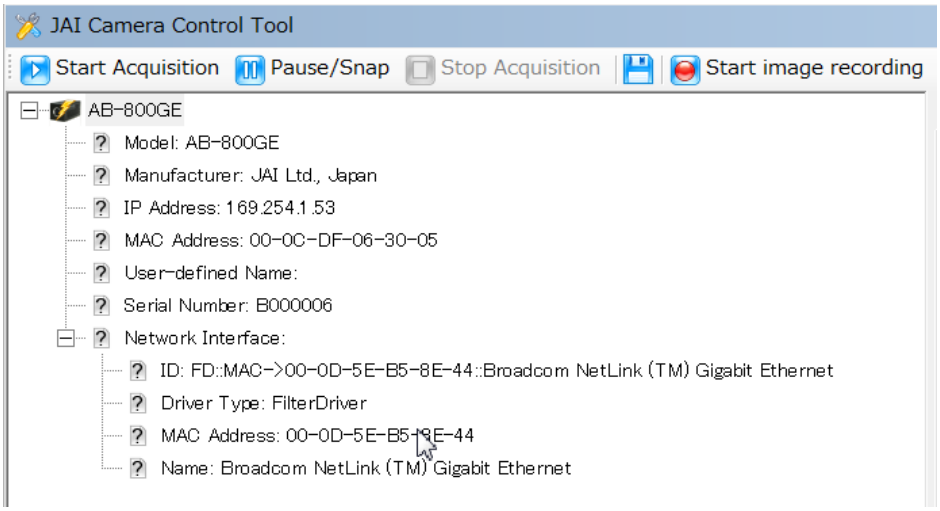
After clicking the icon, the status will change to indicate the camera is successfully connected to the Control Tool.

Waiting for connection



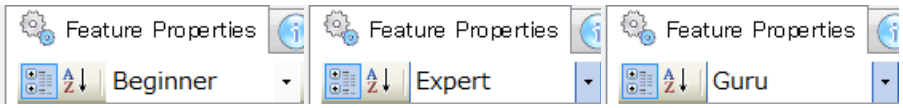
Connected





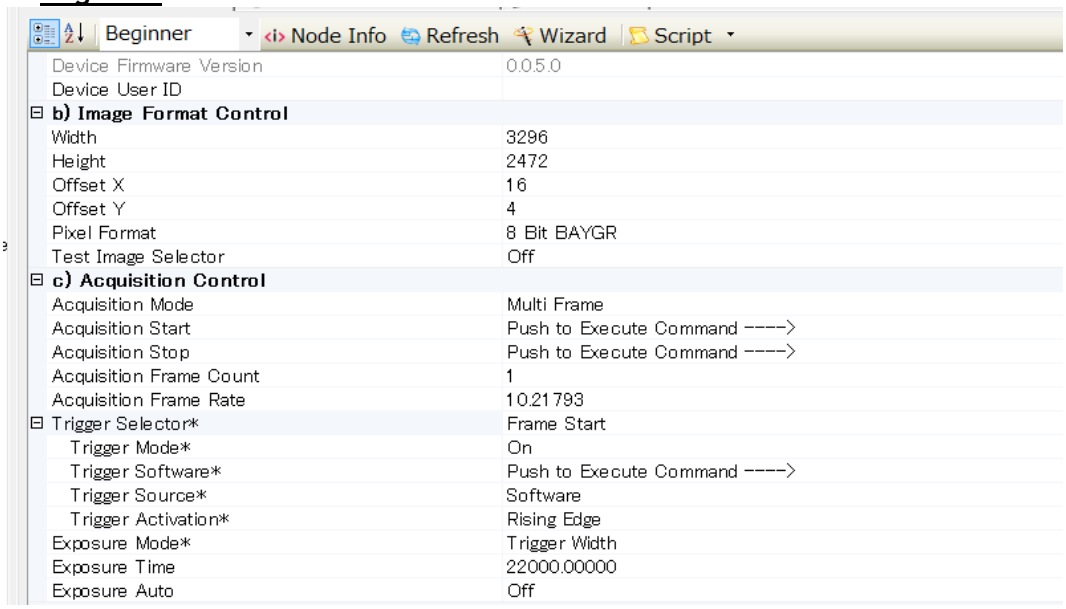
12.2.3 Camera setting layers

GenICam has 3 levels of settings. Those are Beginner, Expert and Guru.
The number of available settings increase with each level up to a maximum in the Guru layer.

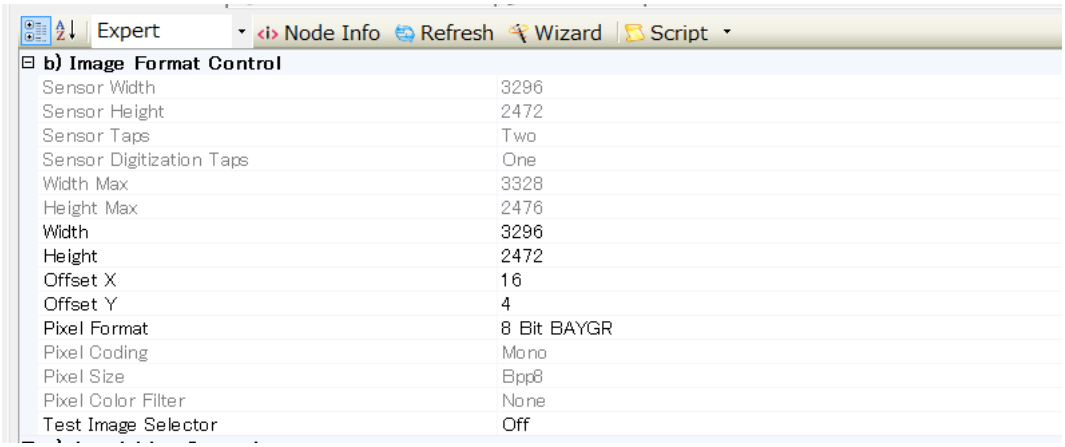


The following examples of Acquisition control menus illustrate how settings expand from level to level.

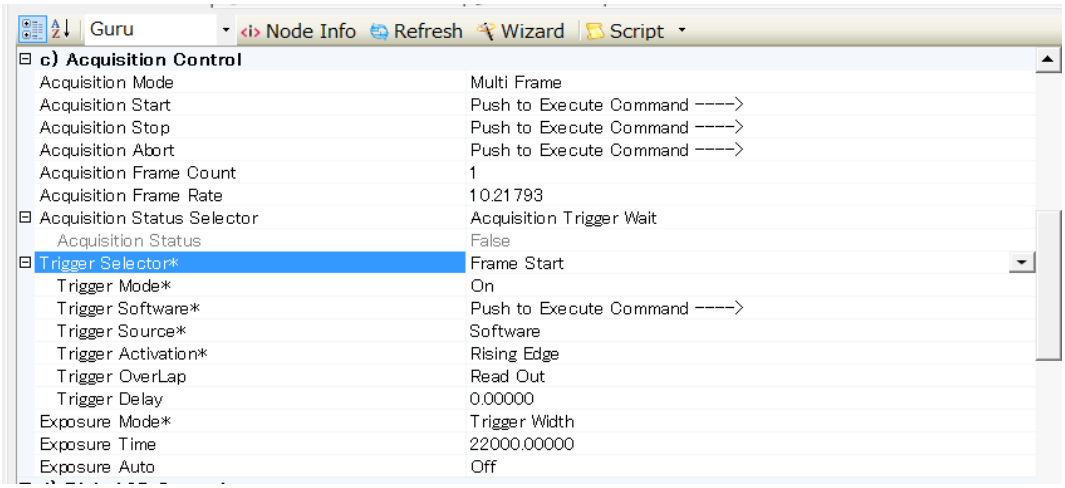
Beginner



Expert / Guru



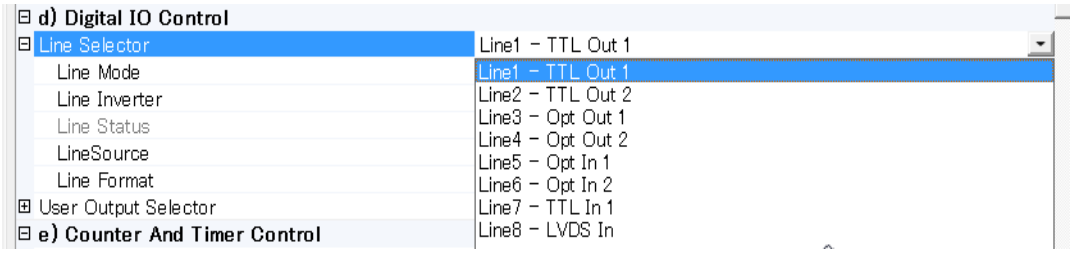
Guru /Expert



12.4. Input and output settings

12.4.1. Connection with the external devices

The relation of the line input and output (Digital I/O) and the external terminal in the JAI GigE Vision cameras is fixed. Refer to chapter 6.1. Digital Interface, for the details.



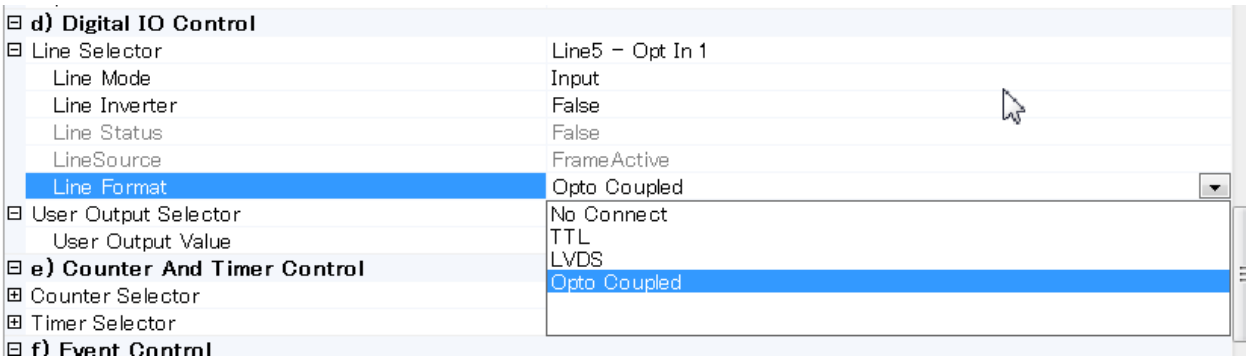
In the Control Tool, they are displayed as Line1-TTL Out 1.
Note: This settings menu is only available in the Expert and Guru setting layers.

12.4.2. Setting inputs and outputs

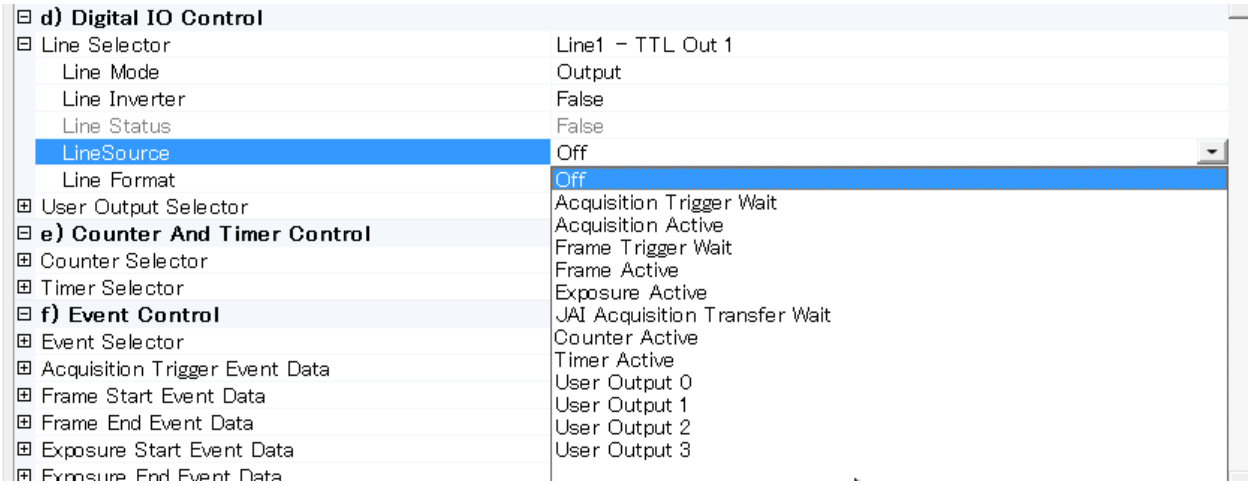
12.4.2.1 Select signal to connect with Line which is selected by Line selector

This function determines which signal is connected with Digital I/O (Line 1 through Line 8).

The following figure is an example of setting Line 5 –Opt In 1. In this case, Line Source is the signal to connect with Line 5 -Opt In 1. But Frame Active is available for only output and accordingly, it is not selectable in the Control tool. Line Format is automatically set at Opto Coupled.



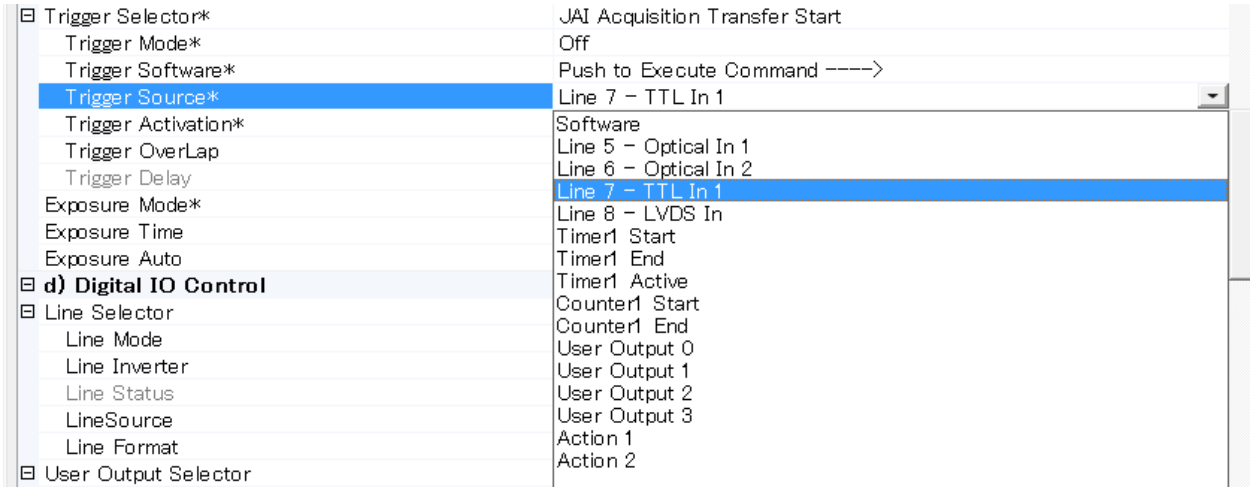
The following figure is an example of setting output so that the signal output from Line1 – TTL Out 1is selected from signals in the Line Source. In this case, there is no selection, OFF.



12.4.2.2 Select Trigger Source

Which signal is used as the trigger signal can be configured by the Trigger Source in the Trigger Selector of Acquisition Control.

In the following figure, Frame Start is selected as the trigger and the trigger source is configured Line7 – TTL In 1.



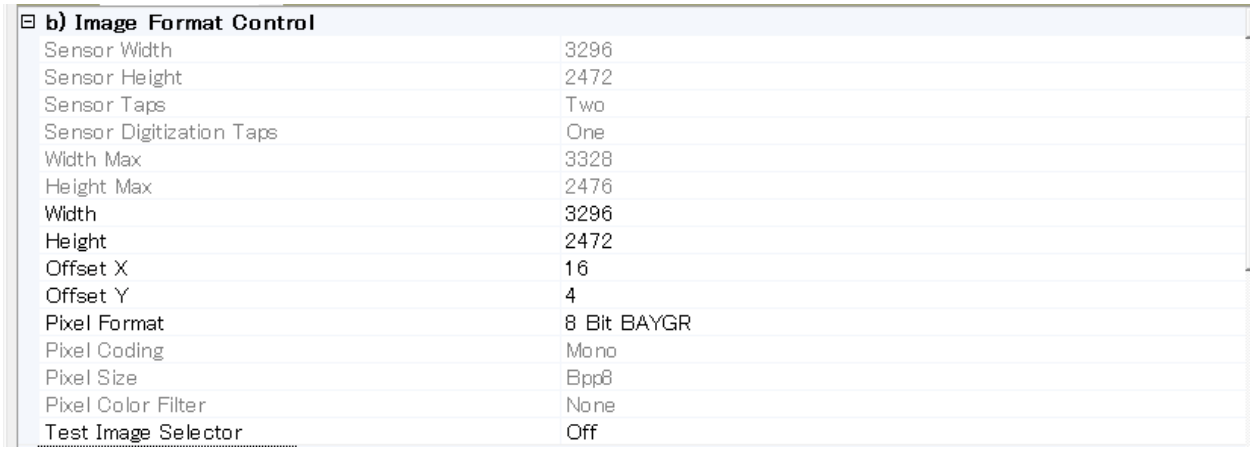
12.4.3. Specify the image size to be captured

Refer also to the chapter 7.2. AOI (Area of Interest).
The following parameters are required to specify the image size.

OFFSET X: Specify the starting position of the image in the horizontal direction
Width: Specify the width of the image
OFFSET Y: Specify the starting line of the image
Height: Specify the height of the image

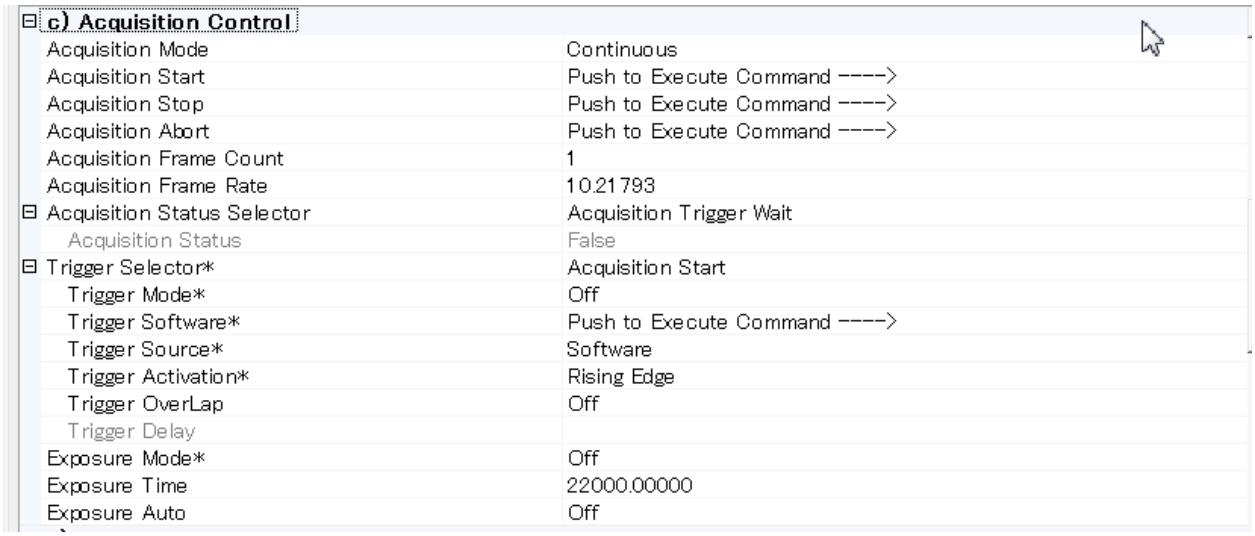
In order to readout full pixels,
OFFSET X = 0
Width = Maximum number of pixels in the horizontal direction
OFFSET Y = 0
Height= Maximum number of pixels in the vertical direction

The above setting includes OB in both horizontal and vertical.

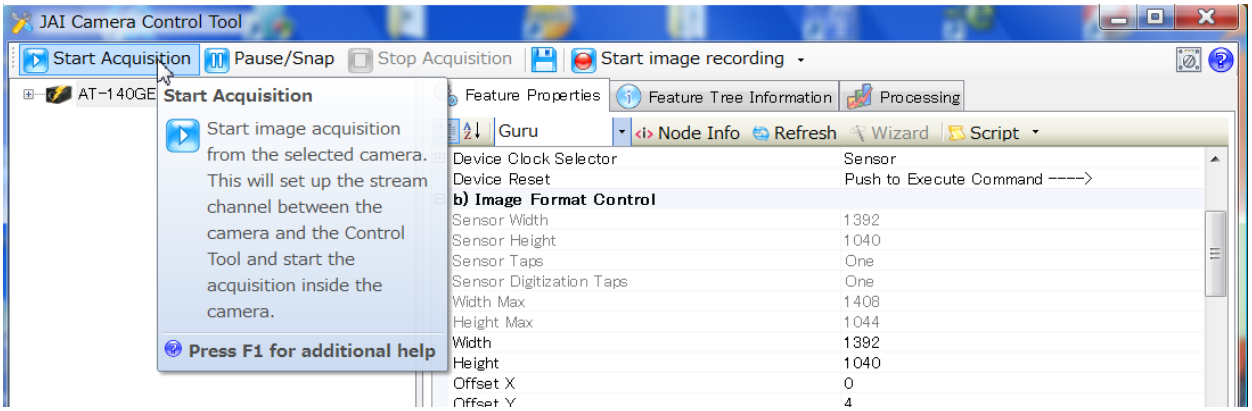


12.4.4. Acquisition of the image

The settings related to image acquisition are configured in the Acquisition Control. The following shows the Acquisition Control screen (Guru layer)



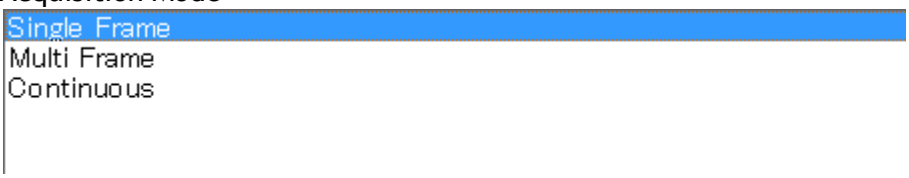
After setting the acquisition, click Start Acquisition button.



12.4.4.1 Basic settings

The basic setting items are Acquisition Mode, Trigger Selector, Exposure Mode.

Acquisition Mode



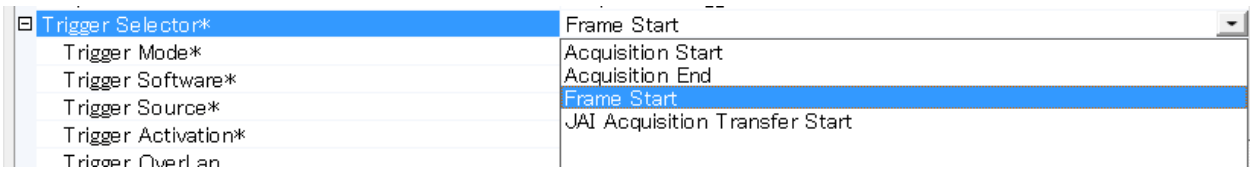
Acquisition Mode can be selected from Continuous, Single Frame and Multi Frame.

Continuous: If the trigger is input, the image is continuously captured.
In order to stop the acquisition, Acquisition End command must be executed.

Single Frame: If the trigger is input, only one frame is captured and after the completion of capturing, the acquisition is automatically stopped.

Multi Frame: If the trigger is input, frames which are set by Acquisition Frame Count are captured and after the completion of capturing, the acquisition is automatically stopped.

Trigger Selector



Trigger Selector includes Acquisition Start and Acquisition End commands which determine the start point and end point of acquisition, and Trigger commands which set the trigger timing.

Acquisition Start has ON or OFF setting. Refer to chapter 9.1 for the details.

ON: In this case, if Acquisition Start Trigger is applied, the status is waiting the trigger input.
The acquisition starts in the order of Acquisition start Trigger input and Trigger signal input.

OFF: In this case, the camera runs freely. If the trigger signal is input, the acquisition starts immediately.

Trigger setting

Select from Frame Start, Exposure Start, Exposure End and JAI Acquisition Transfer Start and set the details.

Frame Start: The exposure starts at the point of frame start.
JAI Acquisition Transfer Start : This command makes the delayed readout from the camera effective.

Exposure Mode setting

Timed : The exposure is effective only for setting duration.
Trigger Width : The exposure time is equal to the trigger width.

12.4.5. Setting examples

12.4.5.1 Capture the image continuously with fastest frame rate

Acquisition Mode	Continuous(Free run)	
Acquisition Frame Rate	10.2 fps	
Trigger selector	Acquisition Start	Trigger mode : OFF
	Acquisition End	Trigger mode : OFF
	Frame Start	Trigger mode : OFF
	JAI Acquisition Transfer Start	Trigger Mode: OFF
Exposure Mode	OFF or Timed	
Exposure Time	Any value	If Exposure Mode is Timed

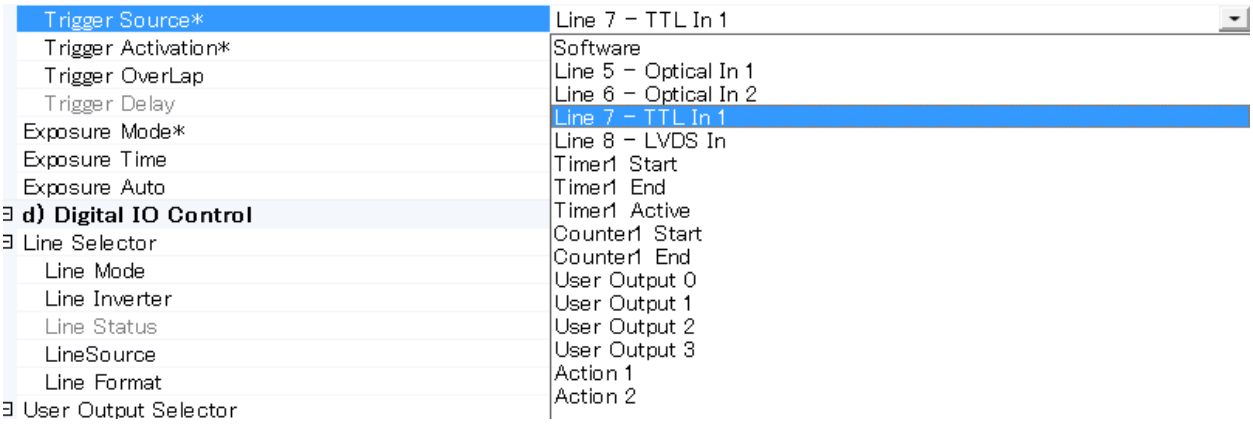
12.4.5.2 Capture the image with half of the frame rate (increasing the sensitivity)

Acquisition Mode	Continuous (Free run)	
Acquisition Frame Rate	5fps	
Trigger selector	Acquisition Start	Trigger mode : OFF
	Acquisition End	Trigger mode : OFF
	Frame Start	Trigger mode : OFF
	JAI Acquisition Transfer Start	Trigger Mode: OFF
Exposure Mode	OFF or Timed	
Exposure Time	Any value	If Exposure Mode is Timed

12.4.5.3 Capture one frame with preset exposure time using the external trigger

Acquisition Mode	Single Frame	
Trigger selector	Acquisition Start	Trigger mode : OFF
	Acquisition End	Trigger mode : OFF
	Frame Start	Trigger mode : ON
	JAI Acquisition Transfer Start	Trigger Mode: OFF
Exposure Mode	Timed	
Exposure Time	Any value	

Frame Start settings



Trigger Source	Choose from the above selection
Trigger Activation	Rising Edge, Falling Edge
Trigger Overlap	Off or Read Out
Trigger Delay	Any value, Normally set to 0

12.4.5.4 Capture multi frames of the image with preset exposure time using the external trigger

In the 12.4.5.3 example, the following setting should be changed.

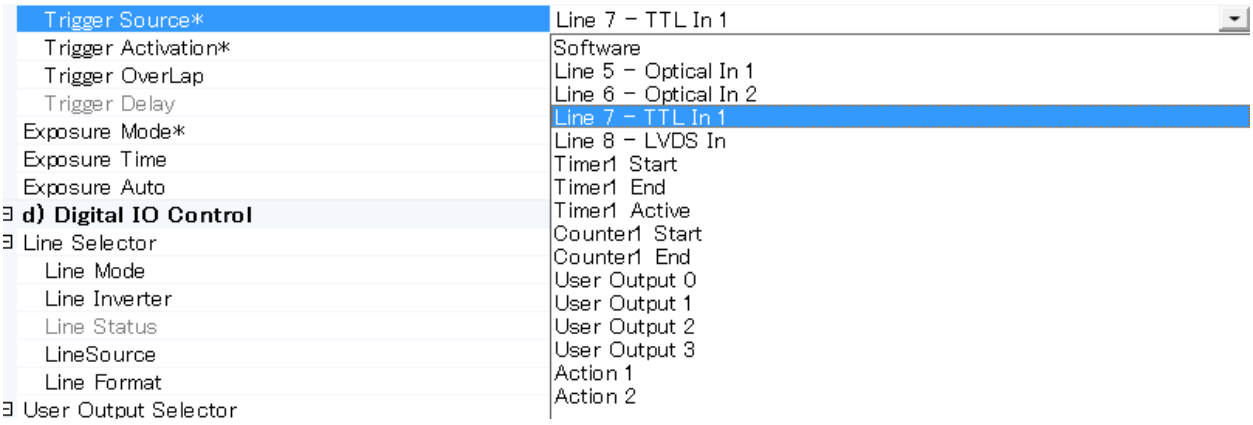
Acquisition Mode	Multi Frame
Acquisition Frame Count	Any value which can be set

When PIV operation is selected, this should be set even number.

12.4.5.5 Capture one frame image with the trigger width using the external trigger

Acquisition Mode	Single Frame	
Trigger selector	Acquisition Start	Trigger mode : OFF
	Acquisition End	Trigger mode : OFF
	Frame Start	Trigger mode : ON
	JAI Acquisition Transfer Start	Trigger Mode: OFF
Exposure Mode	Trigger Width	

Frame Start setting



Trigger Source	Choose from the above selection
Trigger Activation	Rising Edge(Level High) or Falling edge (Level Low)
Trigger Overlap	Off or Read Out
Trigger Delay	Any value、 Normally set to 0

12.4.5.6 Capture multi frames of the image with the trigger width using the external trigger

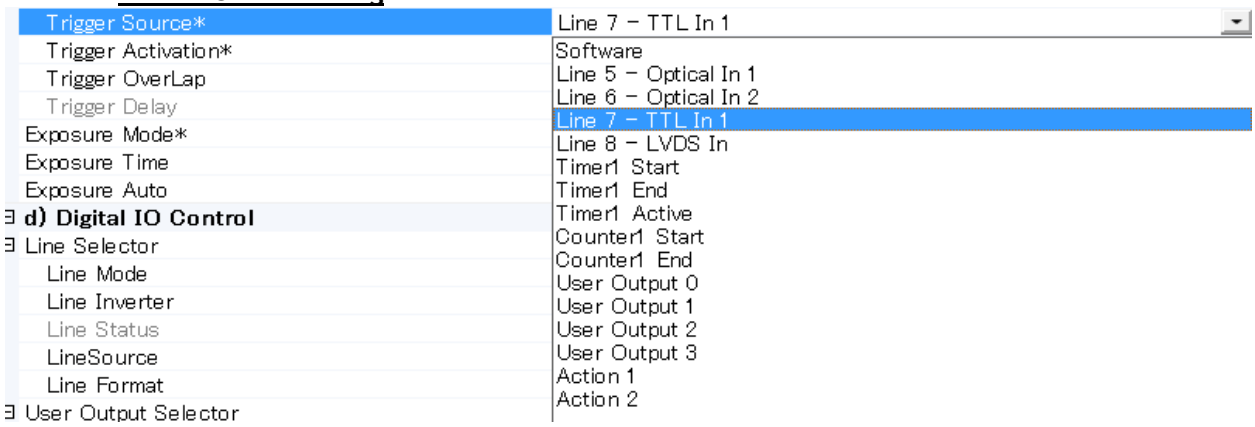
In the example 12.4.5.5, the following setting should be changed.

Acquisition Mode	Multi Frame
Acquisition Frame Count	Any value which can be set

12.4.5.7 Capture the image continuously with preset exposure time by using the external trigger

Acquisition Mode	Continuous	
Trigger selector	Acquisition Start	Trigger mode : OFF
	Acquisition End	Trigger mode : OFF
	Frame Start	Trigger mode : ON
	Exposure Start	Trigger mode : OFF
	Exposure Stop	Trigger Mode: OFF
	JAI Acquisition Transfer Start	Trigger Mode: OFF
Exposure Mode	Timed	
Exposure Time	Any value	

Frame Start setting

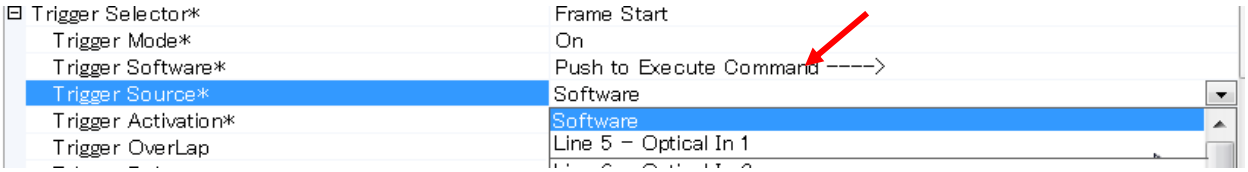


Trigger Source	Choose from the above selection
Trigger Activation	Rising Edge, Falling Edge
Trigger Overlap	Off or Read Out
Trigger Delay	Any value, Normally set to 0

12.4.5.8 Capture the image using Software Trigger

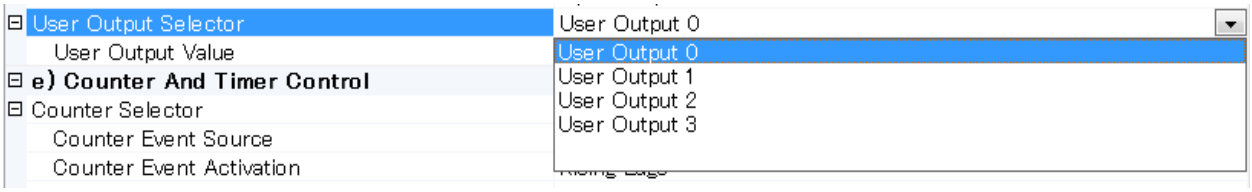
Acquisition Mode	Continuous	
Trigger selector	Acquisition Start	Trigger mode : OFF
	Acquisition Stop	Trigger mode : OFF
	Frame Start	Trigger mode : ON
	JAI Acquisition Transfer Start	Trigger Mode: OFF
Exposure Mode	OFF or Timed	
Exposure Time	Any value	If Exposure Mode=Timed

Frame Start setting

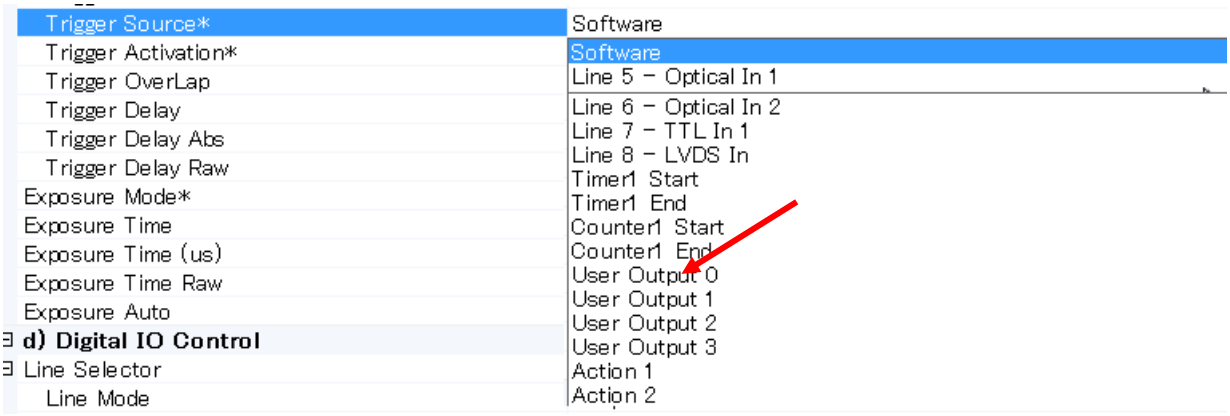


Select “Software” in the Trigger Source and execute Trigger Software command. Software trigger is generated inside the camera and the settings are not changed. Therefore, it is useful if the customer tests the trigger function.

In order to use the software trigger, use “User Output”.



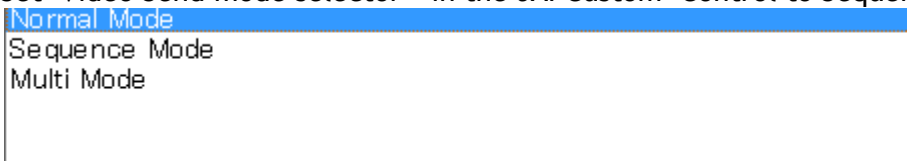
Select User Output, and select the same user output in the Trigger Source.



12.4.5.9 Sequence Trigger setting

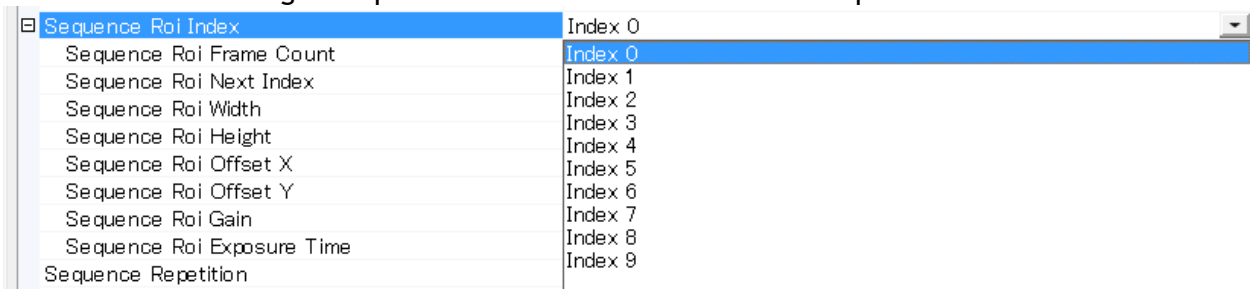
First of all, it is necessary to set acquisition mode described before.

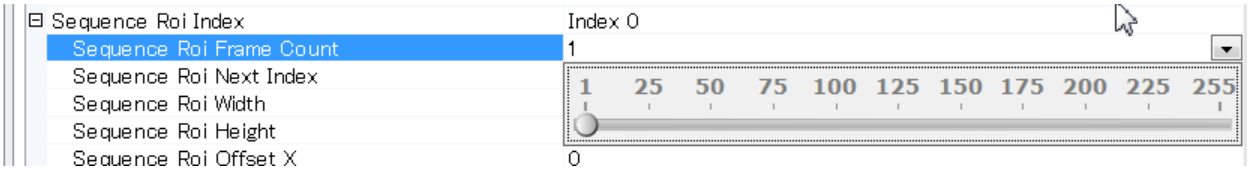
Set Video Send mode selector in the JAI Custom Control to Sequence mode.



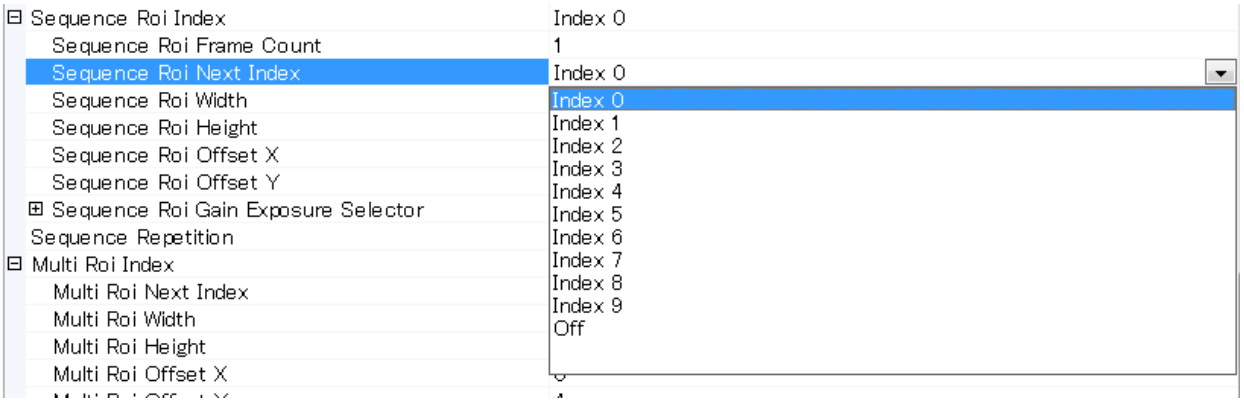
Then, set each image by Sequence ROI Index in the JAI Custom Control.

The following example is for Index0 and one frame is captured.





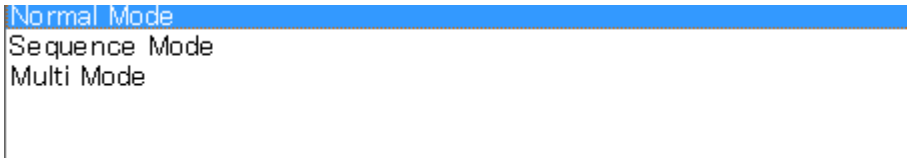
Then, in the Sequence ROI Next Index, the next image is set. Other images are set in the same manner. Next index can also set the order of capturing the images. In order to stop the sequence, the next index of the last index should be set “OFF”.



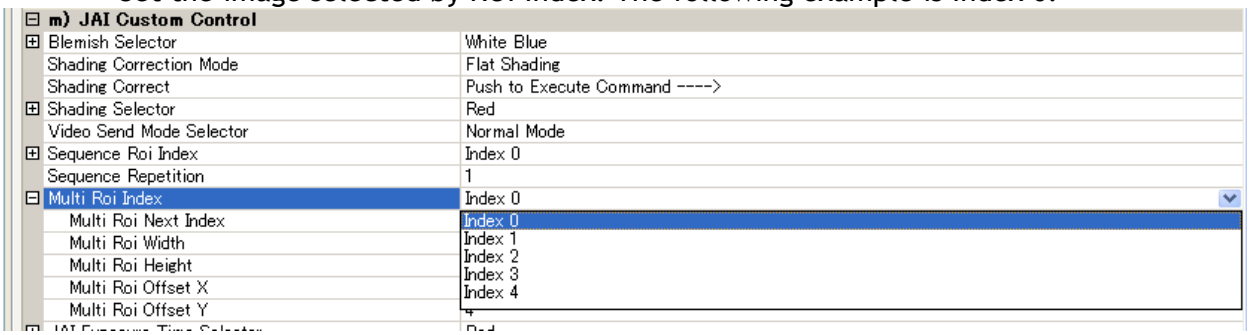
12.4.5.10 Multi ROI setting

First of all, it is necessary to set acquisition mode described before.

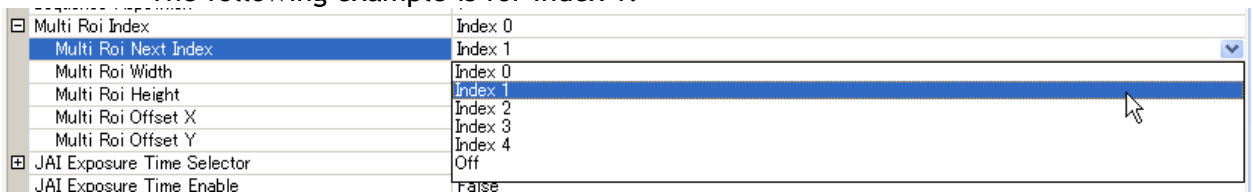
Set “Video Send Mode Selector” in the JAI Custom Control to “Multi Mode”.



Set the image selected by ROI Index. The following example is Index 0.



Then, the next image is set by Multi ROI Next Index.
The following example is for Index 1.



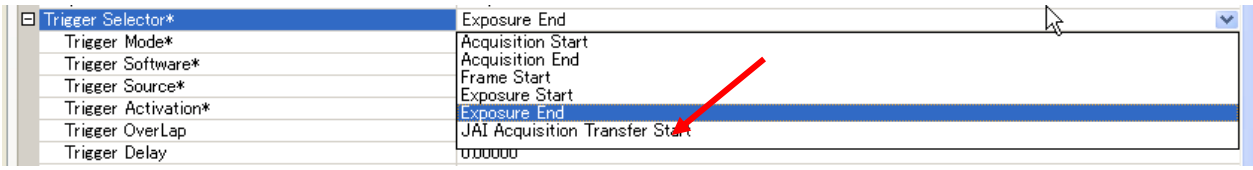
After that, set the image of Index 1 by Multi ROI Index.
While repeating the above procedure, set the necessary ROI. Maximum of 5 images can be set. On the last image setting, set “Multi ROI Next Index” to “OFF”.

12.4.5.11 Delayed readout setting

If a system using multiple cameras is configured, it can use delayed readout in order to improve the traffic in the PC port. Refer to the chapter 8.4.3 The data transfer for multiple cameras.

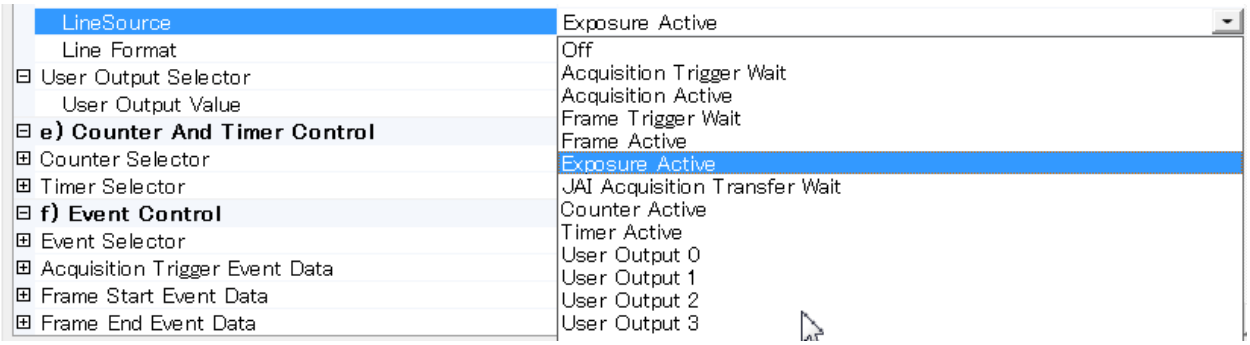
Setting:
Trigger selector: JAI Acquisition Transfer Start
Trigger mode: ON

This should be applied to all connected cameras.



12.4.5.12 Operate the external strobe light

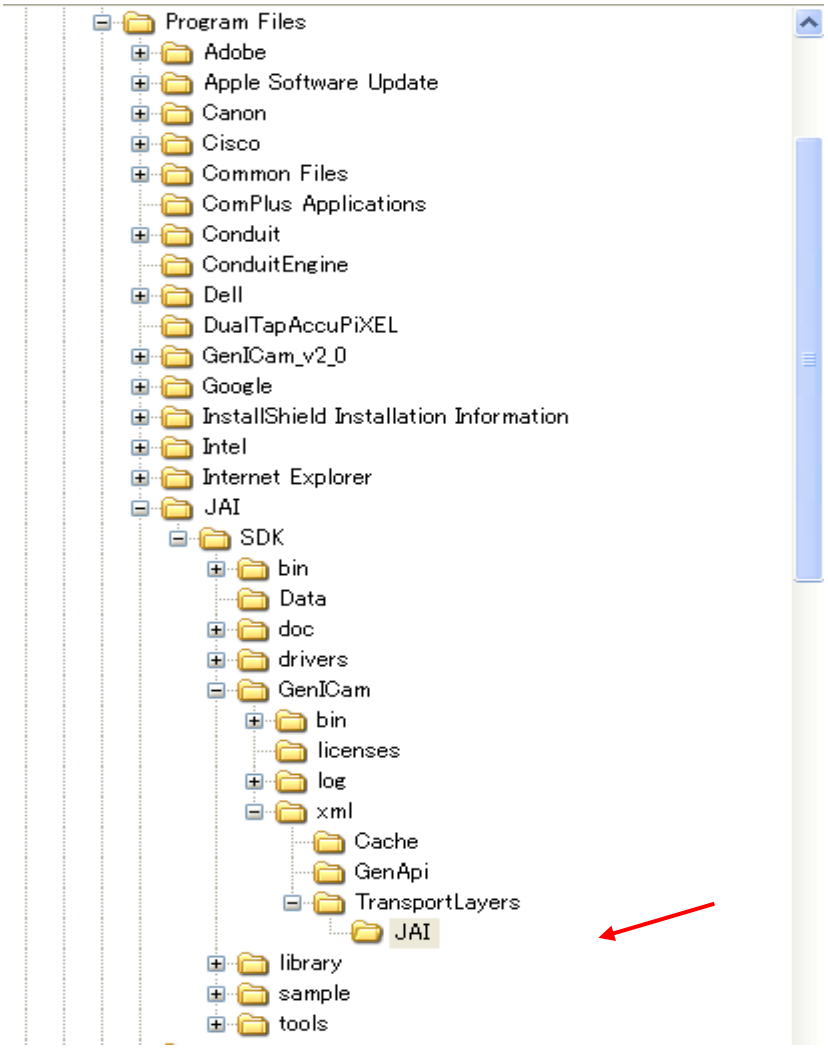
“Exposure Active” can be used as the strobe driven signal.
Then set “LINE” for signal output.
The following example selects Line 1- TTL Out 1 as the output terminal.



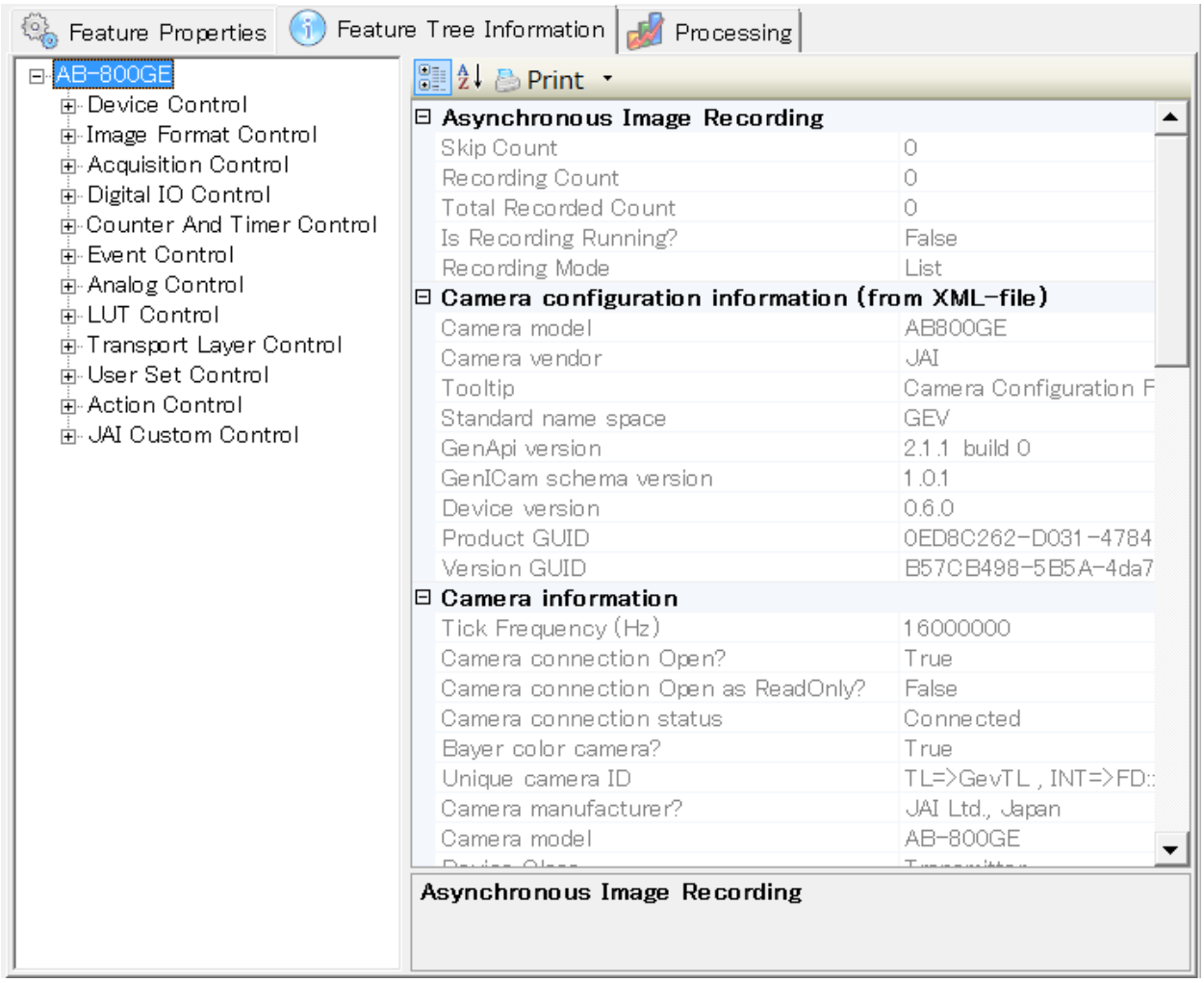
12.4.6 How to view the XML file

All features and registers are stored in the camera as an XML file.
The XML file is stored in the following folder.

Program ⇒ JAI ⇒ SDK ⇒ XML ⇒ Transportlayers ⇒ JAI

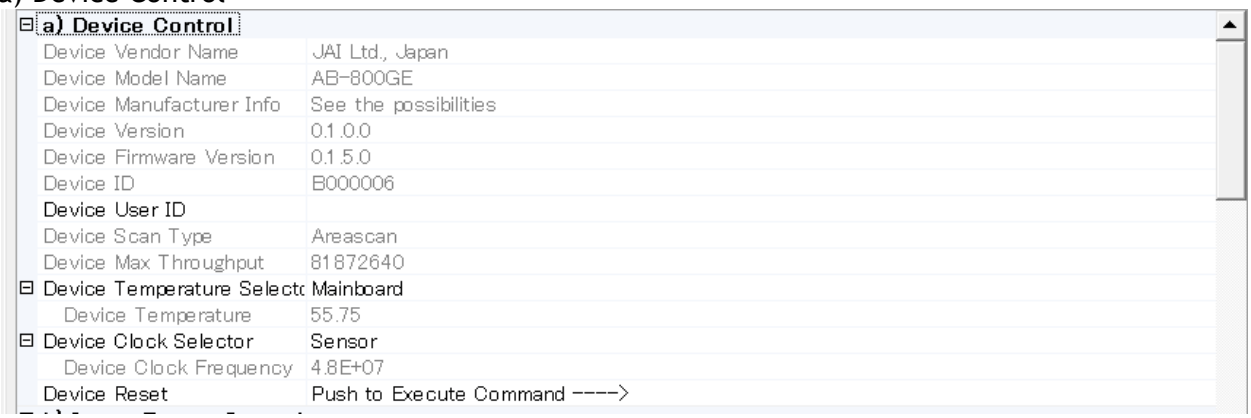


12.4.7 Feature Tree Information



12.4.8 Feature Properties (Guru)

a) Device Control



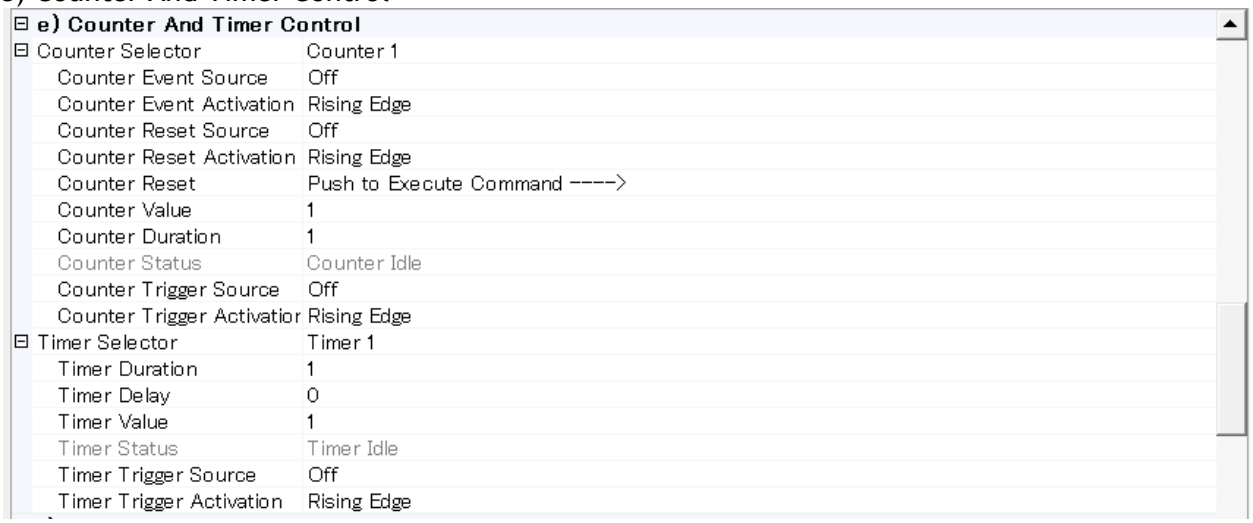
b) Image Format Control

b) Image Format Control	
Sensor Width	3296
Sensor Height	2472
Sensor Taps	Two
Sensor Digitization Taps	One
Width Max	3328
Height Max	2476
Width	3312
Height	2472
Offset X	16
Offset Y	4
Line Pitch	3312
Pixel Format	8 Bit BAYGR
Pixel Size	Bpp8
Pixel Color Filter	Bayer RG
Test Image Selector	Off

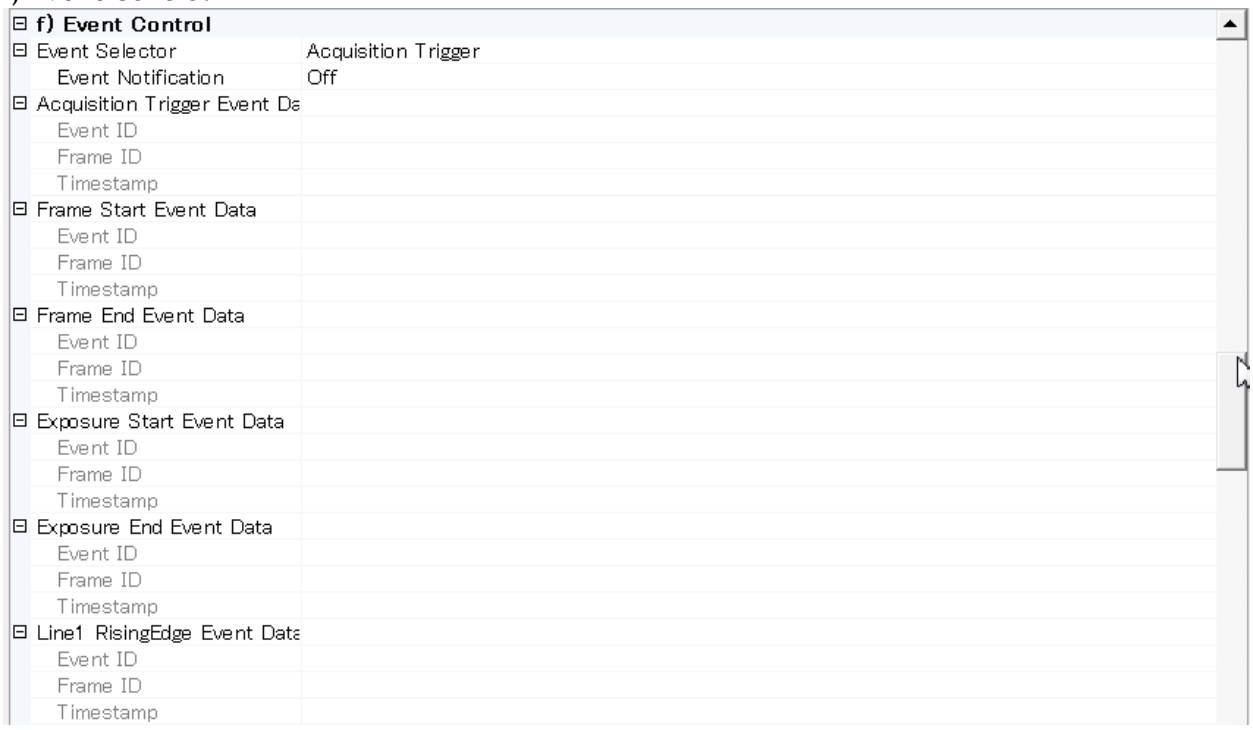
c) Acquisition Control & d) Digital IO Control

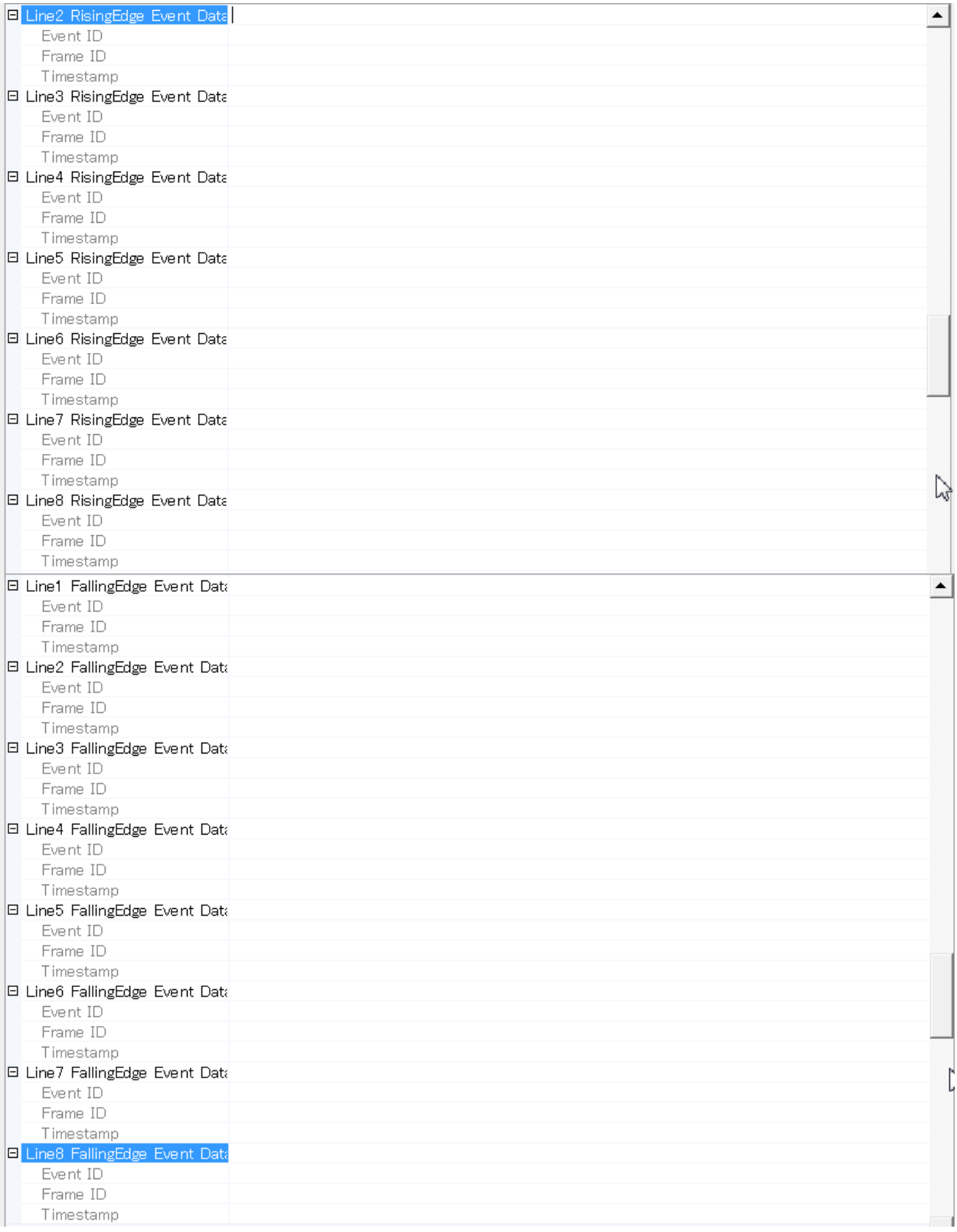
c) Acquisition Control	
Acquisition Mode	Continuous
Acquisition Start	Push to Execute Command ---->
Acquisition Stop	Push to Execute Command ---->
Acquisition Abort	Push to Execute Command ---->
Acquisition Frame Count	3
Acquisition Frame Rate	10.214
Acquisition Status Selector	Acquisition Trigger Wait
Acquisition Status	False
Trigger Selector*	Frame Start
Trigger Mode*	Off
Trigger Software*	Push to Execute Command ---->
Trigger Source*	Line 7 - TTL In 1
Trigger Activation*	Rising Edge
Trigger OverLap	Off
Trigger Delay	0
Exposure Mode*	Off
Exposure Time	2500
Exposure Auto	Off
d) Digital IO Control	
Line Selector	Line1 - TTL Out 1
Line Mode	Output
Line Inverter	False
Line Status	False
LineSource	Exposure Active
Line Format	TTL
User Output Selector	User Output 0
User Output Value	True

e) Counter And Timer Control

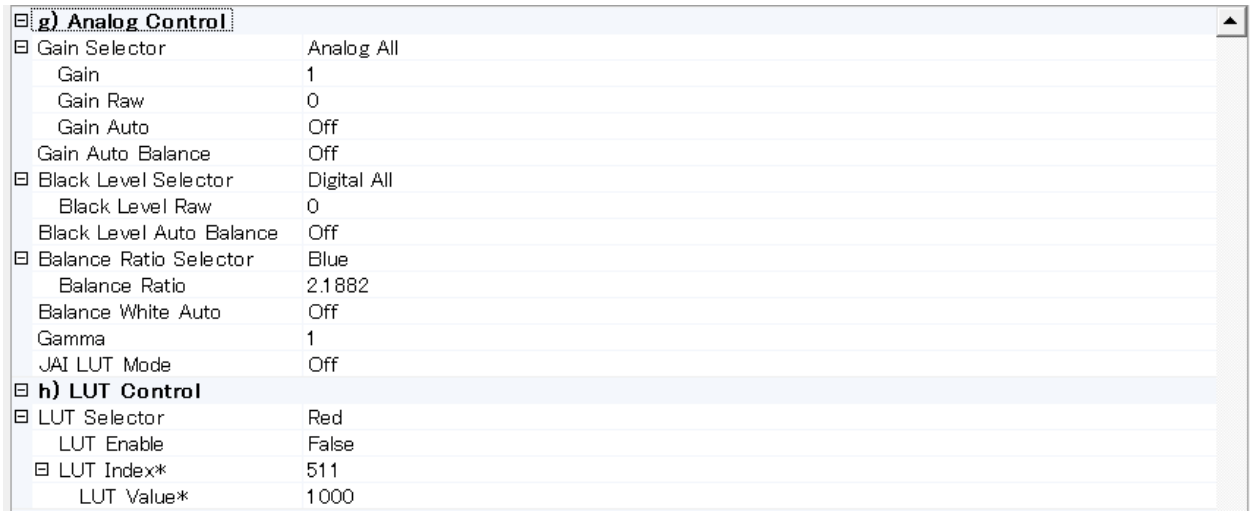


f) Event Control



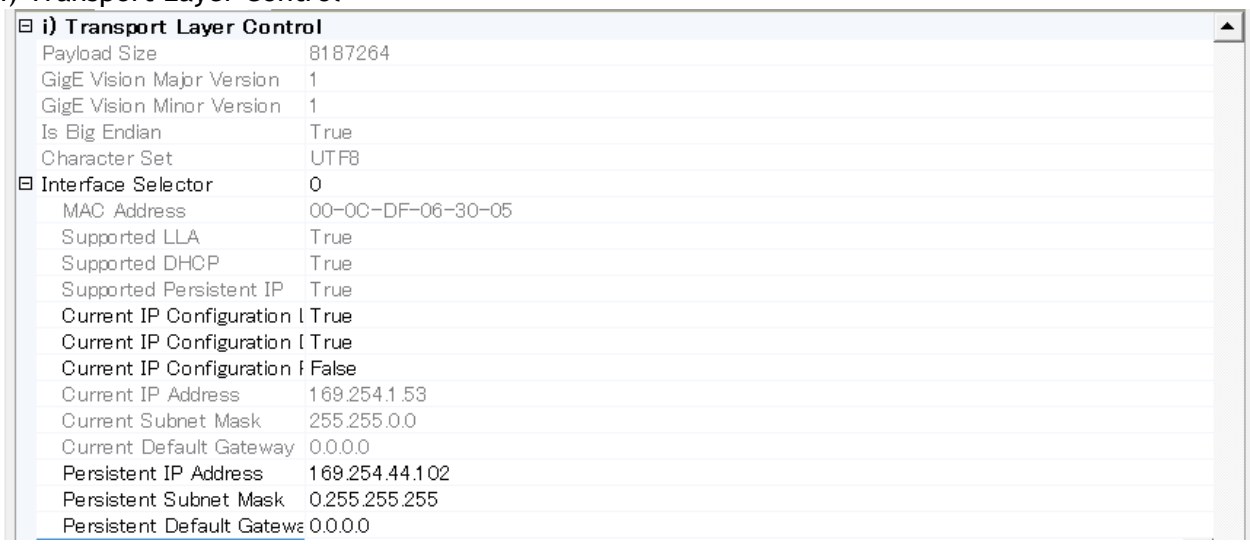

Line2 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line3 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line4 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line5 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line6 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line7 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line8 RisingEdge Event Data
Event ID
Frame ID
Timestamp
Line1 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line2 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line3 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line4 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line5 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line6 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line7 FallingEdge Event Data
Event ID
Frame ID
Timestamp
Line8 FallingEdge Event Data
Event ID
Frame ID
Timestamp

g) Analog Control & h) LUT Control



g) Analog Control	
Gain Selector	Analog All
Gain	1
Gain Raw	0
Gain Auto	Off
Gain Auto Balance	Off
Black Level Selector	Digital All
Black Level Raw	0
Black Level Auto Balance	Off
Balance Ratio Selector	Blue
Balance Ratio	2.1882
Balance White Auto	Off
Gamma	1
JAI LUT Mode	Off
h) LUT Control	
LUT Selector	Red
LUT Enable	False
LUT Index*	511
LUT Value*	1000

i) Transport Layer Control



i) Transport Layer Control	
Payload Size	8187264
GigE Vision Major Version	1
GigE Vision Minor Version	1
Is Big Endian	True
Character Set	UTF8
Interface Selector	0
MAC Address	00-0C-DF-06-30-05
Supported LLA	True
Supported DHCP	True
Supported Persistent IP	True
Current IP Configuration I	True
Current IP Configuration I	True
Current IP Configuration P	False
Current IP Address	169.254.1.53
Current Subnet Mask	255.255.0.0
Current Default Gateway	0.0.0.0
Persistent IP Address	169.254.44.102
Persistent Subnet Mask	0.255.255.255
Persistent Default Gatewa	0.0.0.0

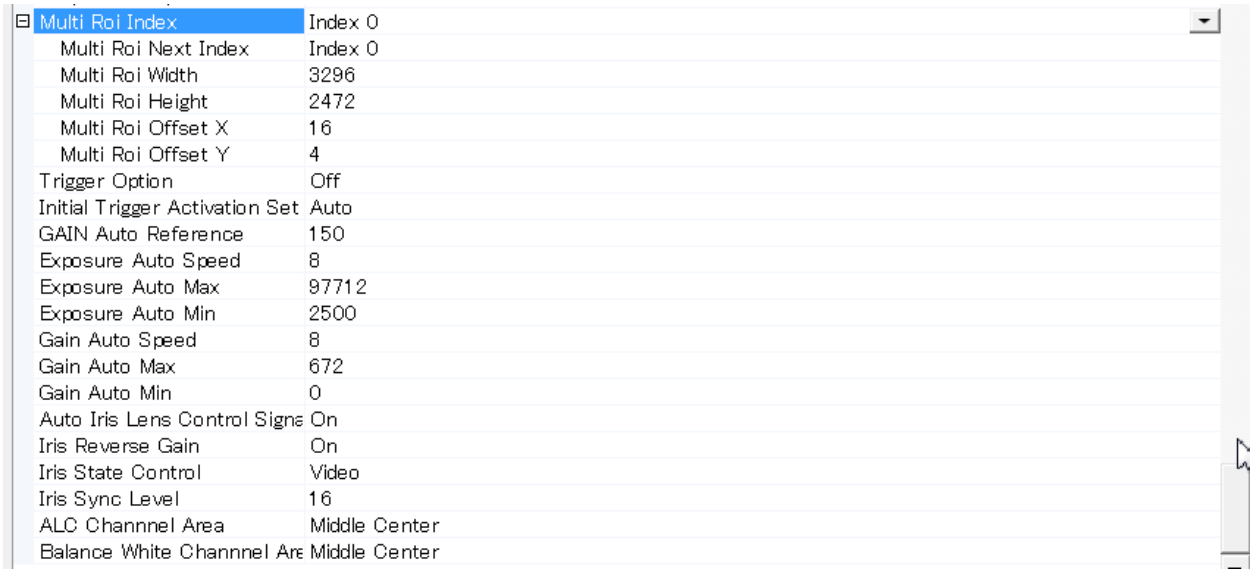
GigE Vision Supported Optio	Link Local Address configuration
Supported Option	True
First URL	Local:JAI_AB-800GE_Ver060.zip;306C0000;9ccf
Second URL	
Number Of Interfaces	1
Message Channel Count	1
Stream Channel Count	1
Heartbeat Timeout	40000
Timestamp Tick Frequency	16000000
Timestamp Control Latch	Push to Execute Command ---->
Timestamp Control Reset	Push to Execute Command ---->
Timestamp Tick Value	0
Control Channel Privilege	ControlAccess
Message Channel Port	52497
Message Channel Destinatio	169.254.228.213
Message Channel Transmiss	300
Message Channel Retry Cou	2
Message Channel Source P(	52497
Stream Channel Selector	0
Stream Channel Port	59415
Do Not Fragment	True
Packet Size	8868
Packet Delay*	1000
Stream Channel Destinati	169.254.228.213
Stream Channel Source F	0

j) User Set Control & k) Action Control

j) User Set Control	
User Set Selector	User Set1
User Set Load	Push to Execute Command ---->
User Set Save	Push to Execute Command ---->
k) Action Control	
Action Device Key	0x00
Action Selector	1
Action Group Key	0x00
Action Group Mask	0x00

l) JAI Custom Control

l) JAI Custom Control	
Blemish Selector	White
Blemish Enable	False
Blemish Detect Threshold	2000
Blemish Detect Position I	0
Blemish Detect	Push to Execute Command ---->
Shading Correction Mode	Flat Shading
Shading Correct	Push to Execute Command ---->
Shading Enable	False
Shading Selector	Blue
Shading Correct Position	5
Shading Correct Position	1
Shading Compensation Va	35637
Video Send Mode Selector	Normal Mode
Sequence Roi Index	Index 0
Sequence Roi Frame Cou	1
Sequence Roi Next Index	Index 0
Sequence Roi Width	3296
Sequence Roi Height	2472
Sequence Roi Offset X	16
Sequence Roi Offset Y	4
Sequence Roi Gain	1
Sequence Roi Exposure T	1
Sequence Repetition	1


Multi Roi Index
Index 0
Multi Roi Next Index
Index 0
Multi Roi Width
3296
Multi Roi Height
2472
Multi Roi Offset X
16
Multi Roi Offset Y
4
Trigger Option
Off
Initial Trigger Activation Set
Auto
GAIN Auto Reference
150
Exposure Auto Speed
8
Exposure Auto Max
97712
Exposure Auto Min
2500
Gain Auto Speed
8
Gain Auto Max
672
Gain Auto Min
0
Auto Iris Lens Control Signa
On
Iris Reverse Gain
On
Iris State Control
Video
Iris Sync Level
16
ALC Channnel Area
Middle Center
Balance White Channnel Are
Middle Center

13. External Appearance and Dimensions

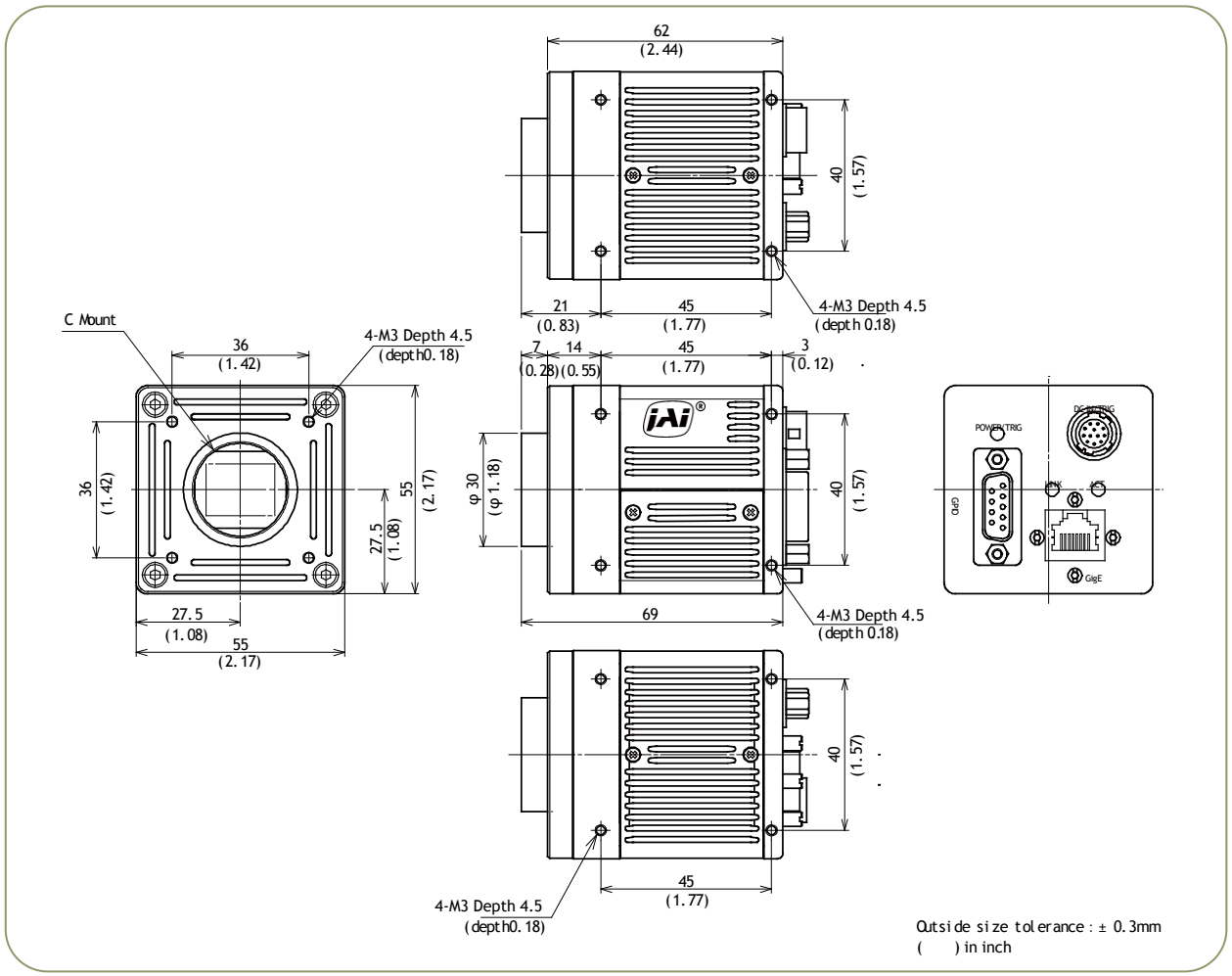


Fig.64 Outline (C mount version)

14. Specifications

14.1 Spectral response

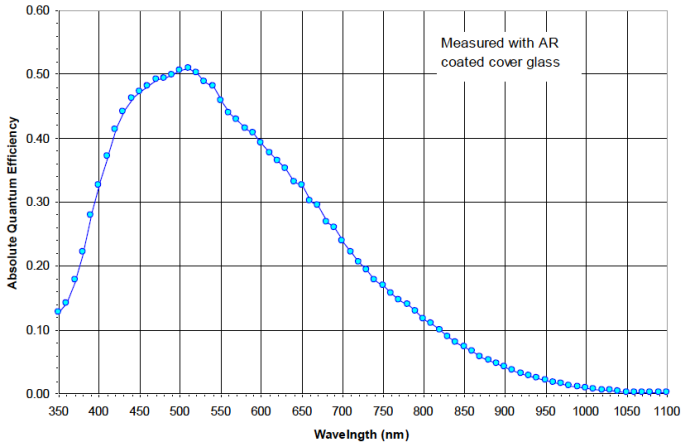


Fig. 65 Spectral response (AM-200GE)

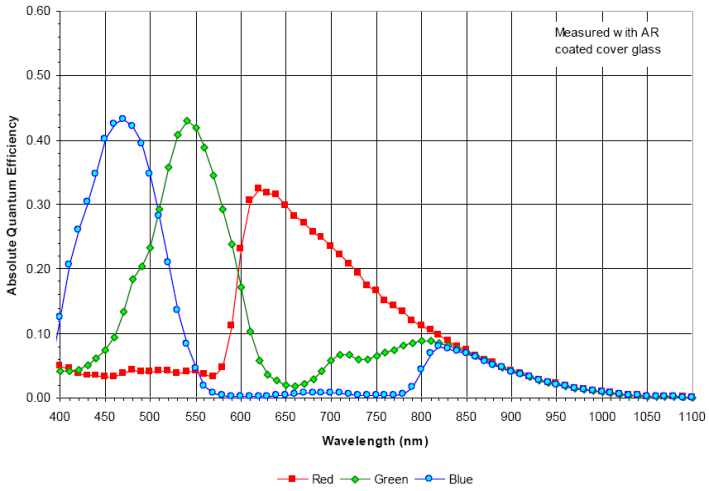


Fig.66 Spectral response (AB-200GE)

14.2 Specifications table

Specifications		AM-200GE	AB-200GE
Scanning system		Progressive scan, 2 taps	
Synchronizing system		Internal	
Image sensor		2/3 inch Monochrome interline CCD	2/3 inch Bayer color interline CCD
Sensing area		8.8 x 6.6mm 11 diagonal	
Cell size		5.5 (h) x 5.5 (v) μm	
Active pixels (for output)		1600 (h) x 1200 (v)	1600 (h) x 1200 (v)
Pixel clock		48 MHz	
Horizontal	Full	49.896KHz (1H=20.04μs) (962 clocks per line)	
	Binning ON	45.113KHz(1H=22.17μs)(1064 clks)	-
Vertical	Full	Total lines 1229 (Effective 1200)	
	Binning ON	Total lines 622 (Effective 600)	-
Pixel format		Mono8, Mono10, Mono10_Packed Mono12, Mono12_Packed	BayerGR8, BayerGR10, BayerGR12, BayerGR10_Packed, BayerGR12_Packed,RGB8_Packed, YUV422_Paked
Acquisition Frame rate	Binning Horizontal:1 Vertical: 1	40.6fps(Max) ~ 0.5(Min) for 8bit 38.4fps(Max) ~ 0.5(Min) for 10/12bit packed 28.8fps(Max) ~ 0.5(Min) for 10/12bit	40.6fps(Max) ~ 0.5(Min) for 8bit 38.4fps'Max) ~ 0.5(Min) for 10/12bit packed 28.8fps(Max) ~ 0.5(Min) for 10/12bit 14.5fps(Max) ~ 0.5(Min) for RGB (*2) 28.8fps(Max) ~ 0.5(Min) for YUV
	Binning Horizontal:1,2 Vertical: 2	72.5fps(Max) ~ 0.5(Min) for 8bit 72.5fps'Max) ~ 0.5(Min) for 10/12bit packed 57.5fps(Max) ~ 0.5(Min) for 10/12bit	-
Image Format	Full resolution	1600 (h) x 1200 (v)	
	Binning (h x v)	1 x 2 1600(h) x 600 (v) 2 x 1 800(h) x 1200(v) 2 x 2 800(h) x 600(v)	-
	AOI	Height : 8 ~ 1204, 1 line/step Offset Y: 0 ~ 1196, 1 line/step Width :8 ~ 1232, 8 pixels/step Offset X :0 ~ 1224, 8 pixels / step	Height :8 ~ 1204, 2 line/step Offset Y : 0 ~ 1196, 2 line/step Width :8 ~ 1232, 8 pixels/step Offset X :0 ~ 1224, 8 pixels / step
Sensitivity on sensor (minimum)		0.21 Lux (Gain 24dB, Shutter OFF, 50% video, 3200K, IR-cut)	0.51 Lux (Gain 24dB, Shutter OFF, 50% Green, 4600K)
S/N ratio		More than 57 dB (0dB gain, CCD output=350mV)	More than 55 dB (0dB gain, CCD output=290mV)
Iris video output		Analog, 0.7 V p-p with 0.3V H.sync	
Acquisition mode		Single frame/ Multi frames (1 – 255)/ Continuous	
Trigger selector		Acquisition start/Acquisition end/ Frame start / JAI Transfer start	
Exposure Control (Trigger)	OFF	Shutter OFF	
	Timed(Smearless OFF)	10μs to 1.999806 sec (2 sec - 194μs), 1μs step	
	Timed(Smearless ON)	10μs to 1.999806 sec (2 sec - 194μs), 1μs step	
	Trigger width	50μs to 2 sec.	
	PIV		
	Pre-dump		
Exposure Auto		Off / Once / Continuous	

Gain		Manual/Auto : -3dB to +24 dB (1 Step 0.0359 dB) Fine gain (Digital gain) (1step=0.00012 times)	Manual/Auto : 0dB to +24 dB (1 Step 0.0359 dB) Fine gain (Digital gain) (1step=0.00012 times)
White balance		-	Manual/Once/Continuous R/B:-7 ~ 10dB, 1 step=0.00012 times
Black level		33.5 LSB at 10-bit output, -256 LSB to 255 LSB can be changed, 1 step is 0.25dB (at 10-bit output)	
ALC function		Built-in, total control combining AGC, Exposure Auto and Auto iris.	
LUT		OFF: γ=1.0, ON= 512 points can be set	
Gamma		0.45, 0.5, 0.55, 0.6, 0.75, 0.80, 0.90, 1.0 (Approximation property)	
Shading correction		1. Flat shading correction 2. Color shading correction (AB-200GE only) Compensated by 128(H) x 128(V) pixels block	
Blemish Compensation (Bright)		Built in, maximum 512 pixels for dark and bright compensation (note: black compensation is only by factory preset)	
Color interpolation		-	3 x 3 interpolation matrix
Test pattern		OFF/Black-white/Gray H-ramp/ Gray V-ramp/White (100%)	OFF/Color bar/Gray H-ramp / Gray V-ramp /White (100%)
OB transfer mode		4 pixels for vertical, 16 pixels each for horizontal right and left sides	
Temperature sensor		-55 to +125ºC (measuring range), resolution is 0.0625ºC	
Interface (*3)		Gigabit Ethernet (IEEE802.3. AIA GigE Vision Standard) Jumbo frame max. 16020 (Default packet size is 1476Bytes) Not compliant with 100BASE-T.	
Power		DC+12V to +24V ± 10%, 8.16W (at normal, Full resolution, DC+12V) DC+12V to +24V ± 10%, 9.84W (at normal, 8x8 AOI, DC+12V)	
Lens mount		C mount The rear protrusion on C mount lens must be less than 10mm.	
Flange back		C mount : 17.526 mm, tolerance 0 to -0.05 mm	
Sensor alignment		X and Y axis: ± 0.2 mm (at center)	
Optical filter		Protection glass only	Optical low pass filter & IR cut filter (670nm at half level)
Operating temperature		-5°C to +50°C	
Humidity		20 – 80% non-condensing	
Storage temp/humidity		-25°C to +60°C/20% to 80 % non-condensing	
Vibration		10G (20Hz to 200Hz, XYZ)	
Shock		70G	
Regulatory		CE (EN61000-6-2 and EN61000-6-3), FCC part 15 class B, RoHS, WEEE	
Size	C-mount	55 x 55 x 69 mm (W x H x D)	
Weight	C-mount	320g	

*1) Approximately 5 minutes pre-heating is required to get the mentioned specifications.
*2) The above specifications are subject to change without notice.

Appendix

1. Precautions

Personnel not trained in dealing with similar electronic devices should not service this camera.
The camera contains components sensitive to electrostatic discharge. The handling of these devices should follow the requirements of electrostatic sensitive components.
Do not attempt to disassemble this camera.
Do not expose this camera to rain or moisture.
Do not face this camera towards the sun, extreme bright light or light reflecting objects.
When this camera is not in use, put the supplied lens cap on the lens mount.
Handle this camera with the maximum care.
Operate this camera only from the type of power source indicated on the camera.
Power off the camera during any modification, such as changes of jumper and switch settings.

2. Typical Sensor Characteristics

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

Vertical Aliasing
When the CCD camera captures stripes, straight lines or similar sharp patterns, the image on the monitor may appear jagged.

Blemishes
All cameras are shipped without visible image sensor blemishes.
Over time some pixel defects can occur. This does not have a practical effect on the operation of the camera. These will show up as white spots (blemishes).
Exposure to cosmic rays can cause blemishes to appear on the image sensor. Please take care to avoid exposure to cosmic rays during transportation and storage. It is recommended using sea shipment instead of air flight in order to limit the influence of cosmic rays on the camera.
Pixel defects/blemishes also may emerge due to prolonged operation at elevated ambient temperature, due to high gain setting, or during long time exposure. It is therefore recommended to operate the camera within its specifications.

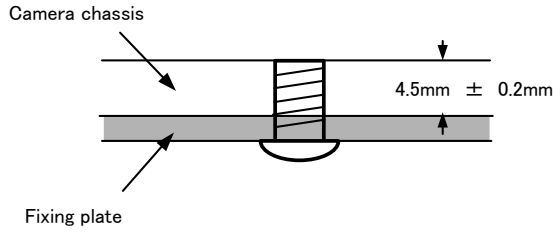
Patterned Noise
When the sensor captures a dark object at high temperature or is used for long time integration, fixed pattern noise may appear on the video monitor screen.

3. Caution when mounting a lens on the camera

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

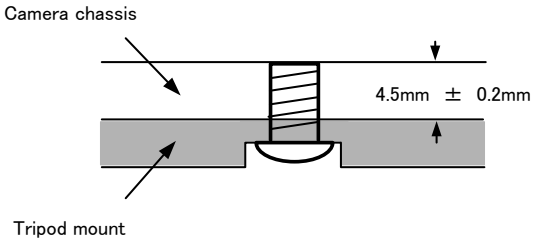
4. Caution when mounting the camera

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



Mounting the camera to fixing plate

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



Attaching the tripod mount

5. Caution for cleaning CCD and Low Pass Filter

If you find dust on the surface of the CCD and/or Low Pass Filter, please clean using a small blower such as those used for photographic equipment. Please do not use compressed air as moisture in the compressed air will cause dust to stick to the surface of CCD and/or Low Pass Filter. After using a blower, if dust is still not removed, please consult with JAI technical support.

6. Exportation

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

7. References

1. This manual and datasheet for the AM-200GE AND AB-200GE can be downloaded from www.jai.com
2. Camera control software can be downloaded from www.jai.com

Change history

Date	Revision	Changes
Jan.2012	1.0	New release
Sept 2013	1.1	Add how to clear CCD or LPF

User's Record

Camera type: **AM-200GE / AB-200GE**

Revision: **……..**

Serial No. **……..**

Firmware version. **……..**

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

User's Mode Settings.

User's Modifications.

Europe, Middle East & Africa	*Asia Pacific*	*Americas*
Phone +45 4457 8888 *Fax +45 4491 3252*	*Phone +81 45 440 0154* *Fax +81 45 440 0166*	*Phone (toll-free) +1 800 445 5444* *Phone +1 408 383 0300*

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