



See the possibilities

User's Manual

CM-030PMCL-RH

*1/3" Progressive Scan
Monochrome Remote Head Camera*

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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 CM-030PMCL-RH complies with the following provisions applying to its standards.

EN 61000-6-3 (Generic emission standard part 1)

EN 61000-6-2 (Generic immunity standard part 1)

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:

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- 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.
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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.

CM-030PMCL-RH

Supplement

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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)
摄像头外壳	×	○	○	○	○	○
电缆线夹	×	○	○	○	○	○
螺丝固定座	×	○	○	○	○	○
.....
<p>○：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。</p> <p>×：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。</p> <p>（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。）</p>						



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数字「15」为期限15年。

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1. General

CM-030PMCL-RH is 17mm diameter Remote Head camera using 330L pixels, monochrome progressive scan CCD. This camera achieves a high speed frame rate of 120.491frames per second. The camera head is small, so it suitable for such machine vision applications as surface mounting, semiconductor inspection, surface inspection etc.

CM-030PMCL employs PoCL (Power on Camera Link) function and the camera operates full functions by just connecting the cable with a POCL compatible frame grabber.

CM-030PMCL-RH is equipped with partial scan and vertical binning modes. Using these functions the camera achieves higher frame rates.

The latest version of this manual can be downloaded from: www.jai.com

The latest version of Camera Control Tool for CM-030PMCL-RH can be downloaded from: www.jai.com

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

2. Camera nomenclature

The standard camera composition consists of:

Camera body	x 1
Sensor Protection cap	x 1

The camera is available in the following versions:

CM-030PMCL-RH

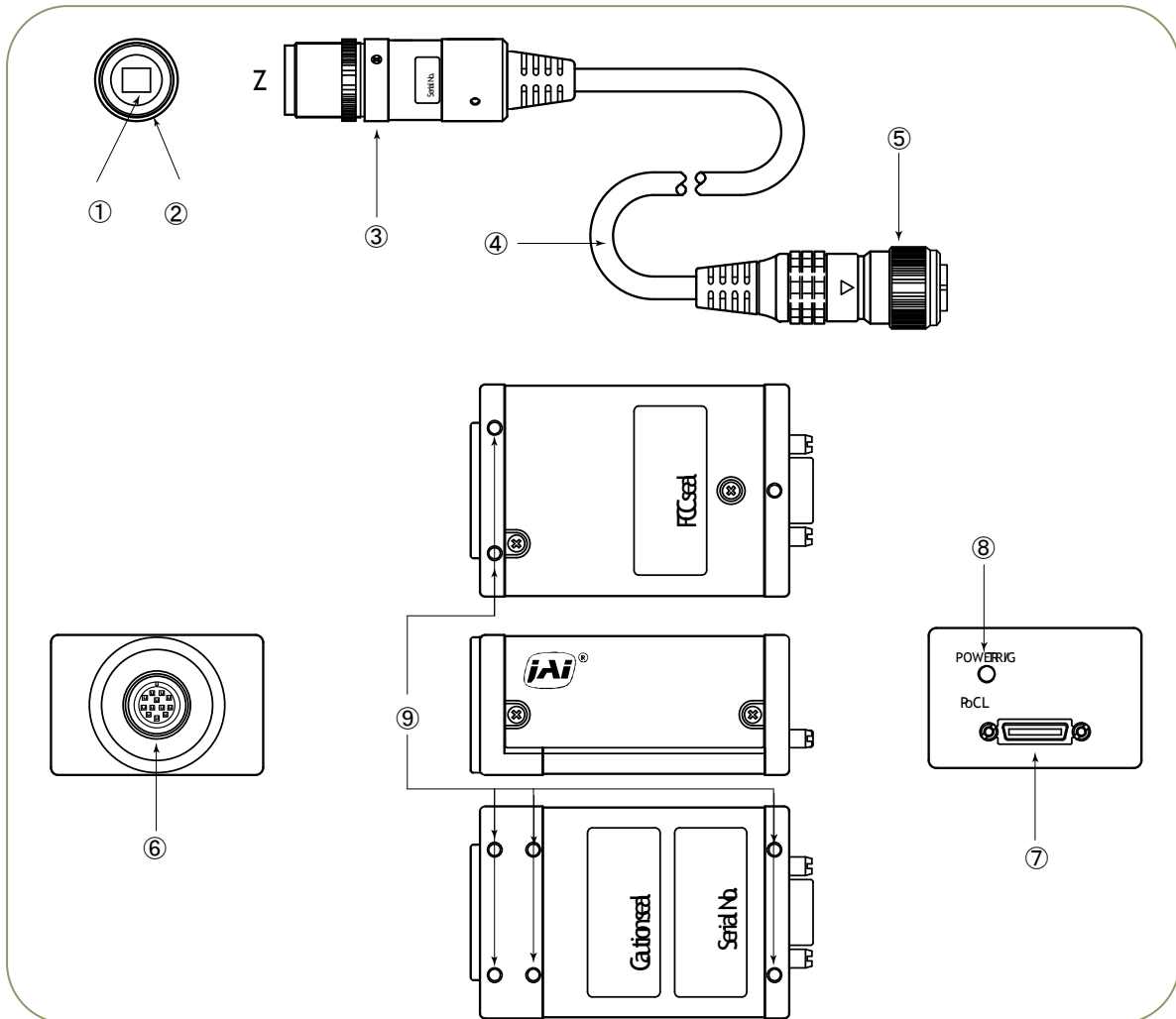
Where **C** stands for "Compact" family, **M** stands for "Monochrome", **30** represents the resolution "330K pixels", and **PMCL** for interface with "Power over Mini-CL"

Options:	OP735	Lens f=7.5mm, F=1.6
	OP715	Lens f=15mm, F=2.0
	OP724	Lens f=24mm, F=3.1
	PD-12U series	AC power adaptor

3. Main Features

- ϕ 17mm Remote head system with 1/3 inch Progressive CCD
- High frame rate of 120 fps in Continuous mode, Full resolution
- 659 (h) x 494 (v) active pixels
- 7.4 μ m square pixels
- 120 frames/second with external trigger and full resolution
- Up to 504 frames/second with partial scan of 1/8
- 193 frames/second with vertical binning
- Shutter speed from 32.48 μ s to 2 sec. using Pulse Width Control
- Programmable exposure from 32.48 μ s to 8.299 ms by 1 LVAL (16.24 μ s) increments
- Pre-select, Pulse width and Pre-select with Smear Less trigger modes
- LVAL-synchronous/-asynchronous operation (auto-detect)
- PoCL (Power over CL) standard compliant
- 10 or 8-bit output
- Setup by Windows NT/2000/XP via serial communication

4. Locations and Functions



- | | |
|---------------------|---|
| ① CCD sensor | 1/3 inch CCD sensor |
| ② Lens mount | Excluding mount M15.5 x 0.5 |
| ③ Lock ring | Is used to fix the focus position |
| ④ Camera head | φ 17mm Camera Head |
| ⑤ Camera cable | 2m |
| ⑥ 12-pin connector | Connecting with CCU |
| ⑦ 12-pin receptacle | Connecting with Camera Head |
| ⑧ 26-pin connector | POCL, Camera Link Interface (Mini-CL) (Note *1) |
| ⑨ LED | Indication for power and trigger input |
| ⑩ Mounting holes | M3 depth 3.5mm for tripod mount plate |

*1) Note: When a Camera Link cable is connected to the camera, please do not excessively tighten screws by using a screw driver. The Camera Link receptacle on the camera might get damaged. For security, the force to tighten screws should be less than 0.291 Newton meter (Nm). Tightening by hand is sufficient in order to achieve this. The camera link cable must comply with PoCL standard.

Fig. 1. Locations (version)

5. Pin Assignment

5.1. Digital Output Connector for Mini-CL (Camera Link)

Type: 26-pin SDR connector (3M or Honda type) Mini-CL connector



Fig.2. Mini-CL connector

Pin No	I/O	Name	Note
1	I	DC +12V	
13	I	GND	For # 26 pin
14	I	GND	For # 1 pin
26	I	DC +12V	
7(+),20(-)	I/O	RXD	Serial Com.
8(-),21(+)	O	TXD	
10(+),23(-)	I	Reserve	
9(-),22(+)	I	Trigger	CC1 Ext. Trigger in
6(-),19(+)	O	TxOUT3	Camera Link out
4(-),17(+)	O	TxOUT2	
3(-),16(+)	O	TxOUT1	
2(-),15(+)	O	TxOUT0	
5(-),18(+)	O	TxCk	Clock for CL

Important Note for PMCL version

CM-030PMCL-RH camera feature “Safe Power” circuit which is specified by the PoCL standard. This circuit is used to verify the presence of camera and PoCL cable before the frame grabber provides power.

5.2. Camera Link interface

The digital video is available via Camera Link, with 8 or 10-bit pixel depth, using the CL Base configuration. The digital output signals follow the Camera Link standard using Channel Link chip sets.

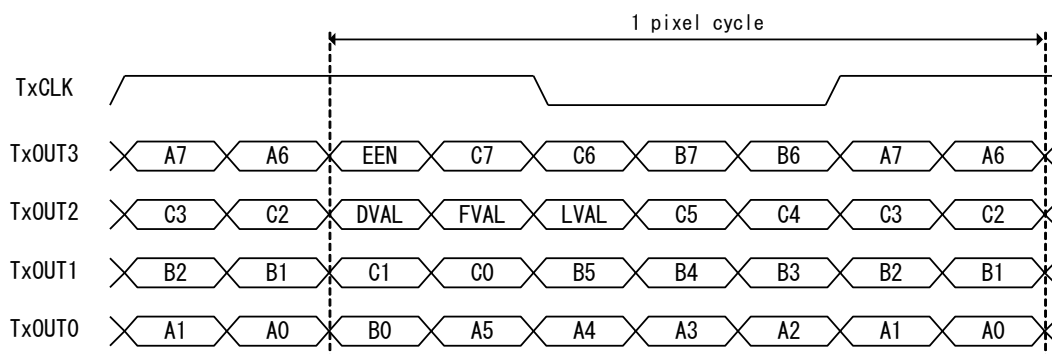
The data bits from the digital video, FVAL, LVAL, DVAL and EEN are multiplexed into the twisted pairs, which are a part of the Camera Link. Trigger signals and the serial camera control are transmitted directly through its own pairs.

The 26-pin Mini-CL SDR connector pin assignment follows the Camera Link base configuration.

For a detailed description of the Camera Link standard, please refer to the Camera Link standard specifications found on www.jai.com.

Port/Signal	8bitoutput	10bitoutput	Pin No.
Port A0	L2	L0	Tx0
Port A1	L3	L1	Tx1
Port A2	L4	L2	Tx2
Port A3	L5	L3	Tx3
Port A4	L6	L4	Tx4
Port A5	L7	L5	Tx6
Port A6	L8	L6	Tx27
Port A7	L9	L7	Tx5
Port B0	NC	L8	Tx7
Port B1	NC	L9	Tx8
Port B2	NC	NC	Tx9
Port B3	NC	NC	Tx12
Port B4	NC	NC	Tx13
Port B5	NC	NC	Tx14
Port B6	NC	NC	Tx10
Port B7	NC	NC	Tx11
Port C0	NC	NC	Tx15
Port C1	NC	NC	Tx18
Port C2	NC	NC	Tx19
Port C3	NC	NC	Tx20
Port C4	NC	NC	Tx21
Port C5	NC	NC	Tx22
Port C6	NC	NC	Tx16
Port C7	NC	NC	Tx17
LVAL			Tx24
FVAL			Tx25
DVAL			Tx26
EEN			Tx23

(Output Timing)



6. Functions and Operations

6.1. Basic functions

The CM-030PMCL-RH camera is 17mm diameter small remote head camera using 330K pixels, monochrome progressive CCD. The length between a camera head and the CCU is 2m and the cable is attached on the camera head. The frame rate is as high as 120.491 fps. The interface to the host PC is via digital Mini Camera Link (Mini-CL) with POCL capability. The output video is either 8 or 10 bits.

The camera has 2/3, 1/2, 1/4 or 1/8 partial scanning and vertical binning for faster frame rates.

There are 3 trigger modes in addition to continuous operation. The Pre-Select, Pulse Width control and Pre-select with Smear Less are available with a unique automatic LVAL sync or async selection function.

Below the functions are described in detail.

6.1.1. Digital Video Output (Bit Allocation)

The 10-bit digital output is set 890 LSB as 100% video level when CCD output is 200mV.

The white clip level is set at 1023 LSB when CCD output is 230mV.

CCD out	Analogue level	Digital Out(10 bits)
Black	Setup 3.6%, 25mV	32LSB
200mV	700mV	890LSB
230mV ↑	800mV	1023LSB

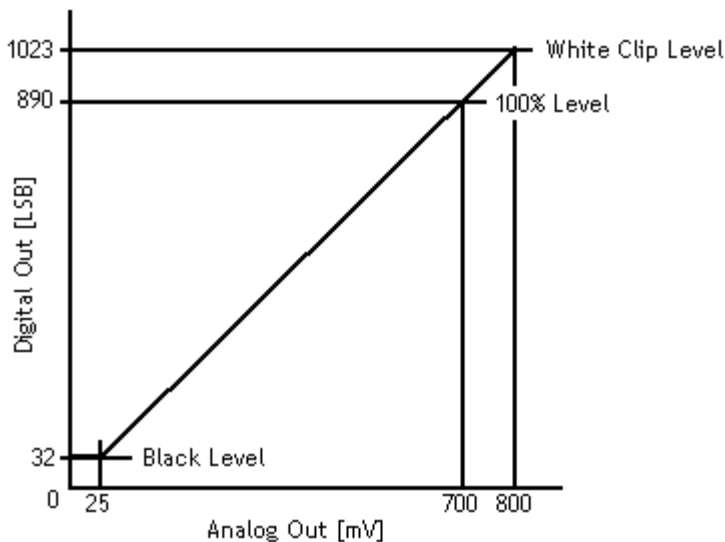


Fig.3. Digital Output Bit Allocation (10 Bits output)

6.1.2. Electronic Shutter

CM-030PMCL-RH allows selecting shutter speed in two ways; preset shutter (10 fixed steps) and programmable exposure (in 511 line period, LVAL, increments).

Preset Shutter

The following shutter speeds can be selected by command SH=0 through SH=9.

OFF (1/120), 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/10000, 1/15000, 1/30000 seconds

Programmable Exposure (PE)

The exposure time can be programmed in 16.24 μ s (LVAL period) increments. The range is from 2 LVAL to 511 LVAL.

Minimum exposure time 2L	Maximum exposure time 511L
16.24 μ s x 2(L) = 32.48 μ s	16.24 μ s x 511 (L) \approx 8.299 ms

In binning mode:

Minimum Exposure time 2L	Maximum exposure time 257L
20.069 μ s x 2(L) = 40.138 μ s	20.069 μ s x 257 (L) \approx 5.158 ms

Preset shutter time for each output mode

The preset shutter value is converted to the programmable value (PE) inside the camera. Accordingly, there is a slight difference between the preset shutter value and the actual exposure time. Please refer the following table.

Preset Shutter Value[s]	Exposure lines [Line]	Actual exposure	
		FULL (μ s)	VBinning(μ s)
Off(1/120)	511	8299	5158
1/250	246	3995	4937
1/500	123	1998	2468
1/1000	62	1007	1244
1/2000	31	503	622
1/4000	15	244	301
1/8000	8	130	161
1/10000	6	97.4	120
1/15000	4	65	80.3
1/30000	2	32.5	40.1

6.1.3. Continuous operation or triggered operation

The camera can operate in continuous operation applications not requiring asynchronous external trigger. The camera will operate at its maximum frame rate, 120.491 frames/seconds in this mode.

For applications that require an external trigger, the camera can accept an external trigger input via the Camera Link interface. The camera can operate with up to 120 frames/second in triggered operation as well.

6.1.4. 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

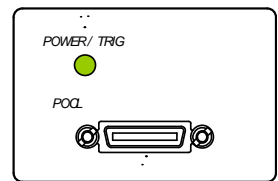


Fig.4. Rear panel

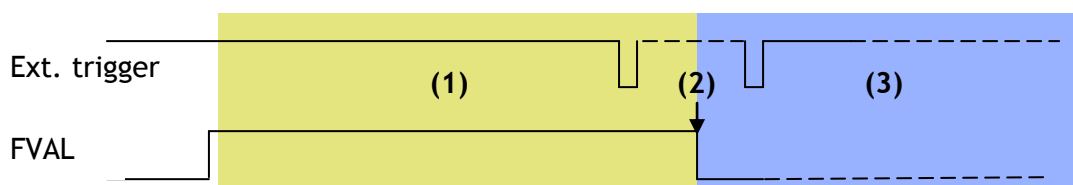
6.1.5. Auto-detect LVAL-sync / async. accumulation

This function replaces the manual setting found in older JAI cameras. Whether accumulation is synchronous or a-synchronous in relationship to LVAL depends on the timing of the trigger input.

When trigger is received while FVAL is high (during readout), the camera works in LVAL synchronous mode, preventing reset feed trough in the video signal. There is a maximum jitter of one LVAL period from issuing a trigger and accumulation start.

If trigger is received when FVAL is low, the cameras works in LVAL-asynchronous mode (no delay) mode.

This applies to both pre-select (PS) trigger mode and pulse width trigger (PW) modes.



- (1) In this period camera executes trigger at next LVAL (prevents feed-through noise)
- (2) Avoid trigger at FVAL transition (+/- 1 LVAL period), as the function may randomly switch between "next LVAL" and "immediate".
- (3) In this period camera executes trigger immediately (no delay)

Fig. 5. Auto-detect LVAL sync /a-sync accumulation

6.1.6. Vertical Binning

Binning mode (Command VB) is a function where the signal charge from 2 adjacent (vertical) pixels are added together and read out as one pixel. Binning results in half vertical resolution and higher frame rate. By adding 2 pixels together, the sensitivity is doubled. The charge accumulated in 2 adjacent lines is added together in the horizontal CCD register. This is done by providing two pulses to the vertical CCD register for each line readout. Vertical binning cannot be used together with the Partial scan.

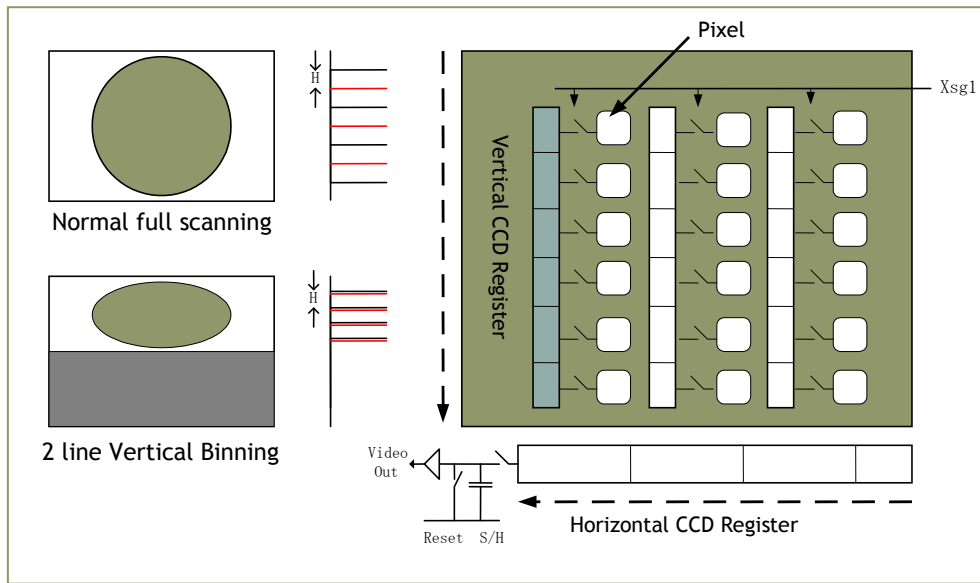


Fig. 6. Vertical Binning

6.2. Sensor Layout and timing

6.2.1. CCD Sensor Layout

The CCD sensor layout with respect to pixels and lines used in the timing and video full frame read out is shown below.

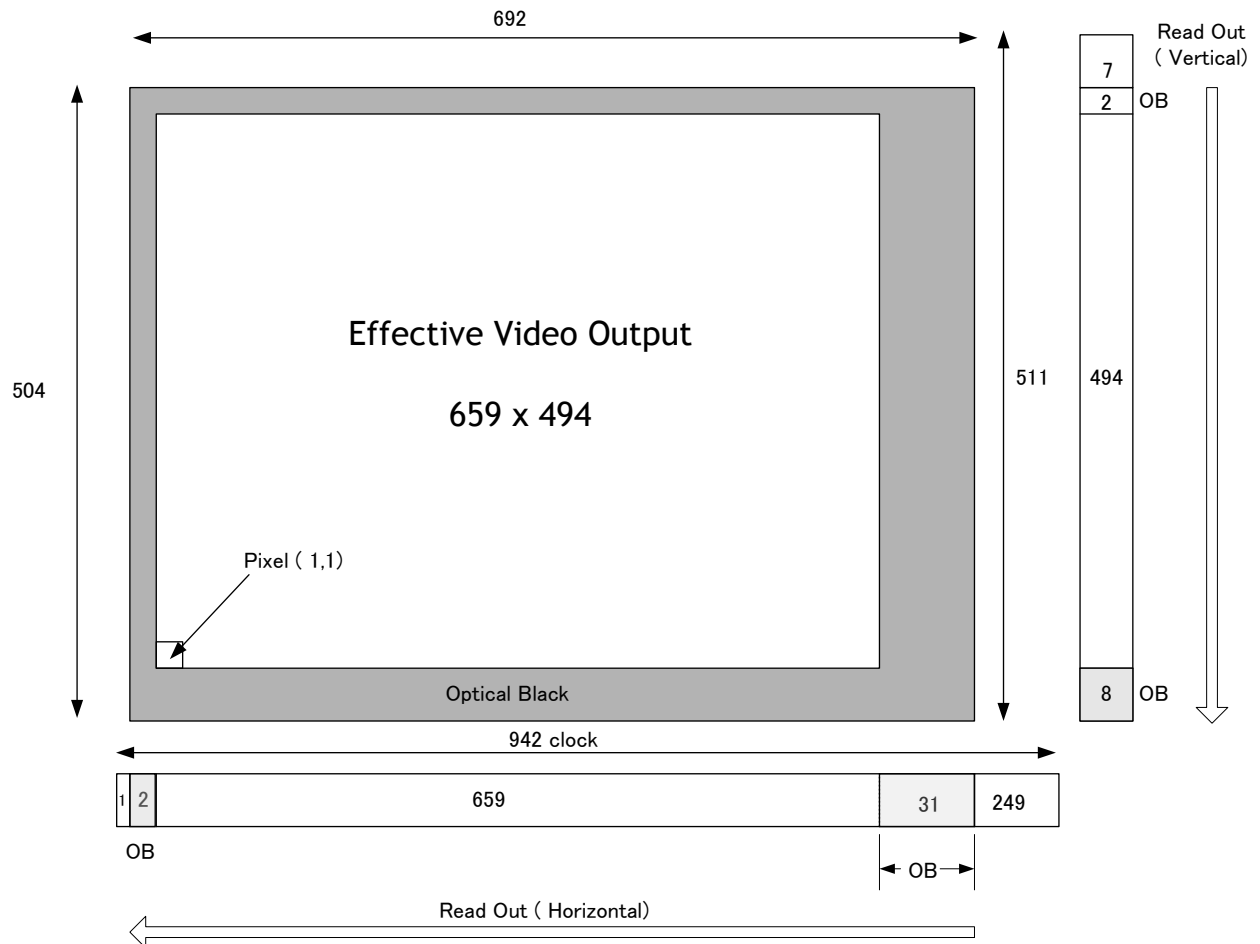


Fig. 7 CCD sensor layout

6.2.2. Horizontal timing

The LVAL period is shown for continuous mode.

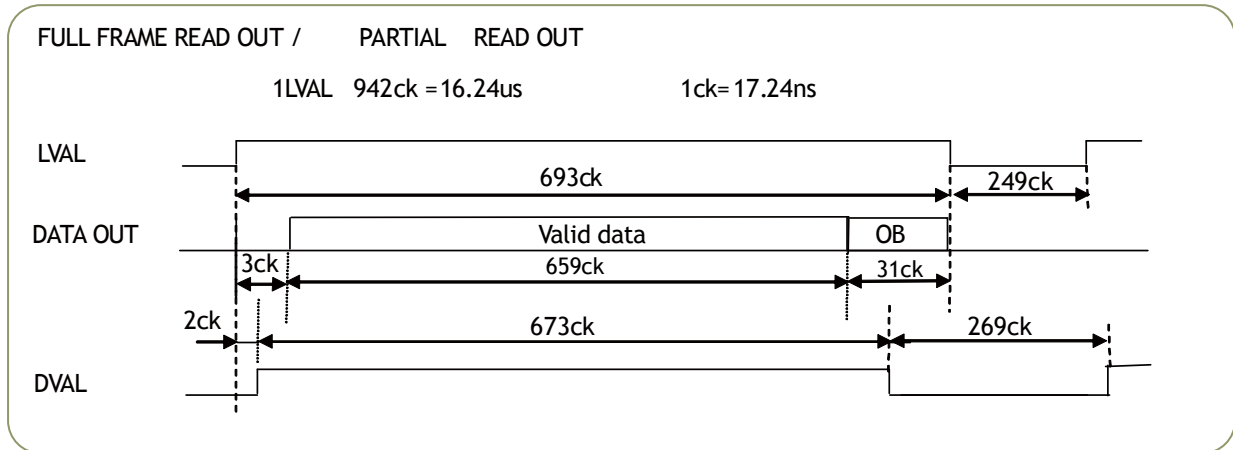


Fig. 8 Horizontal timing

6.2.3. Vertical timing

The FVAL period for continuous mode full scan is shown.

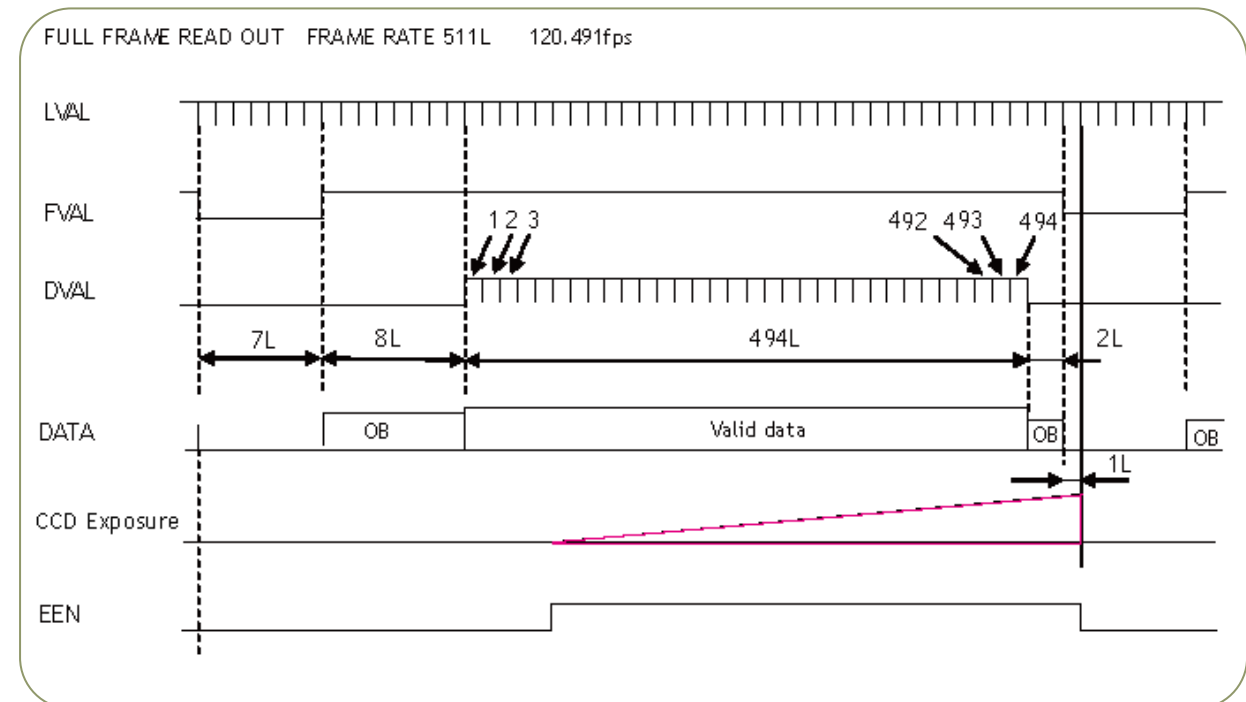
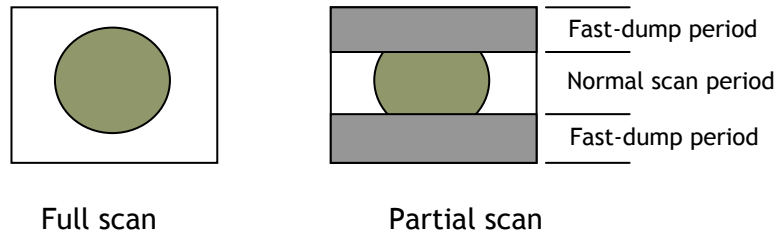


Fig. 9. Vertical timing for full scan

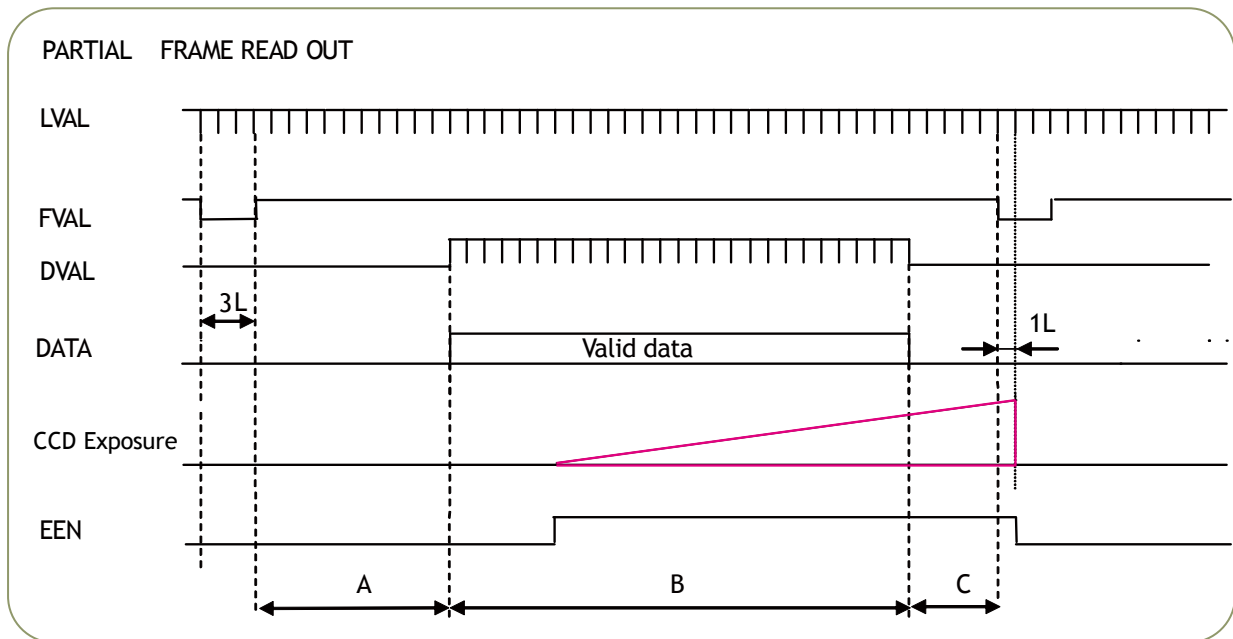
6.2.4. Partial Scan

Partial scan allows higher frame rate by reading out a smaller center portion of the image. This is particularly useful when inspecting objects that do not fill the whole height of the image.



Vertical Timing

The below diagram and table provide vertical timing information for the fixed partial scan settings 1/2, 1/4, 1/3 and 2/3



Values for vertical timing in partial scan continuous mode.

AREA	FVAL Low (L)	A (L)	B (L)		C (L)	Total line (L)	frame rate (L)
			Start line	End line			
2/3	3	14	328		11	356	172.95
			83	410			
1/2	3	19	246		16	284	216.80
			123	368			
1/4	3	27	122		24	176	349.83
			185	306			
1/8	3	31	60		28	124	504.72
			215	274			

Fig. 10. Vertical timing for partial scanning

Horizontal Timing

The horizontal timing is the same the full scanning.

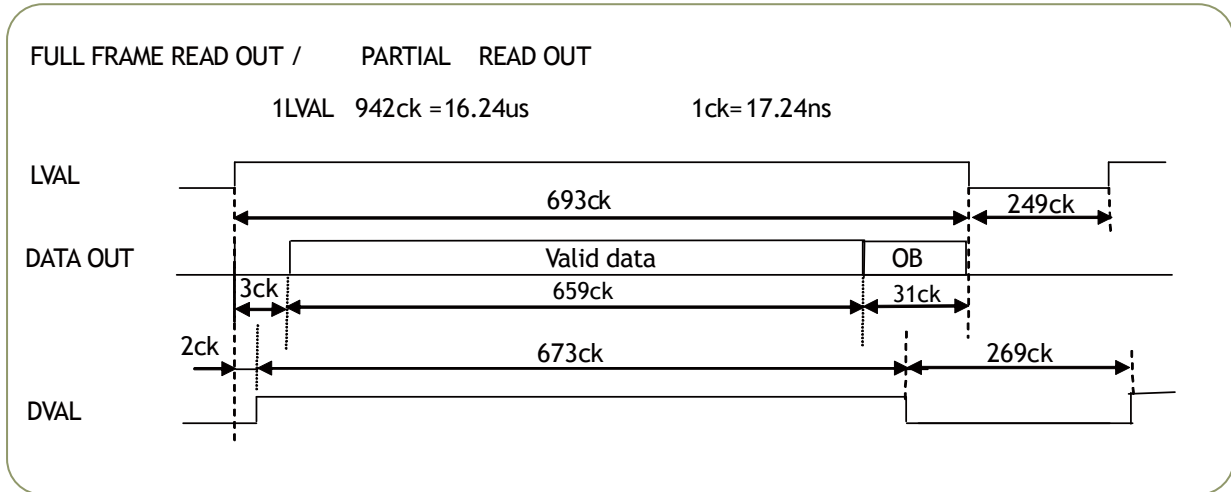


Fig. 11. Horizontal timing for partial scanning

6.2.5. Vertical Binning

Vertical binning combines charge from two adjacent lines, reducing the vertical resolution to half and at the same time increasing frame rate and sensitivity. By activating this function, the frame rate is increased to 193.9 fps.

Important Note

Vertical Binning cannot be used together with the Partial Scan mode.

Horizontal Timing

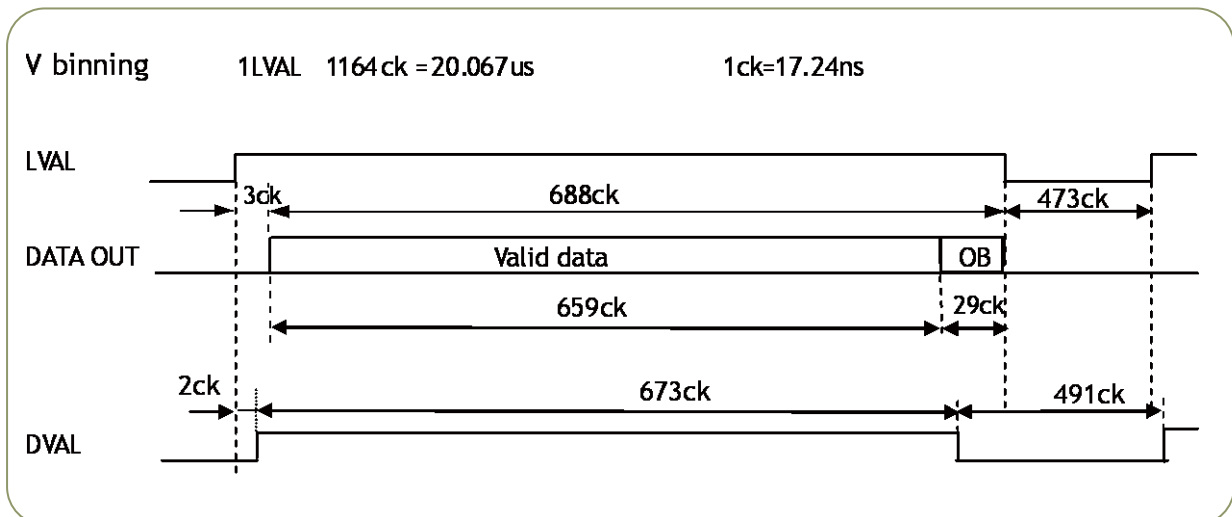


Fig.12. Horizontal Timing for Vertical Binning

Vertical timing

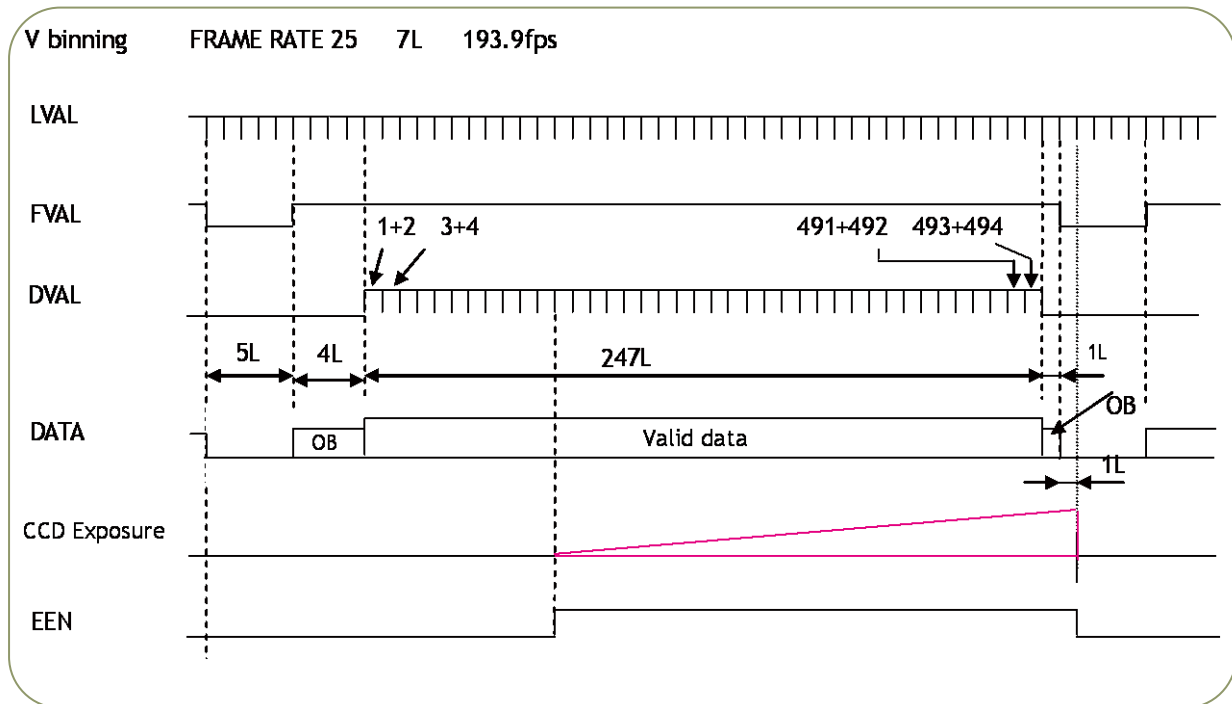


Fig.13. Vertical Timing for Vertical Binning

6.3. Operation Modes

This camera can operate in 4 primary modes.

1. **TR=0** *Continuous Mode* Pre-selected exposure.
2. **TR=1** *Pre-select Mode* Pre-selected exposure.
3. **TR=2** *Pulse Width Mode* Pulse width controlled exposure.
4. **TR=3** *EPS with Smear less Mode* Pre-selected exposure.

6.3.1. Continuous operation

For applications not requiring asynchronous external trigger, but should run in continuous operation, this mode is used.

For timing details, refer to fig. 8 through fig. 13.

To use this mode:

Set function:	Trigger mode to "Continuous".	TR=0
	Scanning	SC=0 through 4
	V Binning	VB=0 or 1
	Shutter mode pre-set or programmable	SM=0 or 1
	Shutter speed	
	SH=0 to 9	
	Programmable exp.	PE=2 to 511
	Other functions and settings	

6.3.2. Pre-select Trigger Mode

An external trigger pulse initiates the capture, and the exposure time (accumulation time) is defined by the SH or PE commands.

The resulting video signal will start to be read out after the selected shutter time.

For timing details, refer to fig. 8 through fig. 13 and fig. 14 & 15.

To use this mode:

Set function:	Trigger mode to "Edge pre-select"	TR=1
	Scanning	SC=0 to 4
	V Binning	VB=0 or 1
	Shutter mode to pre-set or programmable	
	SM=0 or 1	
	Shutter speed	
	SH=0 to 9	
	Programmable exp.	PE=2 to 511
	Other functions and settings	
Input:	Ext. trigger. Camera Link or 12-pin Hirose	TI=0, TI=1

Important notes on using this mode

1. The minimum trigger interval > 1 LVAL.
2. Depending on the timing of the leading edge of the trigger pulse in relationship to FVAL, accumulation will be synchronous or a-synchronous in relationship to LVAL. See chapter 6.1.5 for details.

LVAL_sync timing

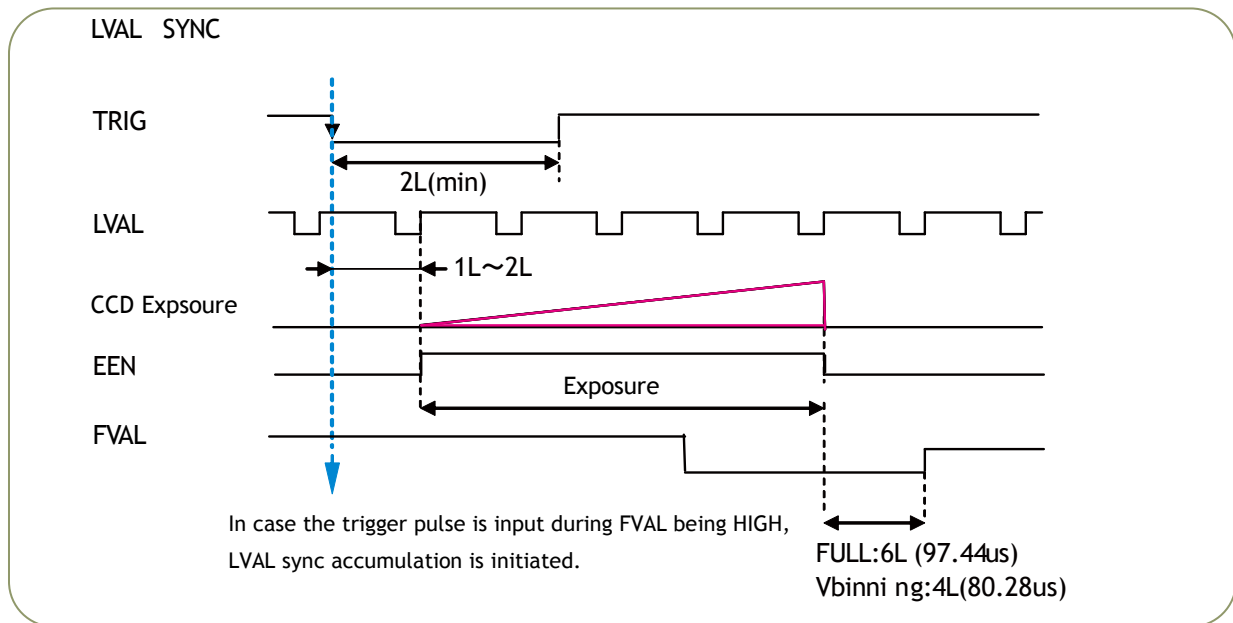


Fig. 14. Pre-select trigger mode. LVAL synchronized.

LVAL_async timing

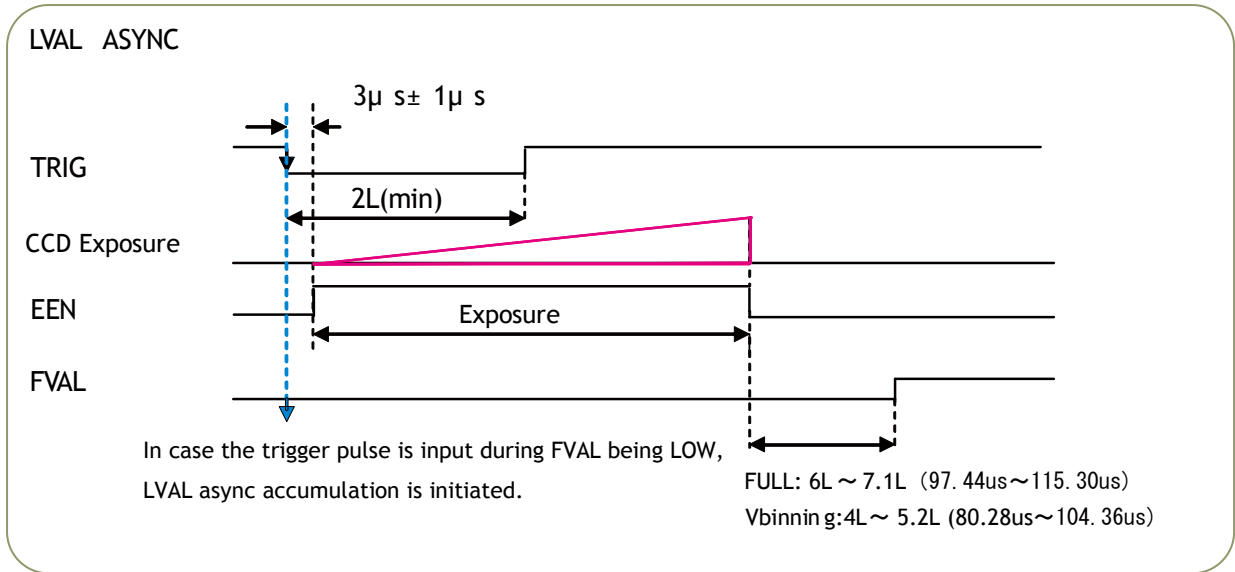


Fig.15. Pre-select trigger mode. LVAL asynchronous

6.3.3. Pulse Width Trigger Mode

In this mode the accumulation time is equal the trigger pulse width. Here it is possible to have long time exposure. The maximum recommended time is <240 frames (2 seconds).

For timing details, refer to fig. 8 through fig. 13 and fig. 16 & 17.

To use this mode:

Set function:	Trigger mode to "Pulse width control".	TR=2
	Partial scan	SC=0 to 4
	Vertical binning	VB= 0 or 1
	Other functions and settings	
Input:	Ext. trigger. Camera Link or 12-pin Hirose	TI=0, TI=1

Important notes on using this mode

1. The minimum trigger interval > 1 LVAL
2. Depending on the timing of the leading edge of the trigger pulse in relationship to FVAL, accumulation will be synchronous or a-synchronous in relationship to LVAL. See chapter 6.1.5. for details.

LVAL_sync timing

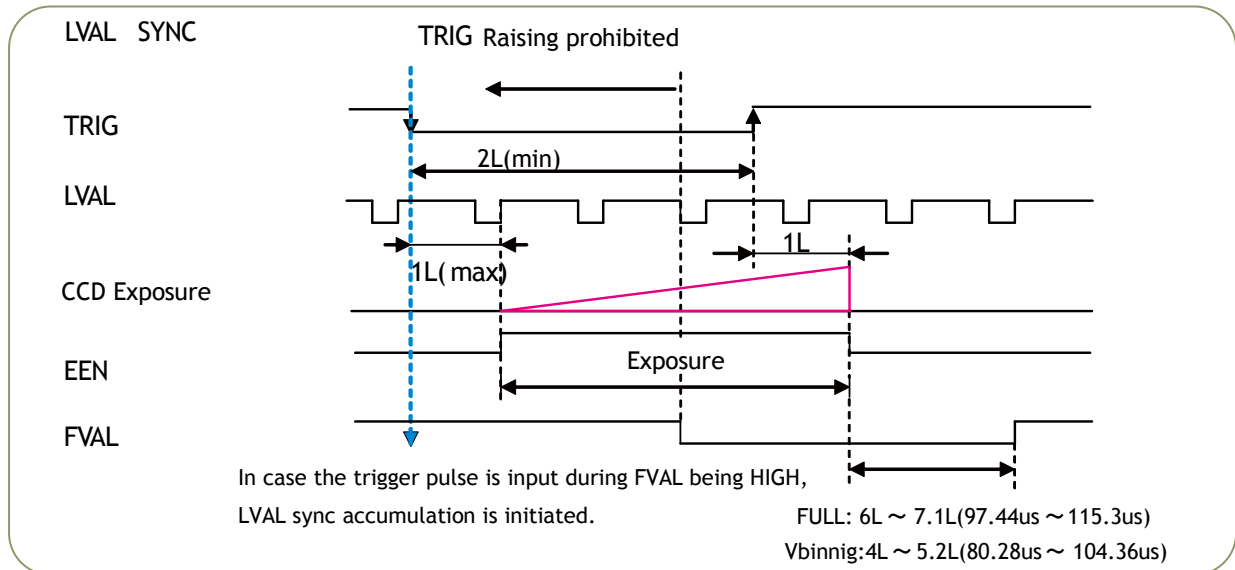


Fig. 16. Pulse width trigger mode. LVAL synchronized.

LVAL_async timing

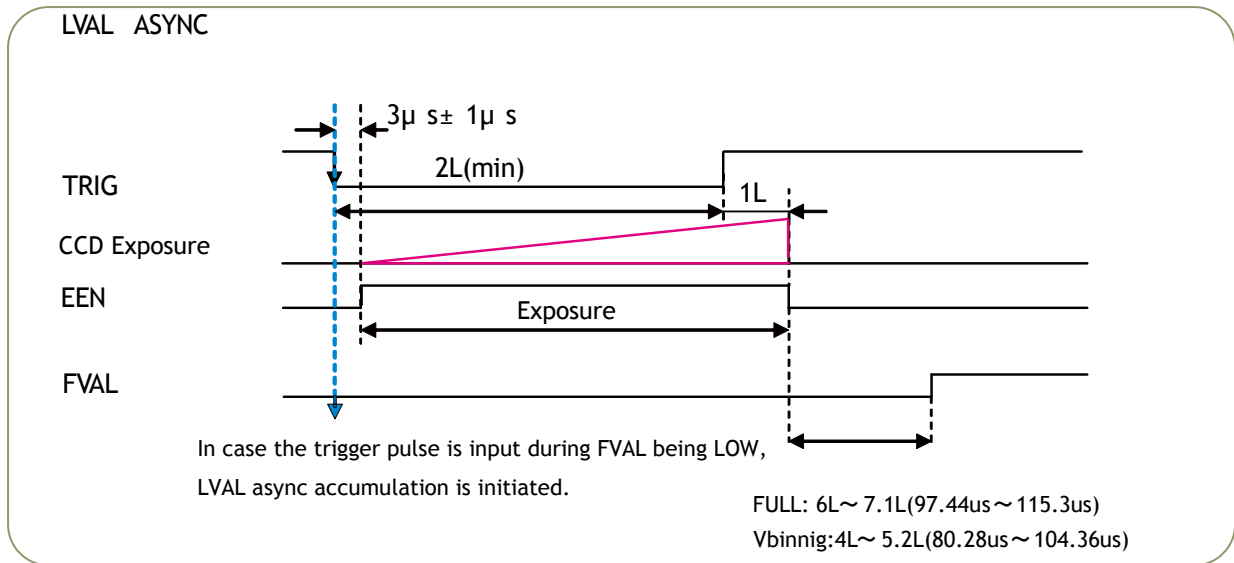


Fig.17. Pulse Width trigger mode. LVAL asynchronous

6.3.4. EPS with Smear Less trigger mode

In this mode, a fast dump of accumulated charges is activated after the trigger pulse is input. Then, the exposure starts at 64 L after the trigger leading edge.

The exposure time is determined by the presser shutter speed, either presser or programmable.

Thus, as the fast dump is made, this mode functions as the smear less mode which eliminates the smear on the upper part of the image.

Important notes on using this mode

When the shutter setting is either PE=511 or OFF, EEN is kept as HIGH.

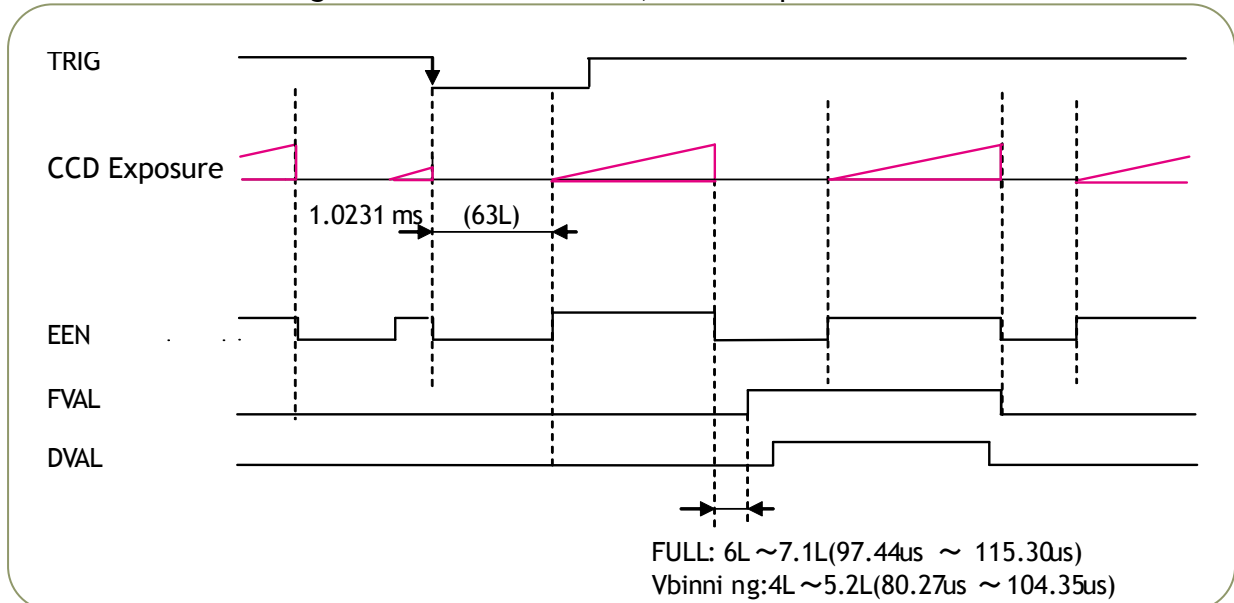


Fig. 18. EPS with Smear Less

6.3.5. Minimum interval of the trigger input on each operation mode

Mode	Read out mode	Line (Trigger minimum interval) *
Continuous	Full	511
	2/3 Partial	356
	1/2 Partial	284
	1/4 Partial	176
	1/8 Partial	122
	V. Binning	257
Pre-select	Full	513
	2/3 Partial	359
	1/2 Partial	287
	1/4 Partial	179
	1/8 Partial	125
	V. Binning	259
Pulse width	Full	513
	2/3 Partial	359
	1/2 Partial	287
	1/4 Partial	179
	1/8 Partial	125
	V. Binning	259
EPS(Smear less)	Full	578
	2/3 Partial	423
	1/2 Partial	351
	1/4 Partial	243
	1/8 Partial	189
	V. Binning	324

*1) The minimum interval for trigger modes shows in case of LVAL sync mode. For LVAL sync mode, the accumulation time should be added.

*2) In order to maintain the minimum interval on the partial scan, it is necessary so that the exposure time should not exceed the lines for the continuous mode. When the exposure is set at longer than that of the continuous mode, the interval becomes longer than the described by figures (Exposure time - Lines of the continuous).

6.4. Mode and function matrix.

The following table shows which functions will work in the different modes for CM-030PMCL-RH.

Trigger Mode \ Func.		Shutter		Partial scan	V Binning	Accumulation LVAL sync/async
		Pre-select	Programmable			
Cont.	TR=0	Yes	Yes	Yes	Yes	-
EPS	TR=1	Yes	Yes	Yes	Yes	Auto
PWC	TR=2	-	-	Yes	Yes	Auto
EPS w/ Smearless	TR=3	Yes	Yes	Yes	Yes	Async only

Fig. 19. Mode and function matrix.

7. Configuring the Camera

7.1. RS-232C control

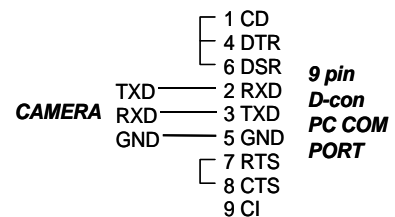
Any configuration of the CM-030PMCL-RH camera is done via the serial communication in the Camera Link connector. The camera can be set up from a PC running terminal emulator software, or using JAI's camera control software.

Below is the description of the ASCII based short command protocol.

Communication setting

Baud Rate	9600 bps
Data Length	8 bit
Start Bit	1 bit
Stop Bit	1 bit
Parity	None
Xon/Xoff Control	None

RS 232C cable



Protocol

Transmit setting to camera:

NN=[Parameter]<CR><LF> (NN is any kind of command. Capital or small letters.)

The camera answers:

COMPLETE<CR><LF>

To have all communication visible on the emulator screen, start with:

EB=1<CR><LF>

The camera answers:

COMPLETE<CR><LF>

Transmit request command to camera:

NN?<CR><LF> (NN is any kind of command.)

The camera answers:

NN=[Parameter]<CR><LF>

Transmit the following to have the camera actual setting:

ST?<CR><LF>

The camera answers:

A complete list of the current settings

Transmit the following to have a command list:

HP?<CR><LF>

The camera answers:

A list with all commands and possible settings

Invalid parameters send to camera: (99 is an invalid parameter)

SH=99<CR><LF>

The camera answers:

02 Bad Parameters!!<CR><LF>

To see firmware number:

VN?<CR><LF>

To see camera ID: The manufacturing lot number is shown.

ID?<CR><LF>

7.2. Setting functions

7.2.1. Bit allocation. BA=0, BA=1

This command sets the output for either 8-bit or 10-bit.

7.2.2. Partial scan. SC=0 through 4.

The CCD scanning format can be selected between full or partial scanning. With partial scanning only the vertical central part of the CCD sensor is read out with a higher frame rate. The partial scan is done by a fast dump read out of the lines in the vertical CCD register down to the top of the partial image. This central part of the image is read out with normal speed. The lines below the partial image are read out and dumped with a high speed.

7.2.3. Vertical binning. VB=0, VB=1

The CM-030PMCL-RH has only vertical binning mode. With V binning the pixel charge from 2 adjacent lines are added together in the horizontal CCD register. It is done by double pulses to the vertical CCD register.

Note: Vertical Binning cannot be used together with the Partial scanning.

7.2.4. Shutter mode. SM=0 and SM=1

With SM=0 this function selects the shutter from the 10 fixed steps (SH=0 through SH=9).
With SM=1 from programmable in 550 steps (PE=2 through PE=551).

7.2.5. Trigger polarity. TP=0, TP=1.

The active trigger polarity is low as default (TP=0). It can be invert it to active high (TP=1).

7.2.6. Gain level. GA=-84 through +336.

GA=0 is 0dB gain, which is normal working point. The range is from -3 dB to +12 dB.

7.2.7. Black level. BL=0 through BL=1023.

Black level (or set-up level) will set the video level for black. Factory setting is 32 LSB for 10bit or 8 LSB for 8bit.

7.3. Save and Load Functions

The following commands are used to store and load camera settings in the camera EEPROM.

Load settings. LD

This command will load previous stored settings to the camera. 3 user settings can be stored in the camera EEPROM. 1 factory setting is also stored in the camera. The settings stored in the last used user area are used as default settings at power up.

Save Settings. SA

This command will store the actual camera settings to 1 of the 3 user area in the camera EEPROM.

EEPROM Area. EA

If received, the camera will return the last used user area number.

7.4. CM-030PMCL-RH command list

	Command Name	Format	Parameter	Remarks
A - General settings and utility commands.				
1	Echo Back	EB=[Param.]<CR><LF> EB?<CR><LF>	0=Echo off 1=Echo on	Off at power up
2	Camera Status Request	ST?<CR><LF>		Actual setting
3	Online Help Request	HP?<CR><LF>		Command list
4	Firmware Version	VN?<CR><LF>		3 digits (e.g.) 100 = Version 1.00
5	Camera ID Request	ID?<CR><LF>		max 10 characters
6	Model Name Request	MD?<CR><LF>		max 11 characters
7	User ID	UD=[Param.]<CR><LF> UD?<CR><LF>		User can save and load free text.(11 or less characters)
B - Shutter				
1	Shutter Mode	SM=[Param.]<CR><LF> SM?<CR><LF>	0=Preset Shutter 1=Programmable exposure	
2	Preset Shutter	SH=[Param.]<CR><LF> SH?<CR><LF>	0=Off, 1=1/250, 2=1/500, 3=1/1000, 4=1/2000, 5=1/4000, 6=1/8000, 7=1/10000, 8=1/15000, 9=1/30000	Available when SM=0.
3	Programmable Exposure	PE=[Param.]<CR><LF> PE?<CR><LF>	2 to 511	Available when SM=1.
C - Trigger mode				
1	Trigger Mode	TR=[Param.]<CR><LF> TR?<CR><LF>	0=Normal (Continuous) 1=EPS(Edge pre select) 2=PWC(Pulse width control)	

CM-030PMCL-RH

	Command Name	Format	Parameter	Remarks
			3=EPS with Smear Less	
2	Trigger Polarity	TP=[Param.]<CR><LF> TP?<CR><LF>	0=Active Low 1=Active High	
3	Trigger Input	TI=[Param.]<CR><LF> TI? <CR><LF>	0=Camera Link	
D -Image Format				
1	Bit Allocation	BA=[Param.]<CR><LF> BA?<CR><LF>	0=10bit 1=8bit	
2	Scan Format	SC=[Param.]<CR><LF> SC? <CR><LF>	0=Full Frame 1=2/3 Partial 2=1/2 Partial 3=1/4 Partial 4=1/8 Partial	
3	V-Binning	VB=[Param.]<CR><LF> VB?<CR><LF>	0=OFF 1=On	Only for CM-030PMCL-RH
E - Gain, Black and signal settings				
1	Gain Level	GA=[Param.]<CR><LF> GA?<CR><LF>	-84 to 336	
2	Black Level	BL=[Param.]<CR><LF> BL?<CR><LF>	0 to 1023	
F - Saving and loading data in EEPROM				
1	Load Setttings (from Camera EEPROM)	LD=[Param.]<CR><LF>	0=Factory area 1=User 1 area 2=User 2 area 3=User 3 area	Latest used DATA AREA becomes default at next power up.
2	Save Settings (to Camera EEPROM)	SA=[Param.]<CR><LF>	1=User 1 area 2=User 2 area 3=User 3 area Note : parameter 0 is not allowed	
3	EEPROM Current Area No Request.	EA?<CR><LF>	0=Factory area 1=User 1 area 2=User 2 area 3=User 3 area	The camera returns the latest used DATA AREA.

NOTE: Do not try to use commands not shown in this list.

8. Camera Control Tool for CM-030PMCL-RH

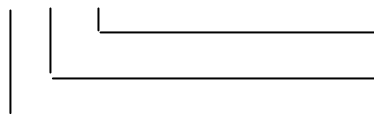
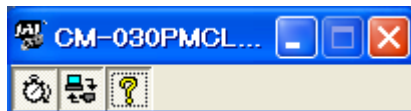
The Camera Control Tool for Windows 2000/XP can be downloaded from www.jai.com. The control tool contains a camera control program and a developer's kit for integrating the control tool in your own software. For the integrator and experienced user, the Camera Control Tool is much more than a program with a window interface. It also provides an easy and efficient ActiveX interface built for MS Windows 2000/XP. The OCX interface has the ability to connect to the camera using the serial interface of the PC by reading and writing properties for the camera. This integration requires simple programming skills within Visual Basic, Visual C++ or similar languages in a Microsoft Windows environment.

8.1. Camera Control Tool Interface

The Camera Control Tool Software is based on a main Tool Bar and a number of associated Tool Windows. Each button in the Tool Bar pops up a separate Tool Window when pressed. The layout of the program can be adjusted by arranging the windows the way it is preferred. The program will store this information and recreate this layout, when the program is restarted. All Camera Control Tools have a Communication Window and an About Window. The other window(s) contains camera control commands.

8.1.1. Camera Control Tool Bar

This is a Camera Control Tool Bar and when the button of each window, each control GUI can be initiated.



About Window

Communication Window

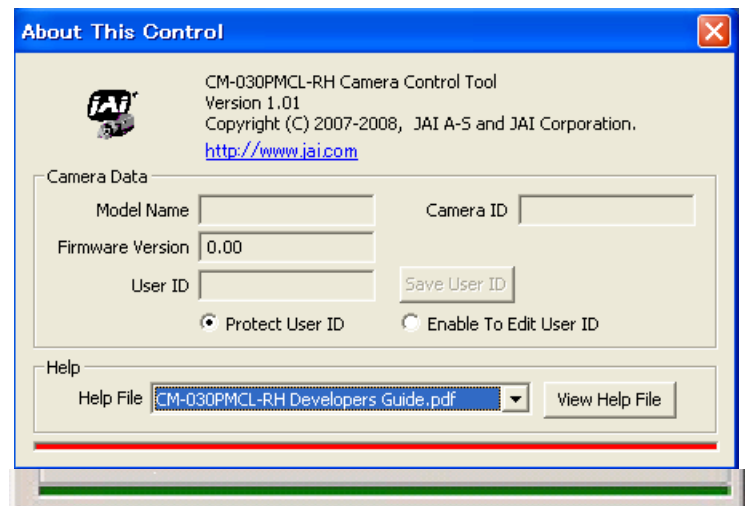
Camera Control

8.2. The About Window

The about window contains a picture of the camera and information about the version of the program, Internet connection to JAI A/S and access to the help documents.

The drop-down box labelled "Help File" will list all files which have the extension .pdf and that are found in the program (default) folder.

C:\Program Files\JAI A-S\control tool name"



It is possible to download updated operation manuals from the jai website: <http://www.jai.com>

An updated manual can be saved in the folder address mentioned above and it will automatically be included in the list of help files.

At the bottom of the windows (all windows but the Communication Window is a colored bar. The bar is green when the Camera Control Tool is connected to a camera and the camera is turned on.

The bar is red when the Camera Control Tool is not connected to a camera or when the camera is turned off.

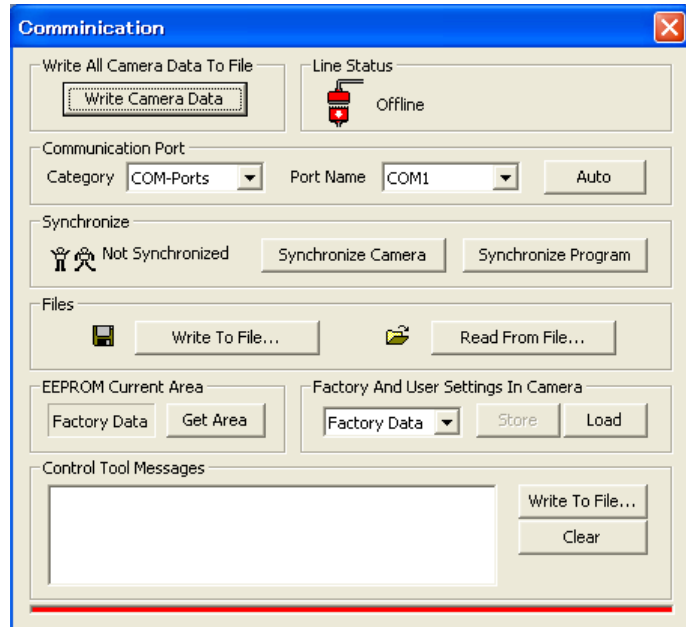
8.3. Communication Window

The Communication Window is used to connect the Camera Control Tool with the JAI camera.

Camera Link communication:

Select "Camera Link" at the pull-down box for Category. Port Name shows DLL file names (or frame grabber names) for all Camera Link frame grabbers that are installed in the pc. This is done by using a DLL file called "clserial.dll" to upload all frame grabber DLLs that are found in the pc.

Just select the option for the frame grabber that is installed in the pc.



Auto search

Click the auto button to search for a camera on communication port 1 to 16. The camera control program automatically sends camera request on every communication port. The user is prompted to use a communication port if a camera answers the request.

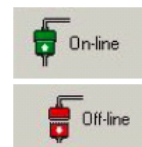
This button is only used for RS-232 communication.

Off/On-line mode

The Camera Control Tool Application can run Offline (without a camera attached) and all functions are fully functional in offline mode.

Off line mode is indicated in The Communication Window, where a status field with graphic and text indicates the on/off-line status.

Changing the selected communication port (from the communication window) changes the online/off-line status. If a camera is found on the selected communication port the application runs online otherwise offline.



Changing the settings in the application will automatically update the camera settings when the application is online.

If the application loses connection with the camera it will automatically go to offline mode and it is indicated in the communication window.

Synchronize program and camera

The Camera Control software has the ability to synchronize either the camera or the program. Click Synchronize camera to write all settings from the program to the camera or click the Synchronize program to load all settings from the camera to the program.



Files

When clicking the Write to File or Read from File button, the user is prompted for a file using a standard file dialog. New files are created if they do not already exist.

Files for camera settings have the extension cam. Information about the communication port is not stored in the files. All settings are automatically sent to the camera when a file has been loaded (if the camera is online).

Factory and User Settings

Use the Store button to store the current camera settings into the user settings area in EEPROM. Current camera settings are not saved when the camera is turned off. To save current camera settings you have to save them on the available user areas.

Use the Load button to restore previously saved camera settings from either the Factory or the User EEPROM area.

Write All Camera Data to File.

Click the “Write Camera Data” button to save all camera settings into a text file. The information that can be saved is:

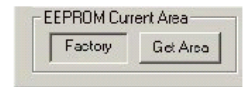
Model Name, Camera ID, User ID, Firmware Version, Current Settings, Factory Settings and the available User Areas.

The file is formatted as shown in the picture below:



EEPROM Current Area

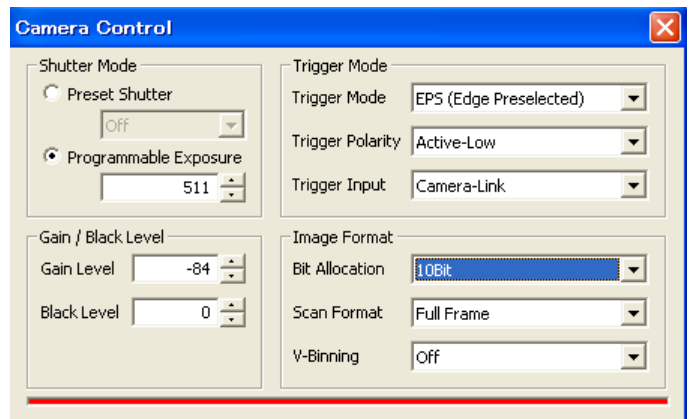
Click the ‘Get Area’ button to read the power up settings area number.



8.4. Camera Control Window

The Camera Control Window contains the fundamental camera setting functions.

It is possible to set the shutter mode, Trigger mode, image format, scan format, gain control and black setting.



8.5. Using the Camera Control Tool

Here is some practical information about the Camera Control Tool:

1. The Camera Control Tool bar is always on top of other windows.
2. When you minimize the Camera Control Tool bar all open windows will close.
3. It is possible to work with the Camera Control Tool when the camera is online and when the camera is offline.
4. The newer JAI cameras always start up with the last used user area (but for some old models it will start up with the last saved user area.)

5. The Camera Control Tool saves the last used settings (not the user area), which don't have to be the same as for the last saved user area.
6. The setup file 'CameraName.ini' stores all information about camera settings. When the program is started the last settings for the program are loaded from the file 'CameraName.ini'
7. When you turn on the camera and the Camera Control Tool, it is possible that the Camera Control Tool does not show the actual camera settings (see 4. and 5.).
 - a. To obtain the camera settings click "Synchronize Program".
 - b. To send the settings saved in the Camera Control Tool (last used settings) to the camera click "Synchronize Camera".
 - c. To see which area the camera has started up in click "Get Area".

Technical drawing of the JAI-AP01 camera module showing front, top, and side views with dimensions in mm and inches.

Front View Dimensions:

- Top flange width: 5.1 (0.2) (in glass t=0.75)
- Top flange thickness: 0.2 (0.008)
- Mounting hole diameter: $\varnothing 16.5$ (0.65)
- Mounting hole position: 16.5 (0.65) from center
- Module width: 60 (2.36)
- Module height: 21.5 (0.85)
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 11 (0.43) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 13.5 (0.53) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 14 (0.55) from center

Top View Dimensions:

- Module width: 44 (1.73)
- Module height: 29 (1.14)
- Mounting hole diameter: $\varnothing 16.5$ (0.65)
- Mounting hole position: 16.5 (0.65) from center

Side View Dimensions:

- Module width: 66 (2.6)
- Module height: 14.5 (0.57)
- Mounting hole diameter: $\varnothing 16.5$ (0.65)
- Mounting hole position: 16.5 (0.65) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 11 (0.43) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 13.5 (0.53) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 14 (0.55) from center

Other Dimensions:

- Mounting hole diameter: $\varnothing 16.5$ (0.65)
- Mounting hole position: 16.5 (0.65) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 11 (0.43) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 13.5 (0.53) from center
- Mounting hole diameter: $\varnothing 17$ (0.67)
- Mounting hole position: 14 (0.55) from center

Notes:

- 3M dph35 (dph014)
- 6M dph35 (dph014)
- Outside Dimensions tolerance : ±0.1

Fig. 20. Outline.

10. Specifications

10.1. Spectral response

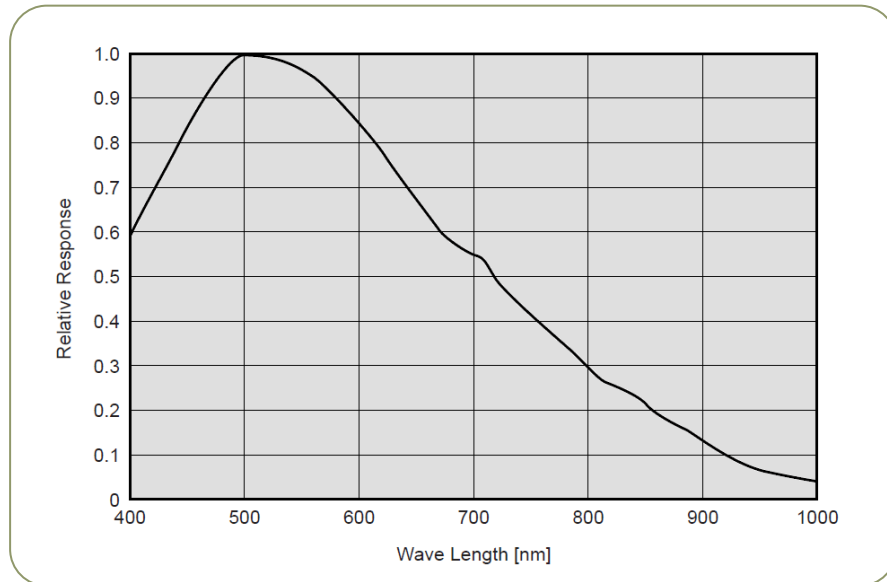


Fig. 21. Spectral response for CM-030PMCL-RH/PMCL

10.2. Specification table

Specifications	CM-030PMCL-RH
Scanning system	Progressive scan
Frame rate full frame	120.491 frames/sec. Progressive (511 lines/frame)
Pixel clock	58 MHz
Line frequency	61.571 kHz (942 pixel clock/line)
CCD sensor	1/3" Monochrome ICX424ALB
Sensing area	4.85 (h) x 3.66 (v) mm
Cell size	7.4 (h) x 7.4 (v) μ m
Active pixels	659 (h) x 494 (v)
Pixels in video output. Full 2/3 partial 1/2 partial 1/4 partial 1/8 partial	659 (h) x 494 (v) 120.491 fps. H = 61.571 kHz 659 (h) x 328 (v) 172.95 fps H= 61.571 kHz 659 (h) x 246 (v) 216.80 fps. H = 61.571 kHz 659 (h) x 122 (v) 349.83 fps. H = 61.571 kHz 659 (h) x 60 (v) 504.72 fps. H = 61.571 kHz
Vertical Binning	1/2 Binning 659(h) x 247(v) 193.88 fps (Note: Binning and Partial scan can not be used at the same time)
Sensitivity on sensor (minimum)	0.3 Lux (Max. gain, Shutter OFF, 50% video)
S/N ratio	More than 50 dB (0dB gain)
Digital Video output	8 or 10 bit in Camera Link
Gain	Manual -3 to +12 dB
Gamma	1.0
Synchronization	Int. X-tal.
Trigger input.	Via Camera Link
EEN output	4 V from 75 Ω source
Trigger modes	Pre-Select , Pulse Width and EPS with Smearless
Accumulation	LVAL synchronous or asynchronous automatic selection
Preset Shutter speed	OFF(1/120) , 9 fixed steps 1/250 to 1/30,000 second
Programmable exposure	2 L to 511 L (32.48 μ s to 8.299 ms)
Pulse width control	2 L to 240 frames (32.48 μ s to 2 seconds)
Readout modes	Full, Partial scan.(2/3, 1/2, 1/4, 1/8) V Binning
Control interface	Camera Link serial
Functions controlled by RS 232C	Shutter, Trigger, Scanning, Read out, Polarity, Black level, Gain,
Operating temperature	-5°C to +45°C
Humidity	20 - 90% non-condensing
Storage temp/humidity	-25°C to +60°C/20% to 90% 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
Power	12V DC \pm 10%. <0.3A (Normal Operation)
Lens mount	ϕ 17mm Exclusive mount
Dimensions	Head ϕ 17 x 46mm (ϕ x D) with 2m cable CCU 44 x 29 x 66 mm (H x W x D)
Weight	Head with 2m cable 120g, CCU 120g

Note: Above specifications are subject to change without notice

Note: Approximately 30 minutes pre heat required in order to meet specifications.

11. Appendix

11.1. 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, including laser sources.

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.

Remove power from the camera during any modification work, such as changes of jumper and switch settings.

11.2. Typical Sensor Characteristics

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

V. Aliasing

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

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 to 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

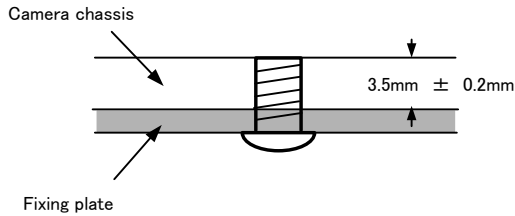
When the sensor captures a dark object at high temperature or is used for long time integration, fixed pattern noise may appear in the image.

11.3. Caution when mounting a lens on the camera

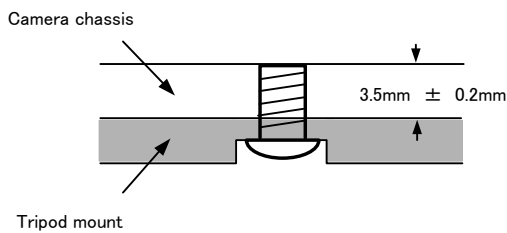
When mounting a lens on the camera dusts particles in the air may settle on the surface of the lens or the image sensor of the camera. It is therefore important to keep the protective caps on the lens and on the camera until the lens is mounted. Point the lens mount of the camera downward to prevent 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.

11.4. 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.



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



11.5. Exportation

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

11.6. References

1. This manual for CM-030PMCL-RH can be downloaded from www.jai.com
2. Datasheet for CM-030PMCL-RH can be downloaded from www.jai.com
3. Camera control software can be downloaded from www.jai.com

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[illegible]

User's Record

Camera type: CM-030PMCL-RH

Revision:

Serial No.

Firmware version.

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

User's Mode Settings.

User's Modifications.

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