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Find the *JAI / Pulnix CV-M40* at our website: *Click HERE*

Double Speed Monochrome
Progressive Scan Camera

CV-M40

Operation Manual

Camera: Revision D
Manual: Version 1.1

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1. General

CV-M40 is a compact monochrome progressive scan camera designed for automated imaging applications. The 1/2" CCD with square pixels offers a superb image quality. The double speed and partial scanning and vertical binning allow the camera to capture high quality images with a high frame rate.
The camera can operate in continuous mode and with triggered edge pre-select and pulse width controlled shutter. Frame delayed read out and vertical binning are also possible modes.
CV-M40 revision D has a new CCD sensor with 6 dB higher sensitivity than revision C.

The latest version of this manual can be downloaded from: www.jai.com
The latest version of Camera Control Tool for CV-M40 can be downloaded from: www.jai.com
Revision D starts with S/N E504301.
For camera revision history, please contact your local JAI distributor.

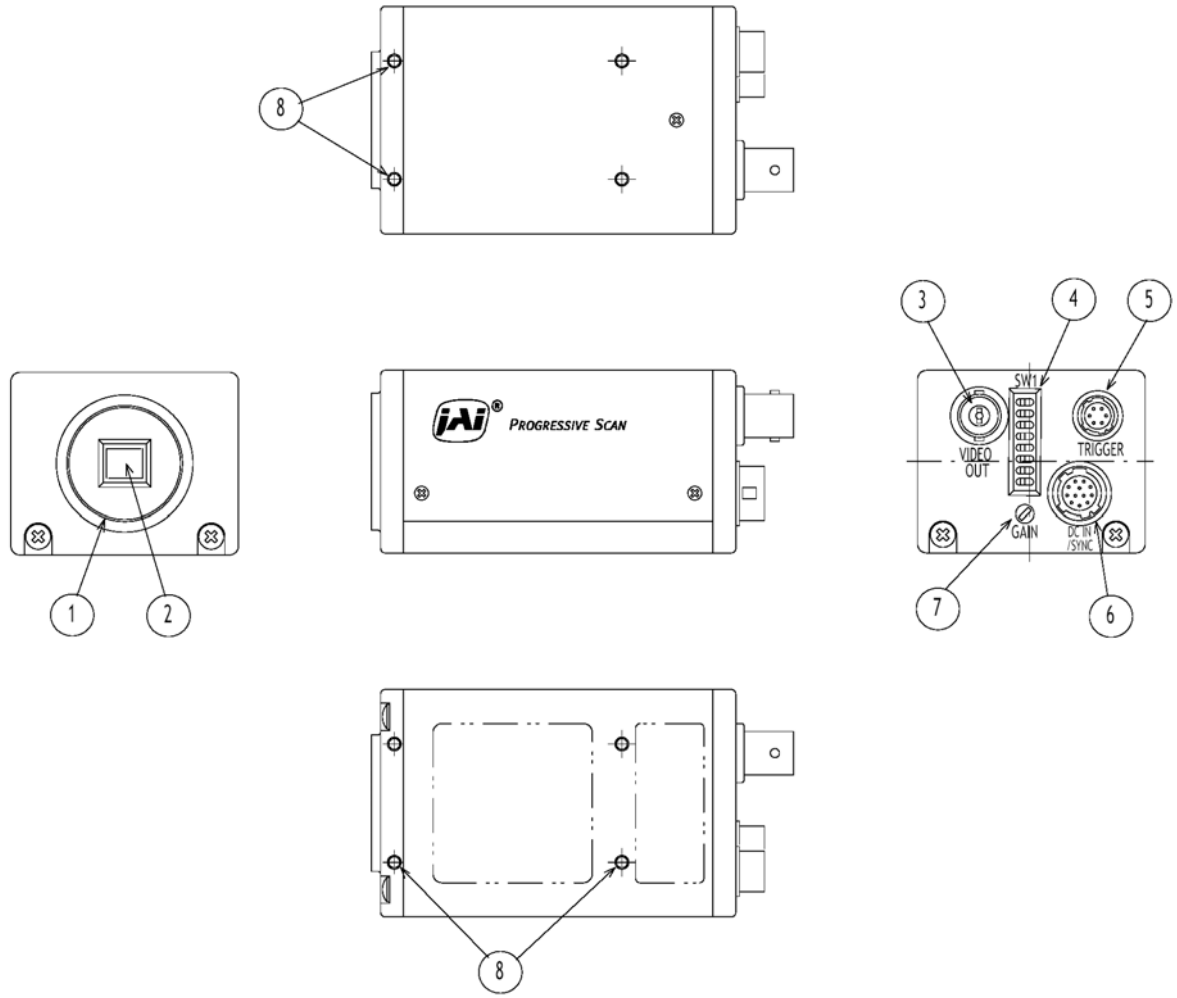
2. Standard Composition

The standard camera composition consists of the camera main body.

3. Main Features

- 1/2” progressive scan monochrome interline transfer CCD sensor
- 659 (h) x 494 (v) 9.9 µm square pixels compatible with VGA format
- Improved sensitivity and reduced smear
- 60 full progressive frames per second
- 120 frames per second with vertical binning
- 234 frames per second with 1/16 (30H) partial scanning
- Programmable partial scan from 15H to 413H in 1H steps
- Shutter speeds from 1/125 up to 1/12,000 sec in 8 steps
- Programmable shutter 2H to 513H
- Internal, external HD/VD or random trigger synchronization
- 24.5 MHz pixel frequency and 31.468 kHz line frequency
- Pixel clock and WEN output
- Edge pre-select and pulse width external trigger modes
- Edge pre-select shutter with frame delay read out
- H reset and H non-reset trigger mode
- Accepts standard C-mount lenses
- Setup via serial port or switches
- Setup by Windows 98/NT/2000 software via RS 232C

4. Locations and Functions



1 Lens mount of C-mount type. *1)
2 Interline-transfer CCD sensor.
3 Video output BNC connector
4 SW1 switch on the rear panel to set the shutter speed and other function modes.
5 6 pin connector for RS 232C signals, input of external trigger pulse and WEN output.
6 12 pin connector for DC +12V power external sync signals and output of video.
7 GAIN potentiometer for adjusting video level.
8 mounting holes 8 x M3deept5.

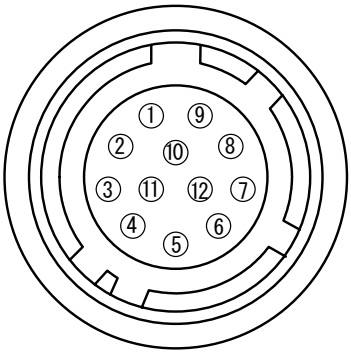
*1) ***Note***: *Rear protrusion on C-mount lens must be less than 10.0mm (0.4 inch approx.)*
When IR cut filter is used, it must be less than 7.0 mm (0.28 inch approx.)
The IR cut filter is placed in the C-mount thread.
The C-mount 25 mm IR cut filter must be ordered separately.

Fig. 1. Locations

5. Pin Assignment

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

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



Pin no.	Signal	Remarks
1	GND	
2	+12 V DC input	
3	GND	
4	Video output	Parallel with the BNC video output. Avoid double termination.
5	GND	
6	***HD in***/out/Trig in	Trigger in for H reset trigger HD in for H non-reset trigger. *1)
7	***VD in***/out/WEN out/Trig in	Triggger in for H non-reset. *1)
8	GND	
9	***NC***/PCK/WEN	Pixel clk JP7 S. WEN JP18 S. *1)
10	GND	
11	+12 V DC input	
12	GND	

Notes:

*Factory settings in **bold italic***

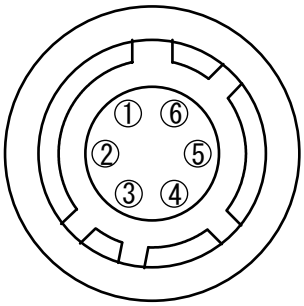
**1) Signals on pin no. 6, 7 and 9 can be changed by jumper setting. See "7.2. Jumper Settings" for more information.*

Warning! Do not input signals not used for the actual mode!

Fig. 2. 12-pin connector.

5.2. 6-pin Multi-connector (RS 232C/TRIGGER)

Type: HR10A-7R-6PB (Hirose) male.
(Seen from camera rear.)



Pin no.	Signal	Remarks
1	TXD out	
2	RXD in	
3	GND	
4	NC	
5	***Ext. Trig input***	***JP 5 short*** for H reset. JP 20 for H non-reset. *1)
6	***WEN out***/NC	*1) *2)

Notes:

*Factory settings in **bold italic***

**1) Signals on pin no. 5 and 6 can be changed by jumper setting.*

**2) WEN is 1 H long and positive going. Negative if JP22 is Short. See "7.2. Jumper Settings" for more information.*

Warning! Do not input signals not used for the actual mode!

Fig. 3. 6-pin connector

5.3. Input and Output Circuits

In the following schematic diagrams the input and output circuits for video and timing signals are shown.

Video output

The video output is a 75 Ω DC coupled circuit. The video DC level for video and video + sync is shown with 75 Ω termination.
The vertical composite sync is with serration and equalize pulses.

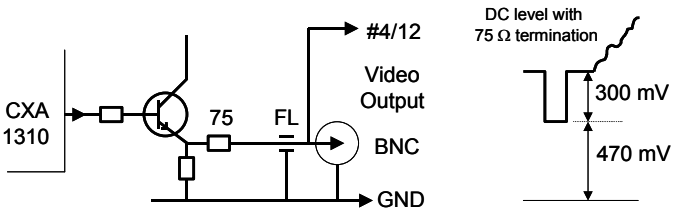


Fig. 4. Video output.

HD, VD and Trigger input

The inputs are AC coupled. To allow longer pulse width, the input circuit is a flip flop, which is toggled by the negative or positive differentiated spikes caused by the falling and rising edge.
The input is TTL as factory setting.
It can be 75Ω terminated by jumper.
As factory setting HD and VD are input.
Warning! *In trigger modes, the HD and VD input circuits are used as trigger inputs. Do not connect signal not used for the actual trigger mode.*

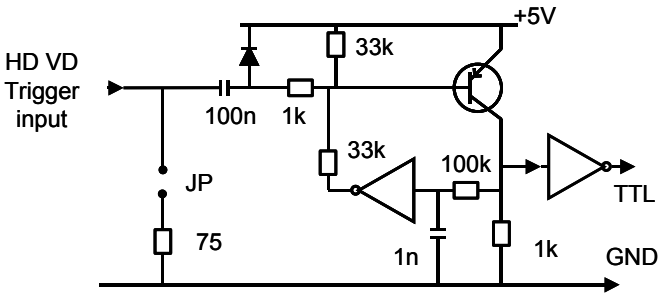


Fig. 5. HD, VD and Trigger input.

HD, VD, WEN and PCLK output

Output circuit for HD, VD, WEN and pixel clock is TTL through emitter follower with 75 Ω in series.
Output level ≥4 V from 75Ω. (Non-terminated).
WEN active polarity is positive 1H. It can be changed to be active low. The WEN timing then depend of the actual mode. Refer to timing diagrams.
If not used, the pixel clock should be disabled.

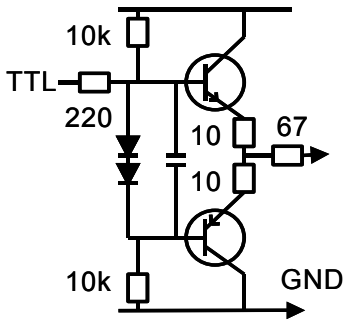


Fig. 6. HD, VD, WEN and PCLK output.

6. Functions and Operations

6.1. Basic functions

Apart from the standard continuous operation, the CV-M40 features two external asynchronous trigger modes Edge Pre-select and Pulse Width Control mode. Edge Pre-select mode can operate with delayed read out, where the trigger falling edge starts a pre-selected exposure, and the raising edge starts the read out.
These external trigger modes can operate with either H reset or H non-reset. In H reset, the internal HD is reset on the falling edge of the trigger and the exposure starts. H non-reset need external HD input. The exposure will be synchronized to the internal HD. It will start on the first HD after the trigger negative going edge. In Pulse width control mode, the exposure stops after the first internal HD
following the trigger rising edge.
H reset or H non-reset trigger mode cannot be selected by switch, jumpers or RS-232C. The mode is automatic selected depending of the input pin used for trigger, and if external HD is applied.

Note: *In H non-reset trigger modes the exposure start can be delayed up to 1H. In pulse width control modes jitter in exposure time can be up to 1H. To avoid this <1H jitter, the trigger pulse should be synchronized to the HD as shown in fig. 8.*

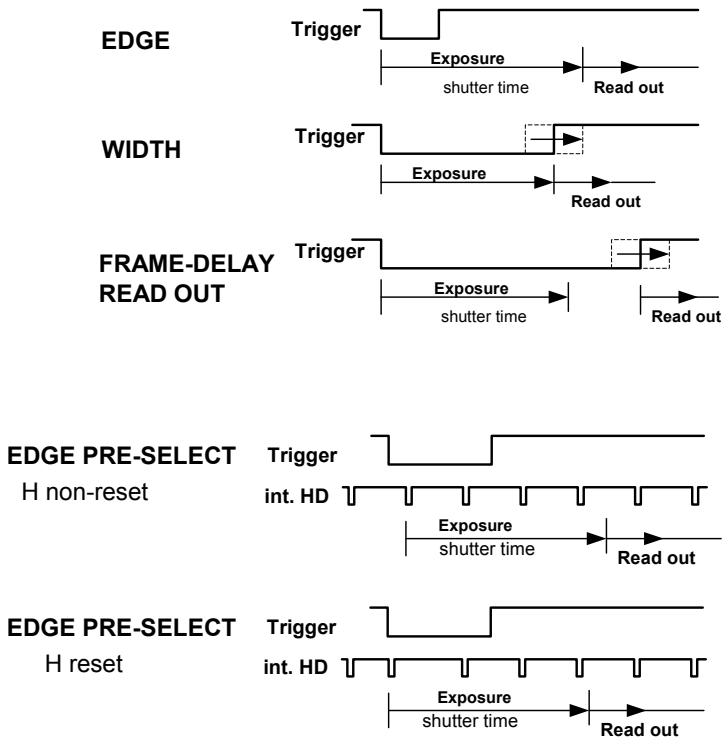


Fig. 7. Trigger modes

6.2. Input/Output of Timing Signals

Some signals can be input or output on different connector pins depending of camera mode and jumper setting. Please refer to the principle diagram fig. 29. It shows input and output pins and the jumper positions as it is for factory setting. The diagram can be useful for understanding the following modes and jumper functions.
For details, please refer to chapter "7.2. Jumper settings"

6.2.1. Input of External HD/VD signals

The factory pre-set is HD/VD input on pin 6/12 and 7/12. The video output is synchronized with external HD/VD signals if applied. If no ext. HD is connected, the camera will switch to the internal X-tal controlled HD sync. If no ext. VD is connected, the camera will continue with its internal VD. The external sync system should always follow the camera sync and scanning system. The external HD/VD signal should be 4.0 Vp-p ±2.0 V from a 75 Ω source. The inputs are factory set to TTL level (2.0 to 5.0 V). The input can be 75 Ω terminated by closing JP8/JP10 on PK8273B board.
Input of external HD/VD for synchronizing the camera to an external source is possible in normal continuous mode. Do not input external VD in trigger modes.

6.2.2. Output of Internal HD/VD signals

In order to output internal HD/VD signal 4.0 Vp-p from a 75 Ω source on pin 6/12 and 7/12, a jumper setting is required. JP9/JP11on PK8273B board open, and JP12/JP13 short.
In normal continuous mode both the internal HD and VD can be output. In trigger modes the internal VD will change to a WEN pulse. (Can be output on pin 7/12 by jumper setting).

6.2.3. Pixel Clock out on pin 9/12

Pin 9/12 is used for either pixel clock or WEN output. From factory none is output. Short jumper JP7 (JP18 open) for pixel clock out. To avoid interference the pixel clock output should be disabled if not used.

6.2.4. WEN out on pin 9/12

For applications where only the 12 pin connector is used, WEN can be output on pin 9/12 if JP18 is short (JP7 open). WEN active polarity is positive 1H. It can be changed to be active low by JP22. The timing then depends of the actual mode.

6.2.5. Input of external trigger

The external trigger input use either the HD or the VD input circuit depending of the mode setting. The external trigger signal should be 4.0 Vp-p ±2.0 V from a 75 Ω source. The trigger inputs can be 75 Ω terminated by closing JP8/JP10 on PK8273B board.
Depending of which input circuit is uses for trigger input, the trigger mode will be H-reset or H non-reset.
For a principle description of how it works, refer to fig. 29. with jumper in factory setting.

1) Trigger input on pin 6/12 will result in H reset mode.
2) Trigger input on pin 7/12 and external HD on pin 6/12 will result in H non-reset mode.

With trigger input on pin5/6:
1a) Trigger input on pin 5/6 will result in H reset mode. (JP5 short).
2a) Trigger input on pin 5/6 and external HD on pin 6/12 will result in H non-reset mode. (JP5 open and JP20 short).

Please refer to chapter "7.2. Jumper settings" for details in mode settings.

6.3. Operation Modes

This camera can operate in 4 primary modes. 1 non-triggered, 3 external asynchronous trigger modes. The triggered shutter can be HD synchronous or with H reset.
To avoid <1H time jitter in H non-reset mode, it is recommended to synchronize the trigger to HD as shown I fig. 8.

1.	*Normal continuous Mode.*	Pre-selected exposure and long time exposure.
2.	*Edge Pre-select Mode.*	Pre-selected exposure.
3.	*Pulse Width Control Mode.*	Pulse width controlled exposure.
4.	*EPS with delayed read out*	Pre-selected exposure with delayed read out

For the 3 trigger modes, the shutter exposure can operate in 2 modes.

H reset:
The trigger leading edge will immediately reset the internal H phase and start the exposure.
This mode need no external HD input.
The delay from trigger falling edge to exposure start is 1.5 μsecond.

H non-reset:
The exposure will start synchronous with the first HD after the trigger leading edge.
This mode need external HD input.
To avoid 1 H jitter it is recommended to synchronize the external trigger to the external HD signal as shown in fig. 8. The trigger falling and rising edge should be within the 4 + 1.5 μs.

Minimum trigger pulse width.

Edge Pre-Select mode H reset:	>2μs
Edge Pre-Select mode H non-reset:	>1H
Pulse Width Control:	>2H
EPS with delayed read out:	>3H + shutter time

Maximum trigger pulse width.
There is no fixed value for the maximum trigger pulse width. In pulse width control and frame delay readout it can be up to about 2 second. Then the dark signal noise will be visible. It is recommended to keep the trigger pulse short.

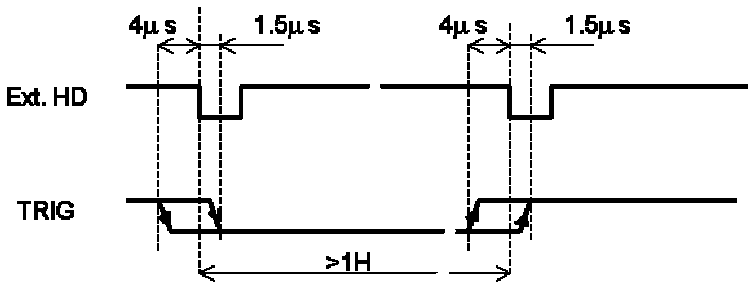


Fig. 8. Trigger HD relation

Please refer to chapter "7.2. Jumper settings" for details in mode settings.

6.3.1. Continuous operation

This mode is used for applications not requiring asynchronous external trigger, but should run in continuous operation.
The shutter time can be selected in 8 steps 8 steps, 1/125 to 1/12,000 sec. Via RS232C in 9 steps 1/60 (Off) to 1/120000. or programmable from 2H to 524H (Off). Binning or partial scan can be used, but not together.
For settings refer to chapter "7. Configuring the camera."
Refer to timing charts for details.

To use this mode:

Set: Rear switch SW1-5 **OFF,** SW1-6 **OFF** for **Normal.** For RS-232C select **Continuous** trigger mode.
SW1-1 through SW1-3 on rear or RS-232C for shutter speed.
Other functions.

Input: If used, input Ext. HD and Ext. VD to pin 6/12 and 7/12.
[JP10 short for HD 75Ω termination. JP8 short for VD 75Ω termination.]

Note: Selection of shutter speed longer than the frame time in binning and partial scanning will result in an exposure equal the frame time.
In partial scan, the shutter can not be completely off. Exposure is frame time -2H.

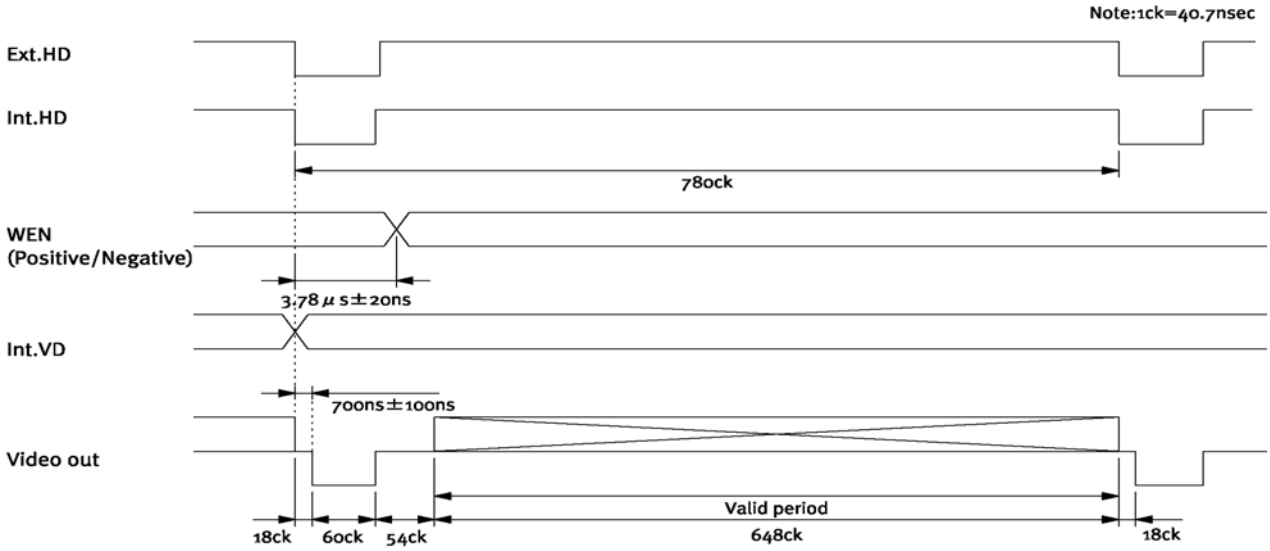


Fig. 9. Horizontal timing

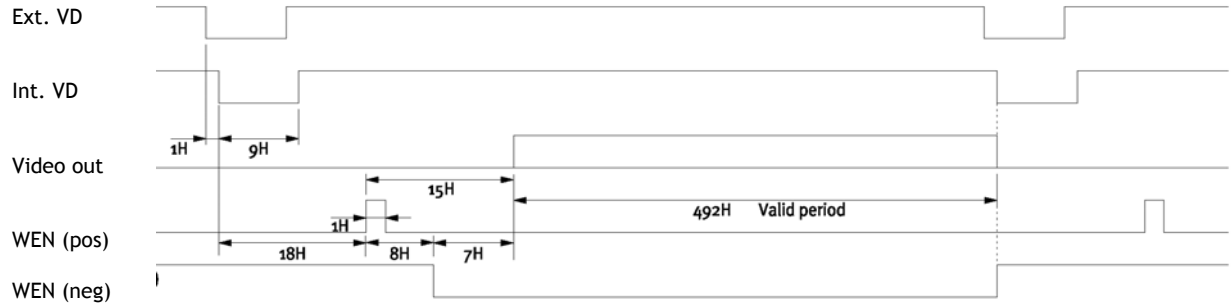


Fig. 10. Vertical timing

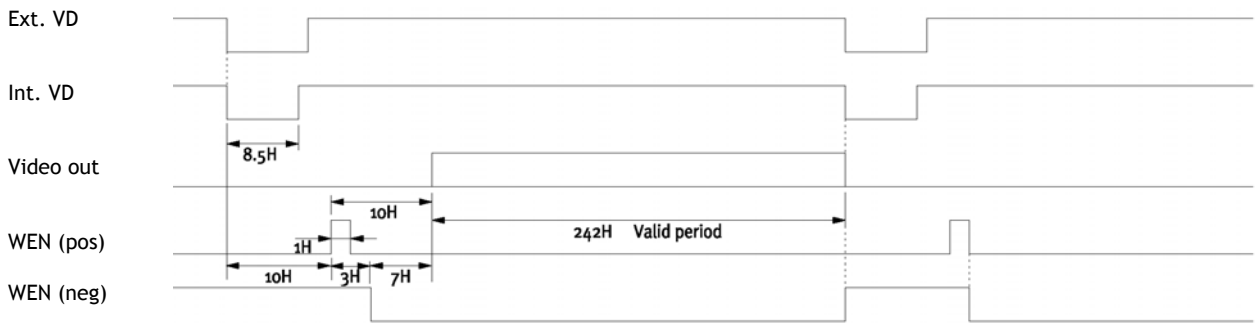
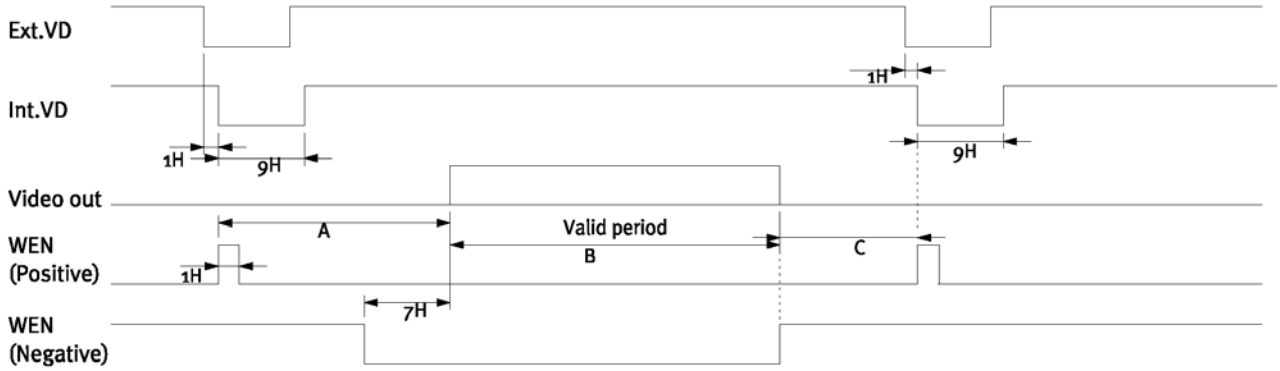


Fig. 11. Vertical timing with binning



Effective readout line	A	B	C
240 line	44H	240H	11H
120 line	65H	120H	15H
60 line	79H	60H	17H
30 line	86H	30H	18H

Note 1:Sync or HD is not mentioned
Note 2:1H=31.777 μ S
Note 3:WEN polarity can be chosen at JP22 of I/F board

Programmable partial scanning is not supported with timing details.

Fig. 12. Vertical timing with partial scan

6.3.2. Edge Pre-select Trigger Mode

This trigger mode can operate in H reset mode or H non-reset mode.
In H reset mode the falling edge of the trigger will immediately reset the internal HD and start the exposure. In H non-reset mode, where an external HD should be input, the exposure will start at the first HD after the trigger. The shutter time can be selected in 8 steps, 1/125 to 1/12,000 sec. Via RS232C in 9 steps, 1/60 (Off) to 1/120,000. Programmable shutter from 2H to 524H (Off). Binning or partial scan can be used, but not together.
The resulting video signal will start to be read out after the selected shutter time.
To avoid up to 1H time jitter in H non-reset, it is recommended to synchronize the trigger to HD. The falling edge of the trigger should be within 4.4 μsec. from the falling edge of the ext. HD. (See fig. 8.).
The WEN pulse indicates the start of valid video signal. Refer to timing charts for details. A new trigger pulse must not be applied before the video read out has been finished. (WEN negative goes high). For partial scanning, refer to fig. 15.
For settings refer to chapter "7. Configuring the camera."
Refer to timing charts for details.

To use this mode:

Set: Rear switch SW1-5 **ON,** SW1-6 **OFF** for **Edge.** For RS-232C select **Edge Pre-Select**.
SW1-1 through SW1-3 on rear or RS-232C for shutter speed.
Other functions.

Input: For H reset: **External trigger** to pin #5/6. >2μs
(JP5 short, JP11 short)
[JP10 short for trigger 75Ω termination.]

For H non-reset: **External trigger** to pin #5/6. >2H
External HD to pin #6/12
(JP20 short, JP5 open, JP9 short)
(JP21 short, JP11short)
[JP8 short for trigger 75Ω termination.]
[JP10 short for HD 75Ω termination.]

Note: For H non-reset the external HD should be input continuously.
Refer to fig. 29. for correct jumper setting and pin connections.

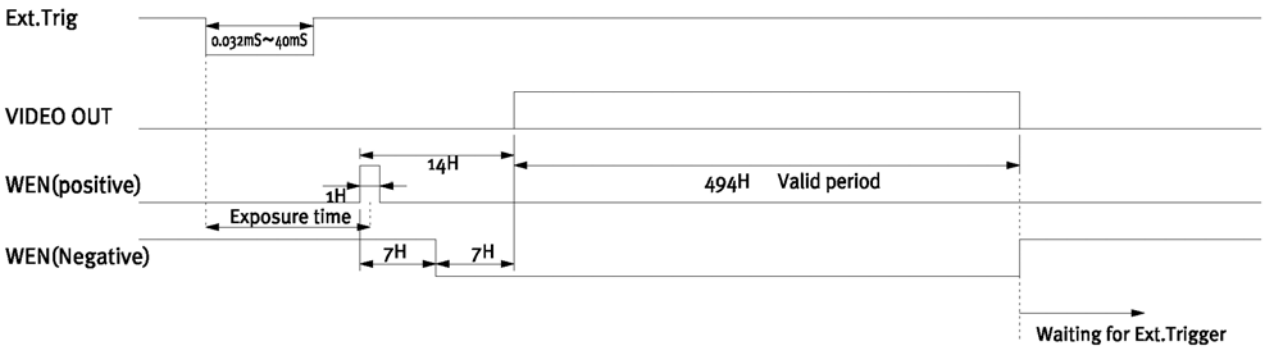


Fig. 13. EPS vertical timing

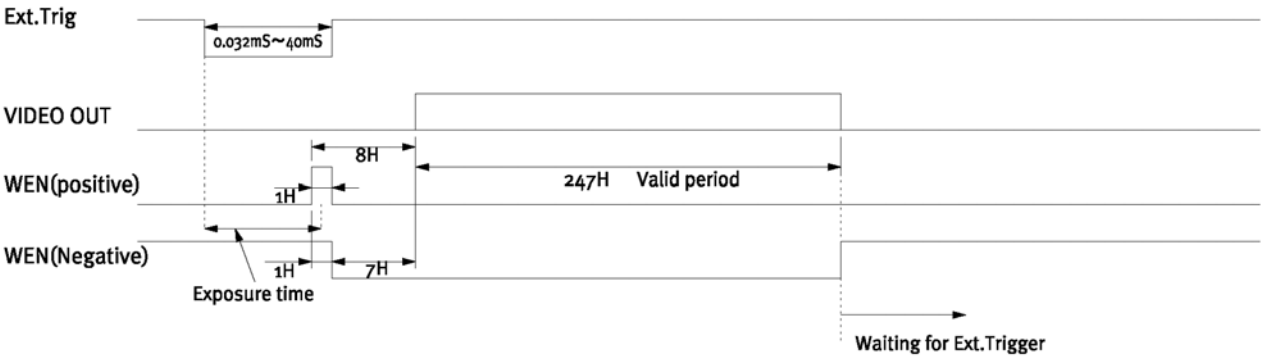
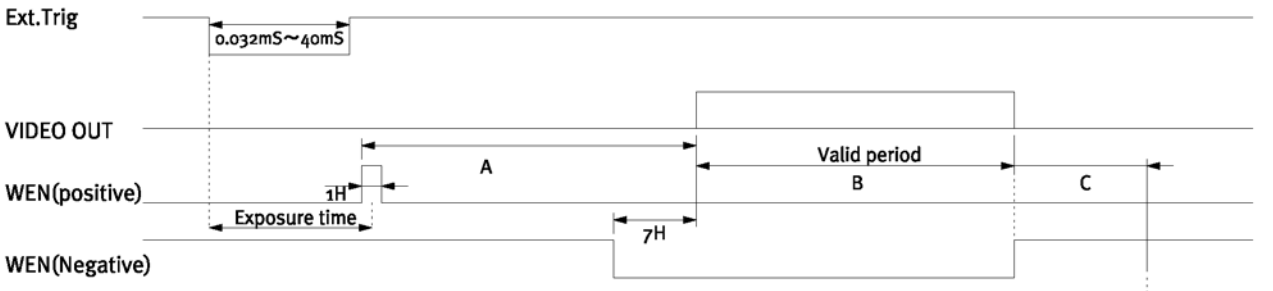


Fig. 14. EPS vertical timing with binnig



Effective readout line	A	B	C
240 line	45H	240H	13H
120 line	66H	120H	17H
60 line	80H	60H	19H
30 line	87H	30H	20H

Note 1:Sync or HD is not mentioned
Note 2:1H=31.777 μ S
Note 3:WEN polarity can be chosen at JP22 of I/F board

Programmable partial scanning is not supported with timing details.

Fig. 15. EPS vertical timing with partial scanning

6.3.3. Pulse Width Control Trigger Mode

This trigger mode can operate in H reset mode or H non-reset mode.
In H reset mode the trigger falling edge will immediately reset the internal H and start the exposure. The exposure will end at the rising edge of the trigger, and the resulting video will be read out. WEN will indicate the start of video read out.
In H-non-reset mode, where a continuous external HD is input, the exposure will start at the first HD pulse after the falling edge of the trigger. The exposure stops at the trigger rising edge. To avoid up to 1H time jitter it is recommended to synchronize the trigger to HD. The falling edge of the trigger should be within 4.4 μsec. from the falling edge of the ext. HD. (See fig. 8.). The resulting video signal will start to be read out after the trigger rising edge. The WEN pulse indicates the start of valid video signal.
The trigger pulse width can be up to 2 second. Here the dark signal noise will be visible.
A new trigger pulse must not be applied before the video read out has been finished. (WEN negative goes high). For partial scanning, refer to fig. 18.
For settings refer to chapter "7. Configuring the camera."
Refer to timing charts for details.

To use this mode:

Set: Rear switch SW1-5 **OFF,** SW1-6 **ON** for **Pulse.** For RS-232C select **Pulse Width Control**.
Other functions.

Input: For H reset: **External trigger** to pin #5/6. >2H
(JP5 short, JP11 short)
[JP10 short for trigger 75Ω termination.]

For H non-reset: **External trigger** to pin #5/6. >2H
External HD to pin #6/12
(JP20 short, JP5 open, JP9 short)
(JP21 short, JP11short)
[JP8 short for trigger 75Ω termination.]
[JP10 short for HD 75Ω termination.]

Note: For H non-reset the external HD should be input continuously.
Refer to fig. 29. for correct jumper setting and pin connections.

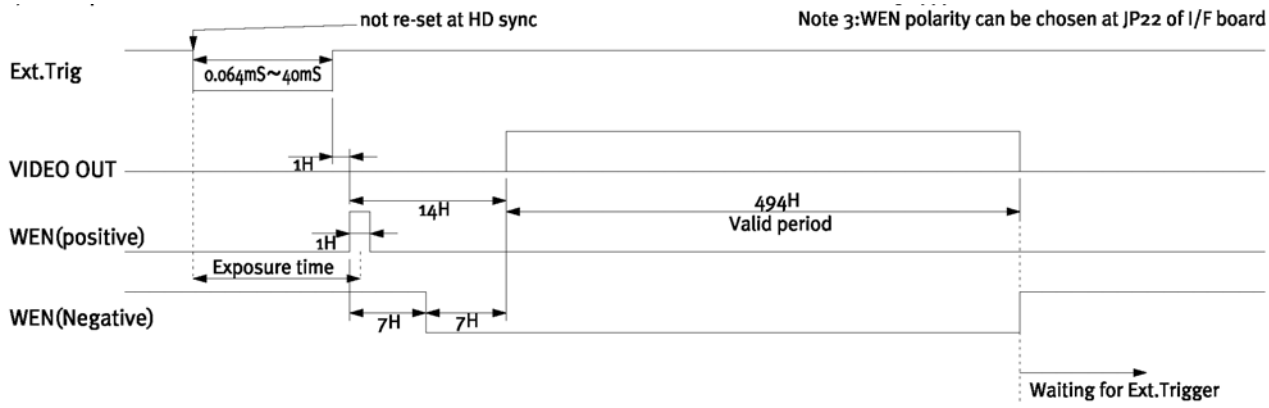


Fig. 16. PWC vertical timing

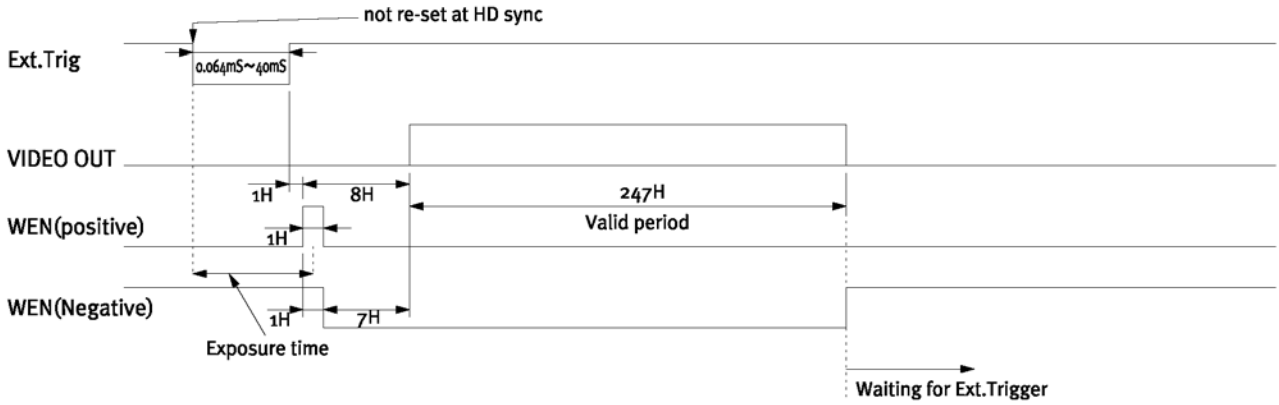
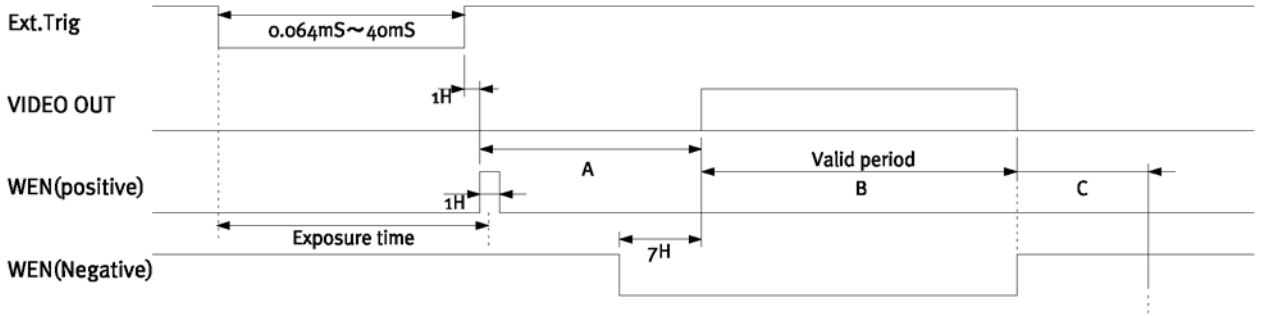


Fig. 17. PWC vertical timing with binning



Effective readout line	A	B	C
240 line	45H	240H	13H
120 line	66H	120H	17H
60 line	80H	60H	19H
30 line	87H	30H	20H

Note 1:Sync or HD is not mentioned
Note 2:1H=31.777 μ S
Note 3:WEN polarity can be chosen at JP22 of I/F board

Programmable partial scanning is not supported with timing details.

Fig. 18. PWC vertical timing with partial scanning

6.3.4. Frame delay read out Mode.

The trigger falling edge will start the selected exposure as for edge pre-select. The trigger raising edge will start the resulting frame to be read out.
This mode allows simultaneous capture of multiple cameras using a common external trigger pulse and sequential multiplexed read out to a single input frame grabber.
This trigger mode can operate in H reset mode or H non-reset mode.
In H reset mode the falling edge of the trigger will immediately reset the internal HD and start the exposure. In H non-reset mode, where an external HD should be input, the exposure will start at the first HD after the trigger. The shutter time can be selected in 8 steps, 1/125 to 1/12,000 sec. Via RS232C in 9 steps, 1/60 (Off) to 1/120,000. Programmable shutter from 2H to 524H (Off). Binning or partial scan can be used, but not together.
To avoid up to 1H time jitter in H non-reset, it is recommended to synchronize the trigger to HD. The falling edge of the trigger should be within 4.4 μsec. from the falling edge of the ext. HD. (See fig. 8.).
When the trigger signal rise, the resulting video signal will be read out.
The WEN pulse indicates the start of valid video signal. Refer to timing charts for details. A new trigger pulse must not be applied before the video read out has been finished. (WEN negative goes high). For partial scanning, refer to fig. 21.
The trigger pulse width should be >3H longer than the pre-selected exposure time.
The maxim trigger pulse width (or delay) should be <2 seconds. Here the dark signal noise will be visible.
For settings refer to chapter "7. Configuring the camera."
Refer to timing charts for details.

To use this mode

Set:	Rear switch SW1-5 **ON,** SW1-6 **ON** for **Frame.** For RS-232C select **Frame delay readout**. SW1-1 through SW1-3 on rear or RS-232C for shutter speed. Other functions.	
Input:	For H reset:	**External trigger** to pin #5/6. >3H (JP5 short, JP11 short) [JP10 short for trigger 75Ω termination.]
	For H non-reset:	**External trigger** to pin #5/6. >3H **External HD** to pin #6/12 (JP20 short, JP5 open, JP9 short) (JP21 short, JP11short) [JP8 short for trigger 75Ω termination.] [JP10 short for HD 75Ω termination.]

Note: For H non-reset the external HD should be input continuously.
Refer to fig. 29. for correct jumper setting and pin connections.
Avoid highlighted scene areas during the delay period.

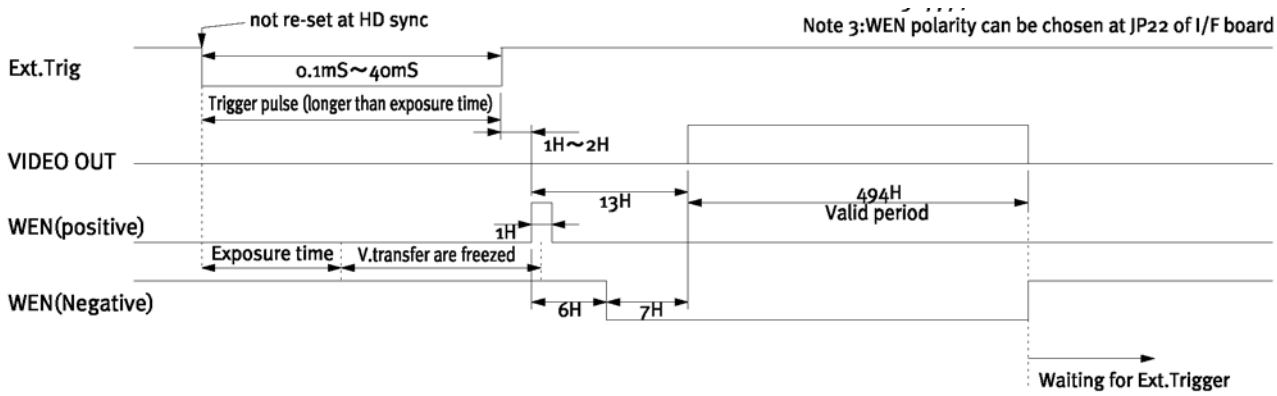


Fig. 19. Frame delay vertical timing

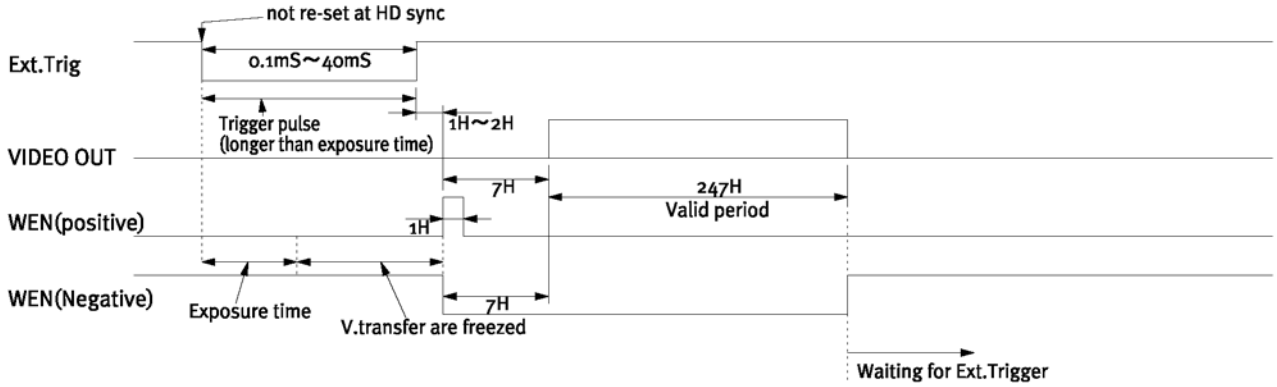
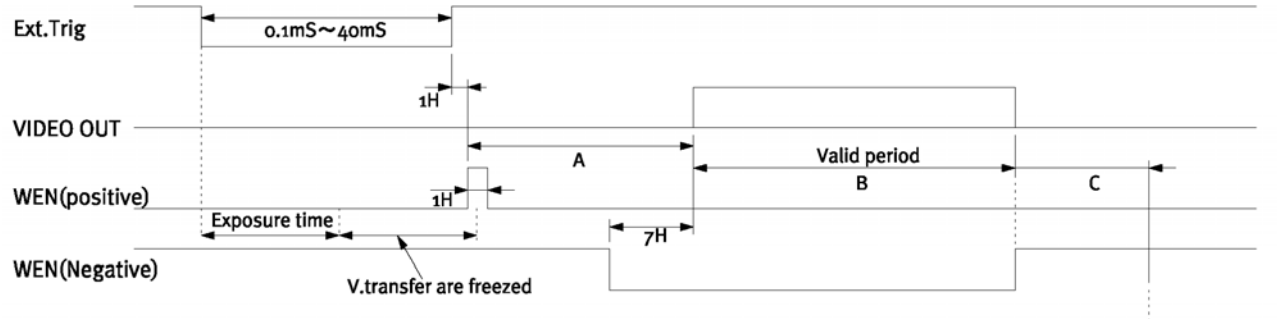


Fig. 20. Frame delay vertical timing with binning



Effective readout line	A	B	C
240 line	45H	240H	13H
120 line	66H	120H	17H
60 line	80H	60H	19H
30 line	87H	30H	20H

Note 1:Sync or HD is not mentioned
Note 2:1H=31.777 μ S
Note 3:WEN polarity can be chosen at JP22 of I/F board

Programmable partial scanning is not supported with timing details.

Fig. 21. Frame delay vertical timing with partial scanning

6.4. Other Functions.

Shutter speed.
The shutter speed can be set by the rear switch SW1-1 through 1-3 in 8 fixed steps from 1/125 to 1/12,000 second.
Via RS-232C it can be set to 9 fixed steps from 1/60 (Off) to 1/12,000 sec. Further it can be programmed with 1H step from 2H to 524H (Off).

Readout mode.
Normal full frame readout or binning can be selected by SW1-4. The binning is vertical 2:1, where the pixel values from 2 adjacent lines are added and read out as a single line. The frame rate is 120. Binning will not work together with partial scanning.
With RS-232C the binning function is found in the "Frames Mode" menu.

Trigger modes.
The 4 modes can be selected by SW1-5 and SW1-6, or via RS-232C in "Trigger Modes" menu.

Format.
Full or partial scanning can be selected by rear SW1-7. With partial selected, the scanning format are set by internal jumpers JP14 through JP17. (1/2, 1/4, 1/8 or 1/16 partial). Factory setting 1/4.
With RS-232C the partial scanning is found in the menu "Frame Modes". Here it is also possible to program the partial scanning with 1line steps from 15H to 413H.
(Note: Programmable partial scan is not supported with timing diagrams.)

Control.
Switch SW1-8 selects if the camera is controlled locally by switch and jumpers or via RS-232C.

Gamma.
Gamma can be set to 1.0 (linear) or 0.45 by internal jumpers JP1 and JP2. Factory setting 1.0.
If JP1 and JP2 is open, the gamma selection can be done via RS-232C.

WEN polarity.
The WEN output pulse is positive going 1H wide as factory setting. It indicates that the resulting video signal is read out. With the internal jumper JP22, the WEN pulse can be changed so it is low during video readout. Refer to timing diagrams for details.

Gain settings.
As factory setting the video gain can be controlled by the rear potentiometer.
Via RS-232C the video gain function has 3 modes.

1. **Automatic Gain Control. AGC.** Here the gain is automatic controlled to keep the video level constant within a 12 dB range. The level is given by the AGC reference value.
2. **Manual Gain Control.** Here the gain level is set by Manual Gain Level via RS-232C.
3. **Hardware (Rear potentiometer)** where the gain can be set by the rear potentiometer.

AGC reference level.
The AGC reference level can be set by RS-232C only. The level is adjusted so the automatic gain control circuit AGC will keep the video level constant. Normal video output 700 mVpp ±30 mV.

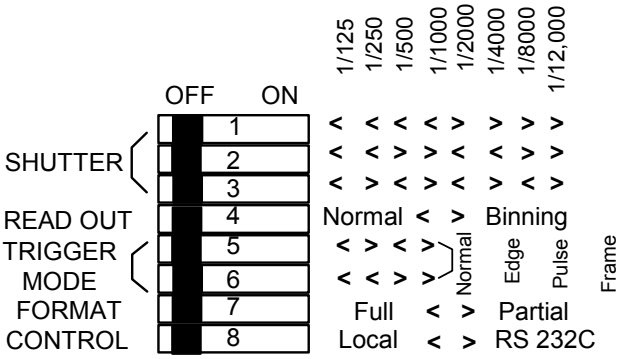
Black level.
RS-232C only. Black level (or set-up) can set the video level for black. Normal 20 mV ±2 mV.

White clip level.
RS-232C only. Is set to clip highlighted video signal peaks. Normal clip level is 800 mVpp ±30 mV.

7. Configuring the Camera

Note: Before making any mode or jumper settings switch the power off.
*Factory settings are shown in "**italic bold**".*

7.1. Mode Setting by Switch



***Note:** The shown switch settings are the factory setting.*

Fig. 22. Switch on camera rear.

7.2. Jumper settings

The inside jumper settings are done as solder bridges. Jumpers are found on the following boards: PK8201C, PK8273B and PK8202C.

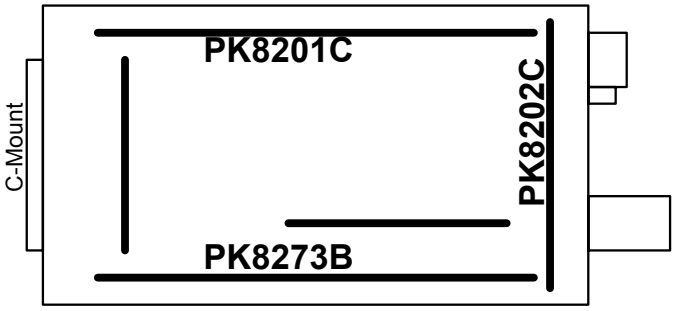


Fig. 23. PCB boards positions

7.2.1. Gamma setting

Jumpers are placed on PK8201C.

Jumper	Set by jumper		Select by RS-232C
	0.45	***1.0***	
JP1	Short	***Open***	Open
JP2	Open	***Short***	Open

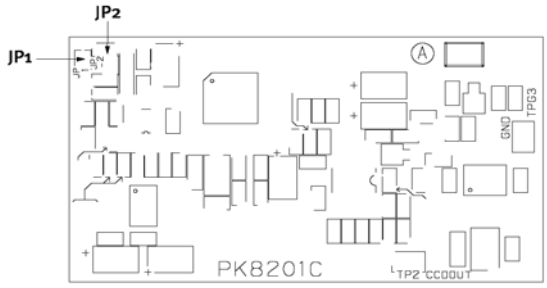


Fig. 24. Gamma setting

7.2.2. Partial scan setting

Jumpers are placed on PK8273B.
Format set by the jumpers are selected as partial by the rear switch SW1-7.

Jumper	Scanning			
	1/16 30 lines	1/8 60 lines	***1/4*** ***120 lines***	1/2 240 lines
JP14	Short	Open	***Open***	Open
JP15	Open	Short	***Open***	Open
JP16	Open	Open	***Short***	Open
JP17	Open	Open	***Open***	Short

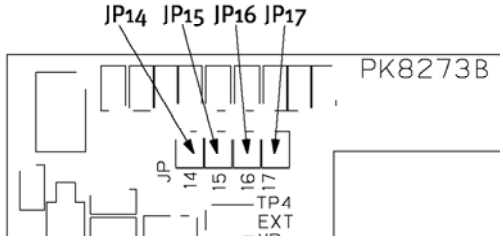


Fig. 25. Partial scan setting

7.2.3. Pixel clock and WEN output

Jumpers are placed on PK8202B.
Note: Do not output pixel clock when not used.

Jumper	Output on pin #9/12		
	N C	PCK	WEN
JP7	***Open***	Short	Open
JP18	***Open***	Open	Short

Jumper	Output on pin #6/6	
	N C	WEN out
JP6	***Open***	Short

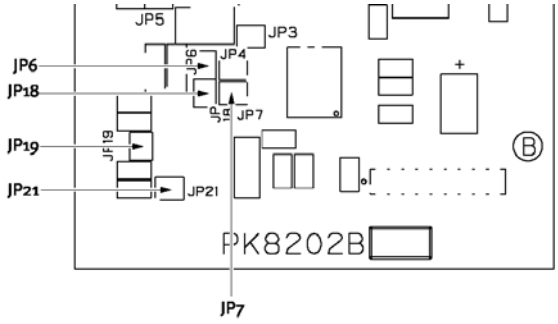


Fig. 26. Pck/WEN output on pin#9/12. WEN on #6/6.

7.2.4. HD/VD input or output

Jumpers are placed on PK8273B and PK8202B.

Note: The HD/VD input circuit are also used as trigger and HD input in trigger modes. The jumper settings and pin connections should be carefully checked to avoid problems.

Jumper	***VD in TTL***	VD in 75 Ω	VD out
JP8	***Open***	Short	x
JP9	***Short***	Short	Open
JP12	***Open***	Open	Short
JP19 *)	***Short***	Short	Short

Jumper	***HD in TTL***	HD in 75 Ω	HD out
JP10	***Open***	Short	x
JP11	***Short***	Short	Open
JP13	***Open***	Open	Short
JP21 *)	***Short***	Short	Short

*) JP21 and JP19 on rear board PK8202B.

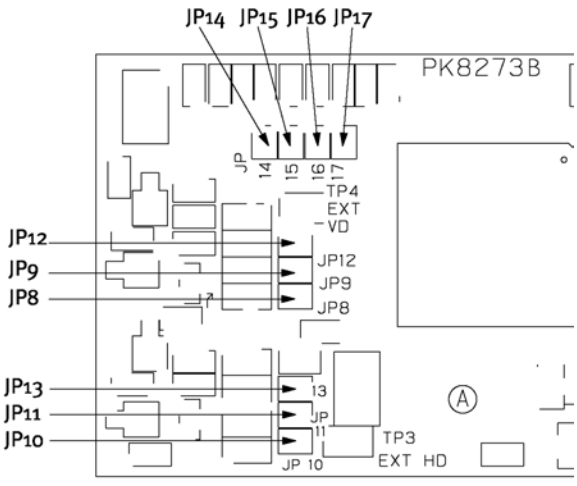


Fig 27. HD and VD input/output jumpers

7.2.5. WEN positive/negative

Jumper is placed on PK8273C.
As factory setting the WEN signal is 1H positive for active. With JP22 it can be changed to be active low. The WEN timing is then changed. Refer to actual timing diagram for details.

Jumper	***WEN positive***	WEN negative
JP22	***Open***	Short

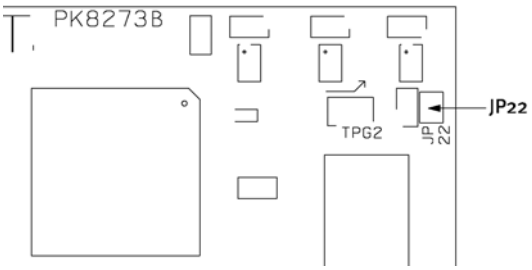


Fig. 28. WEN positive/negative

7.2.6. Principle diagram for input and output jumpers

The below shown diagram with jumpers in factory setting can be useful for control of jumpers and connections.

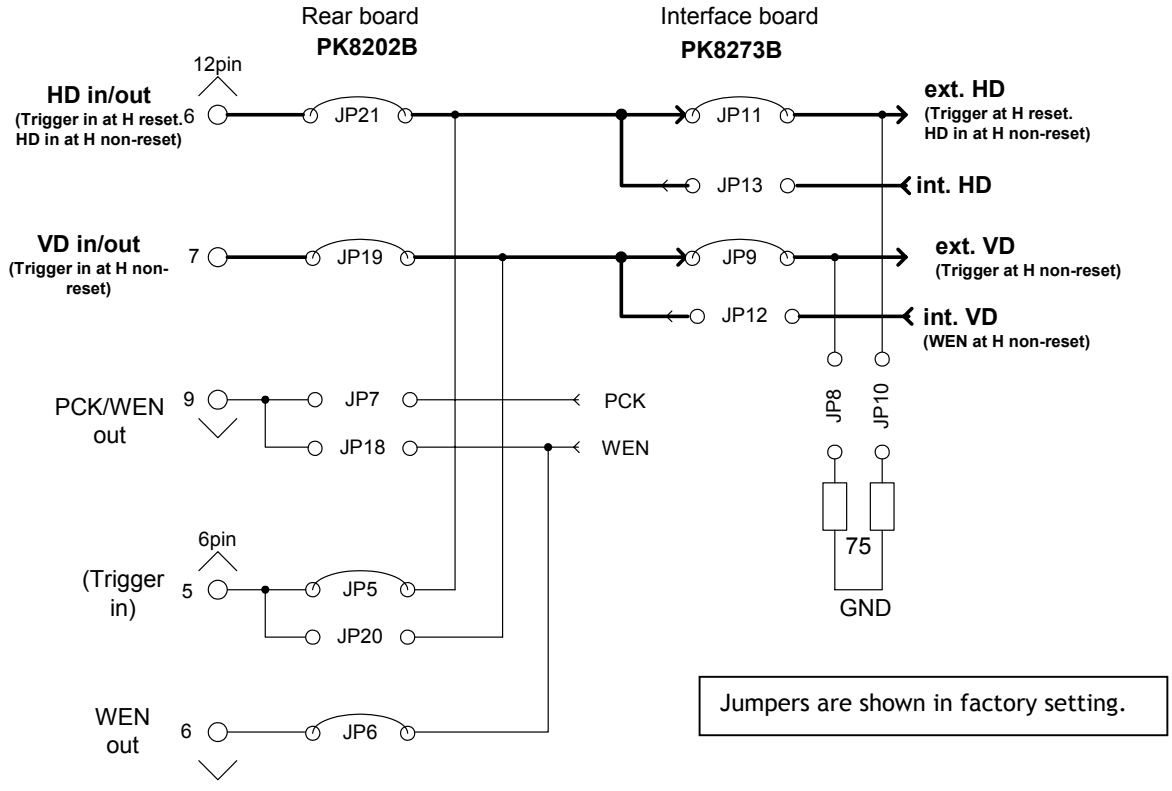


Fig. 29. Principle diagram for input output jumpers and signals.

7.3. Camera Control Tool for CV-40

From www.jai.com Camera Control Tool for Windows 98/NT/2000 can be downloaded.
The control tool contents a camera control program and tools for making your own program.
For the integrator and experienced user, the Camera Control Toll is much more than a program with a window interface. It also provides an easy and efficient ActiveX interface built for MS Windows 98, ME, NT and 2000. 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.
Below the different windows are shown.

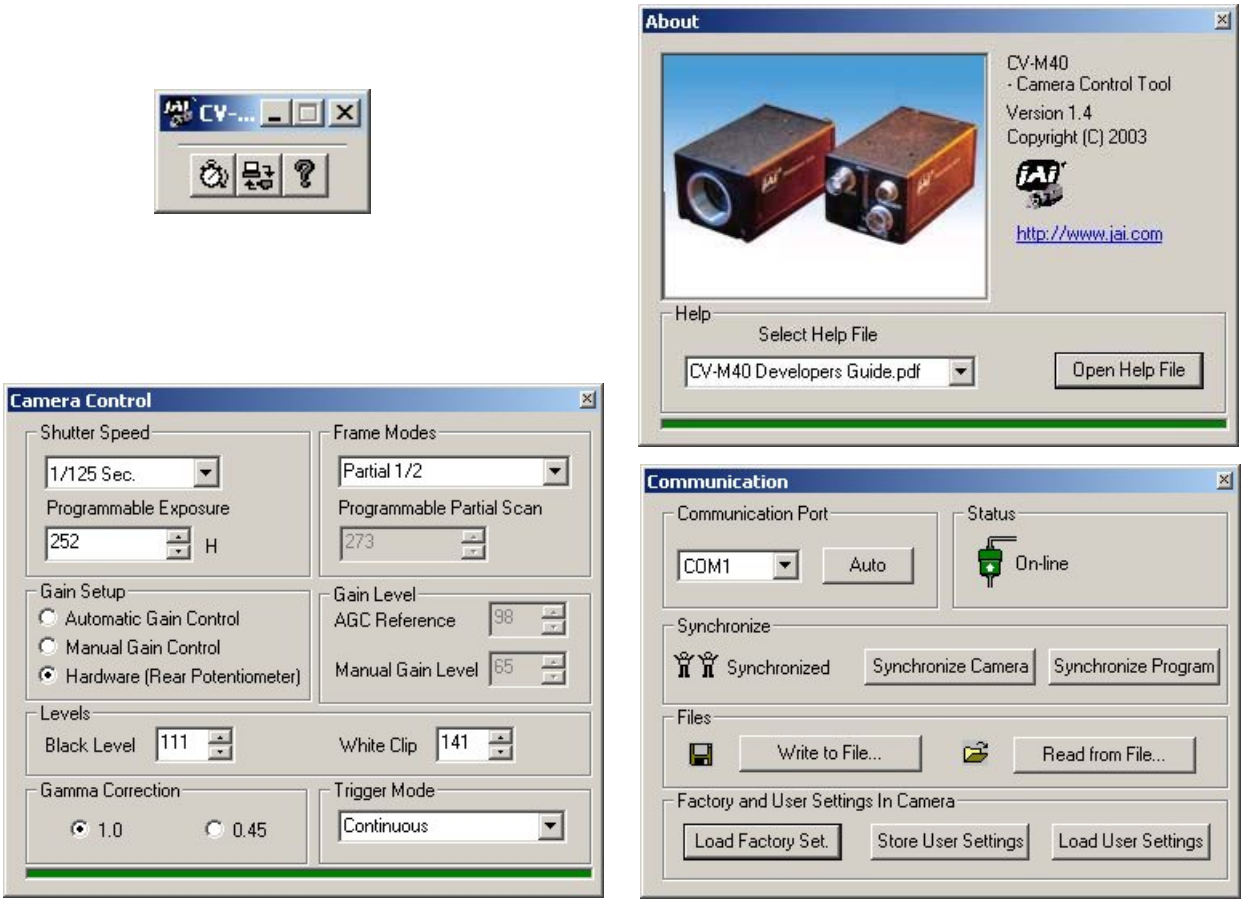


Fig. 30. Camera control tool windows.

7.3.1. Default settings at power up

With the camera rear switch SW1-8 "CONTROL" in "RS 232C, the camera will start with the settings stored in user settings. The user settings can only be stored via RS-232C.
If the camera rear switch SW1-8 "CONTROL" is in "Local", the camera will start with the settings given by the switch and jumper setting.

8. External Appearance and Dimensions

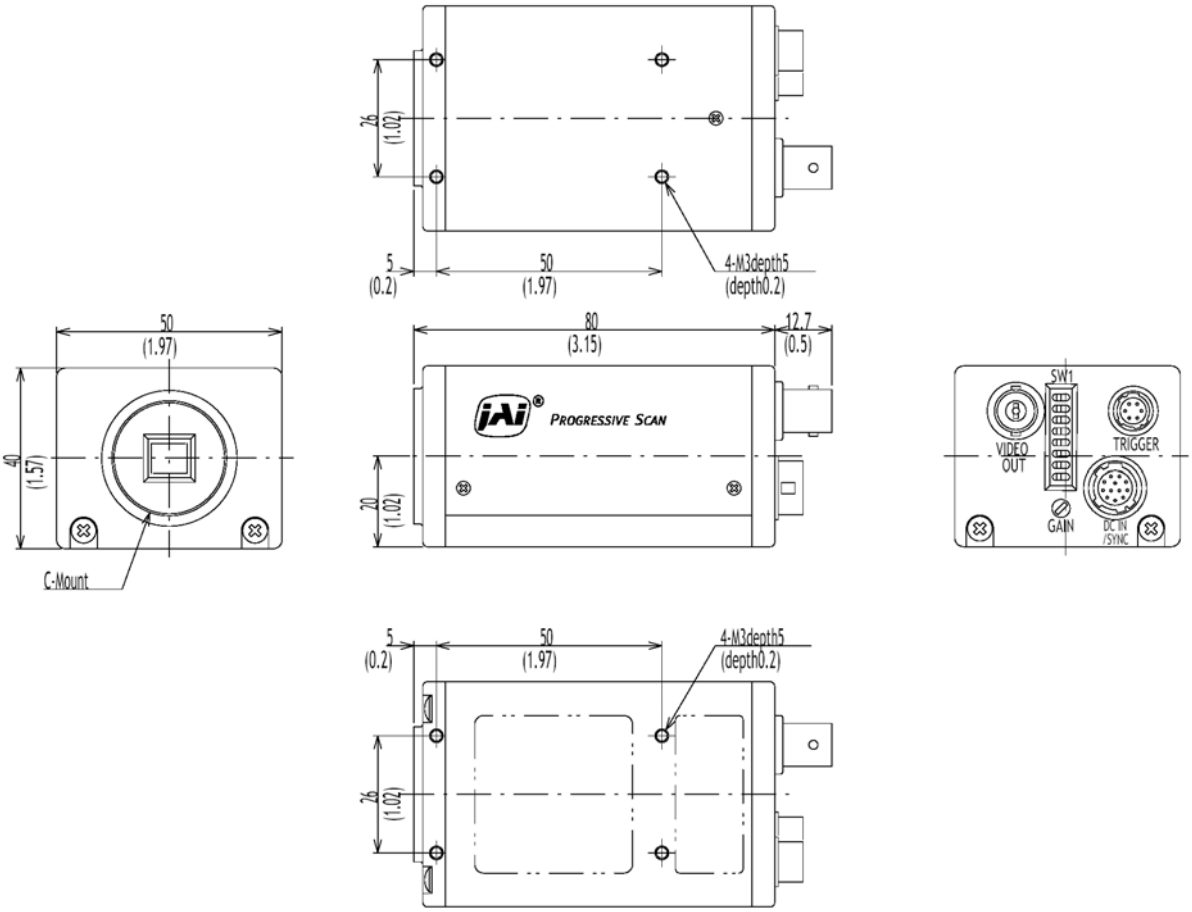


Fig. 31. Outline.

9. Specifications

9.1. Spectral sensitivity

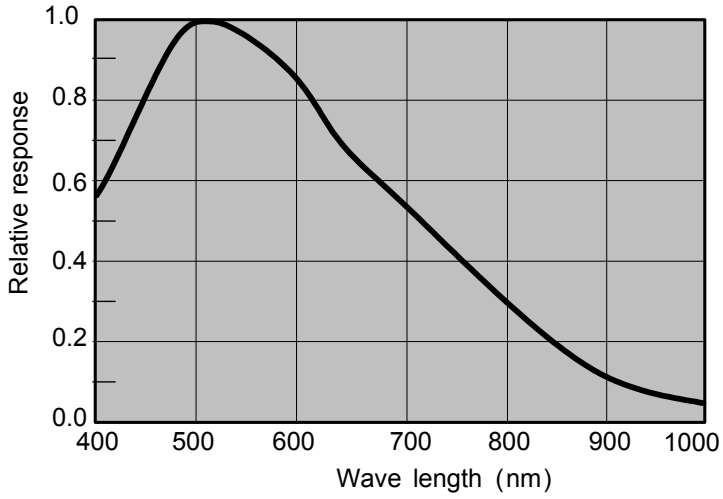


Fig. 32. Spectral sensitivity for CV-M40

9.2. Specification table

Specifications	CV-M40
Scanning system	Progressive scan 60 frames/sec. (525 lines/frame)
Frame rate Full frame Vertical 2:1 binning Partial 1/2 Partial 1/4 Partial 1/8 Partial 1/16	60 fps. 648 (h) x 492 (v) pixels 120 fps. 648 (h) x 242 (v) pixels 106 fps. 648 (h) x 240 (v) pixels 157 fps. 648 (h) x 120 (v) pixels 201 fps. 648 (h) x 60 (v) pixels 234 fps. 648 (h) x 30 (v) pixels
Line frequency	31.4684 kHz. (780 pixels clock/line) (31.777 μsec)
Pixel clock	24.5 MHz. (40.7 ns)
CCD sensor	ICX-414AL-6. 1/2" progressive scan monochrome IT
Sensing area	6.61 (h) x 4.97 (v) mm
Cell size	9.9 (h) x 9.9(v) μm
Effective pixels	659 (h) x 494 (v)
Pixels in video output	648 (h) x 492 (v)
Sensitivity on sensor	0.5Lux (Min. Gain, 100% video) 0.1 Lux (Max. gain, 50% video)
S/N ratio	>48dB
Video output	Composite 1.0Vpp 75Ω
Gain Gain range	Manual - automatic 0 to +12 dB
Gamma	0.45 – 1.0
Synchronization	Int. X-tal. Ext. HD/VD, random trigger
HD/VD input	4 V ±1 V. TTL or 75 Ω terminated
HD/VD output	4 V from 75 Ω source
Trigger input. H non reset	4 V ±1 V. TTL or 75 Ω terminated. >2H to <1300H (External HD input needed)
Trigger input. H non reset	4 V ±1 V. TTL or 75 Ω terminated. >2μsec to <1300H (No external HD input)
EEN WEN output. H reset	4 V from 75 Ω source
Pixel clock output	4 V from 75 Ω source
Trigger modes	Continuous, Edge pre-select, Pulse width control, Frame delay read out
Triggered shutter functions	HD synchronous or H reset
Shutter speed EPS	9 steps. 1/60 to 1/12,000 sec.
Pulse width control	1H to 625H
Frame delay read out	3H to 1250H
Control interface	Switches on rear, RS 232C
Functions controlled by RS 232C	Scanning, Shutter, Trigger, Black level and Gain. AGC level, white clip, user settings
Operating temperature	-5°C to +45°C
Humidity	20 – 80% non-condensing
Storage temp/humidity	-25°C to +60°C/20% to 90%
EMC	CE (EN50081-1 and EN50082-1)
Power	12V DC ± 10%. 2.3 W
Lens mount	C-mount (Flange back 17.526 mm ±0.05mm) Image centre ±0.1mm from C-mount centre
Dimensions	40 x 50 x 80 mm (HxWxD)
Weight	245g

***Note**: Above specifications are subject to change without notice.*

10. Appendix

10.1. 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 setting.

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

Blemishes
Some pixel defects can occur, but this does not have en effect on the practical operation.

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.

10.3. References

1. This manual can and datasheet for CV-M40 can be downloaded from www.jai.com
2. Camera control software can be downloaded from www.jai.com
3. Specifications for the EIA CCD sensor ICX-414L can be found on www.jai.com

11. Users Record

Camera type: **CV-40**

Revision: **(Revision D)**

Serial No. **……..**

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

Users Mode Settings.

Users Modifications.

DECLARATION OF CONFORMITY
AS DEFINED BY THE COUNCIL DIRECTIVE
89/336/EEC
EMC (ELECTROMAGNETIC COMPABILITY)
WE HEREWITH DECLARE THAT THIS PRODUCT
COMPLIES WITH THE FOLOWING PROVISIONS APPLYING TO IT.
EN-50081-1
EN-50082-1

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