

Small Cubic Type

1/2", 1/3" VGA CCD

Color / Monochrome PoCL CameraLink Camera

STC-MC32PCL (1/2" VGA CCD Color)

STC-MB32PCL (1/2" VGA CCD Monochrome)

STC-MC33PCL (1/3" VGA CCD Color)

STC-MB33PCL (1/3" VGA CCD Monochrome)

Product Specifications

OMRON SENTECH CO., LTD.

Revisions

Rev	Date	Changes	Note
02	2015/12/18	New Document	
	2016/01/18	Same revision as Japanese version Added Protocol Specifications	
03	2016/04/07	Revised: Added Smear half reduction on 11H.D4	
04	2016/04/13	Revised: Optical Filter information	
05	2017/04/07	Revised Power Consumption	
06	2017/07/03	Revised Change the name of company	

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1 Overview

- 1.1 The existing Progressive cameras are discontinued due to the CDS and DAC ICs discontinuation. However we'll provide the succession cameras for these cameras. Please check the specifications differences between the existing cameras and the succession cameras before use the succession cameras.

1.2 Camera lineup

Existing product	Succession product (Same dimensions and the mounting position)
STC-POCL33A	STC-MB33PCL
STC-POCLC33A	STC-MC33PCL
STC-POCL83A	STC-MB32PCL
STC-POCLC83A	STC-MC32PCL
-	STC-MB32PCL(New)
	STC-MC32PCL(New)
STC-POCL152A	STC-MB32PCL
STC-POCLC152A	STC-MC152 PCL
STC-POCL202A	STC-MB32PCL
STC-POCLC202A	STC-MC32PCL
-	STC-MB32PCL (New)
-	STC-MC32PCL (New)

1.3 Changes from the existing products

Below functions have been added.

- A. Pixel defect correction (up to 64 pixels)
- B. AGC and auto shutter function (Default: Manual gain, manual shutter)
- C. Field update function
- D. WB,AWB
- E. RGB Output(Color camera only)
- F. 12bits output
- G. Gamma Collection

Below specifications do not change.

- A. Software (CLCtrl2 ver 1.15 or later)
- B. IO signals
- C. Mechanical dimensions including the mounting position
- D. Tripod

2 Specifications

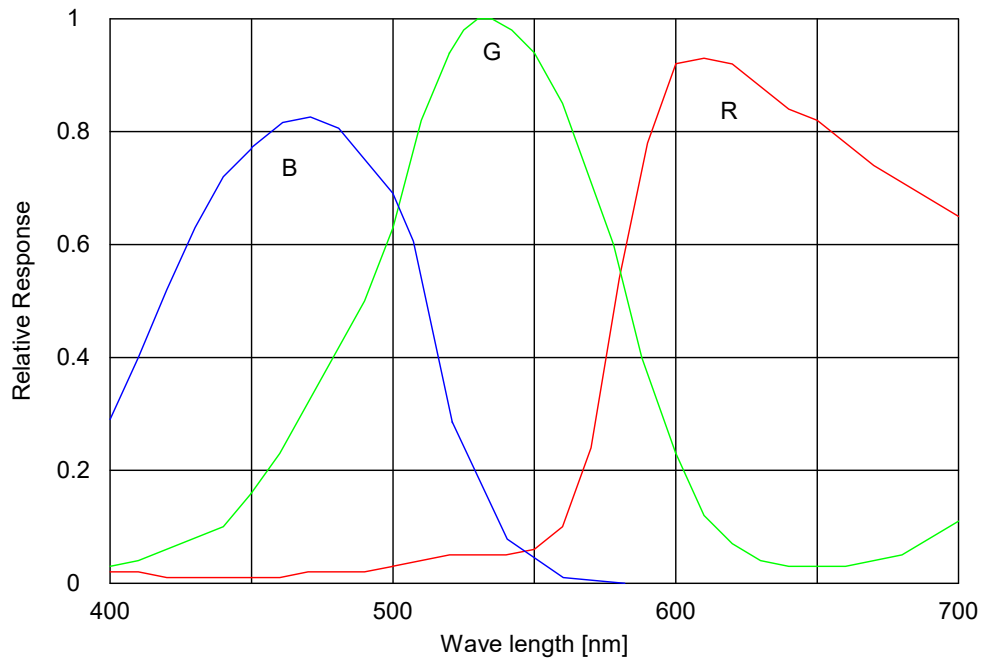
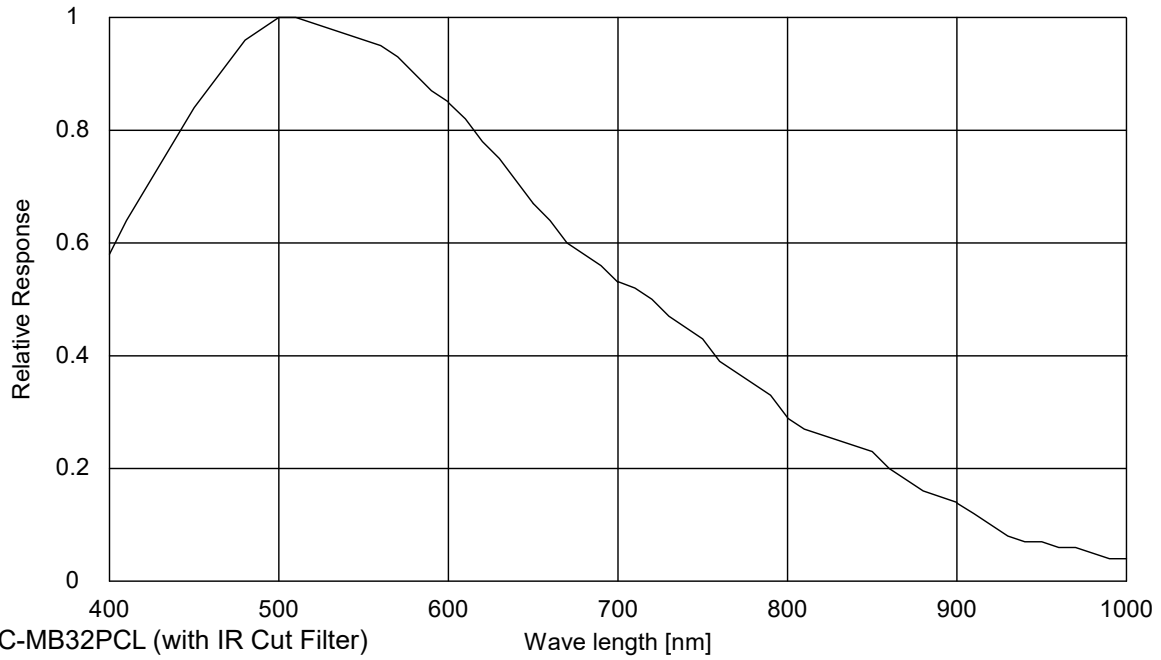
2.1 STC-MC32PCL / STC-MB32PCL

2.1.1 Electronic specifications

Model Number	STC-MC32PCL	STC-MB32PCL
Image Sensor	1/2" VGA Progressive Color CCD (Sony: ICX414AQ)	1/2" VGA Progressive Monochrome CCD (Sony: ICX414AL)
Image Sensor	692 (H) x 504 (V)	
Active Picture Elements	VGA Class: 648 (H) x 494 (V)	
Chip Size	7.48 (H) x 6.15 (V) mm	
Cell Size	9.9 (H) x 9.9 (V) μ m	
Scanning System	Progressive	
Scanning Method	Full scanning, Partial full scanning, 1/2 partial scanning, 1/4 partial scanning, Variable partial scanning	Full scanning, Partial full scanning, 1/2 partial scanning, 1/4 partial scanning, Variable partial scanning, Binning 1/2 partial scanning, Binning 1/4 partial scanning, Variable Binning partial scanning
Vertical Frequency (Frame rate)	31.47 (30 fps) / 62.94 (60 fps) / 94.784 (90 fps) Hz	
Horizontal Frequency	15.7343 (30 fps) / 31.4685 (60 fps) / 47.2028 (90 fps) kHz	
Pixel Frequency	12.2727 (30 fps) / 24.5454 (60 fps) / 36.8181 (90 fps) MHz	
S/N Ratio	Less than 10 Digit (gain 0 dB)	
Minimum Scene Illumination	Less than 0.1 Lux at F1.2	Less than 0.1 Lux at F1.2
Video Output	8 / 10 / 12 bit Raw, RGB Data (Base Configuration)	
TAP	1 TAP	
Shutter Speed	OFF, 1/3 to 1/40,000 seconds (30 fps) OFF, 1/7 to 1/80,000 seconds (60 fps) OFF, 1/11 to 1/120,000 seconds (90 fps) *Variable at every horizontal and clock	
ALC	Support (AE, AGC), (Default: AE: OFF, AGC: OFF)	
Gain	0 to 27 dB (Default: 0 dB)	
Gamma	1 / 0.45 (Default: 1)	
White Balance	Manual / Auto	NA
Pixel Defect Correction	Up to 64 pixels (Default: ON)	
Power	Input Voltage	DC12V +/- 10%
	Consumption	Less than 2.0 W
Operational Mode	Edge preset trigger (V reset / Non-reset) / Pulse width trigger (V reset / Non-reset)	
Communication	RS232 through 12pin connector	
Field Update Function	Support	

2.1.2 Spectral Sensitivity Characteristics

STC-MB32PCL



2.1.3 Mechanical Specifications

Model Number		STC-MC32PCL	STC-MB32PCL
Dimensions		28 (W) x 28 (H) x 40 (D) mm *excluding the connectors	
Lens Mount		C Mount	
Optical Filter		No IR Cut Filter	
Optical Center Accuracy		Positional accuracy in Horizontal and Vertical directions: +/- 0.31 mm Rotational accuracy of Horizontal and Vertical: +/- 2.1 deg.	
Material	Case	Aluminum alloys	
	Tripod	Polycarbonate ABS	
Interface connector		HR10A-7R-6PB (Hirose) or equivalent	
Tripod		Tripod can be attached to plates (4 screws on the bottom plate, 3 screws on the another plate)	
Weight		Approximately 42 g	

2.1.4 Environmental Specifications

Model Number		STC-MC32PCL	STC-MB32PCL
Operational Temperature		Environmental Temperature: 0 to +50 deg. C, Environmental Humidity: 0 to 85%	
Storage Temperature		Environmental Temperature: -25 to +65 deg. C, Environmental Humidity: 0 to 90%	
Vibration		20Hz to 200Hz to 20Hz (5min./cycle), acceleration 10G, XYZ 3 directions 30 min. each	
Shock		Acceleration 70G, half amplitude 6ms, XYZ 3 directions 3 times each	
Standard Compliancy		EMS: EN61000-6-2, EMI: EN55011 (Class A)	
RoHS		RoHS Compliant	

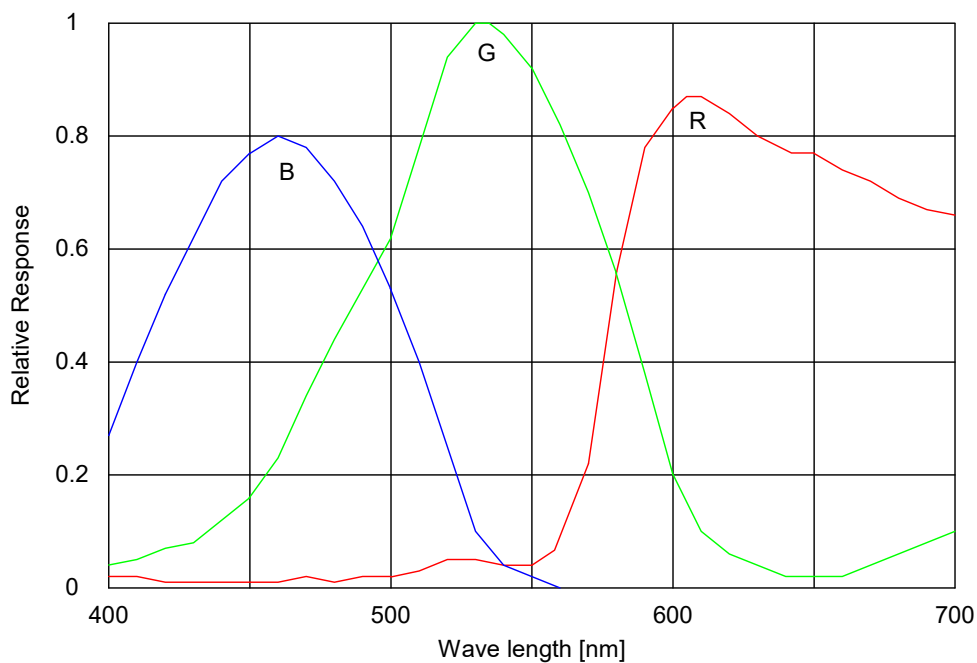
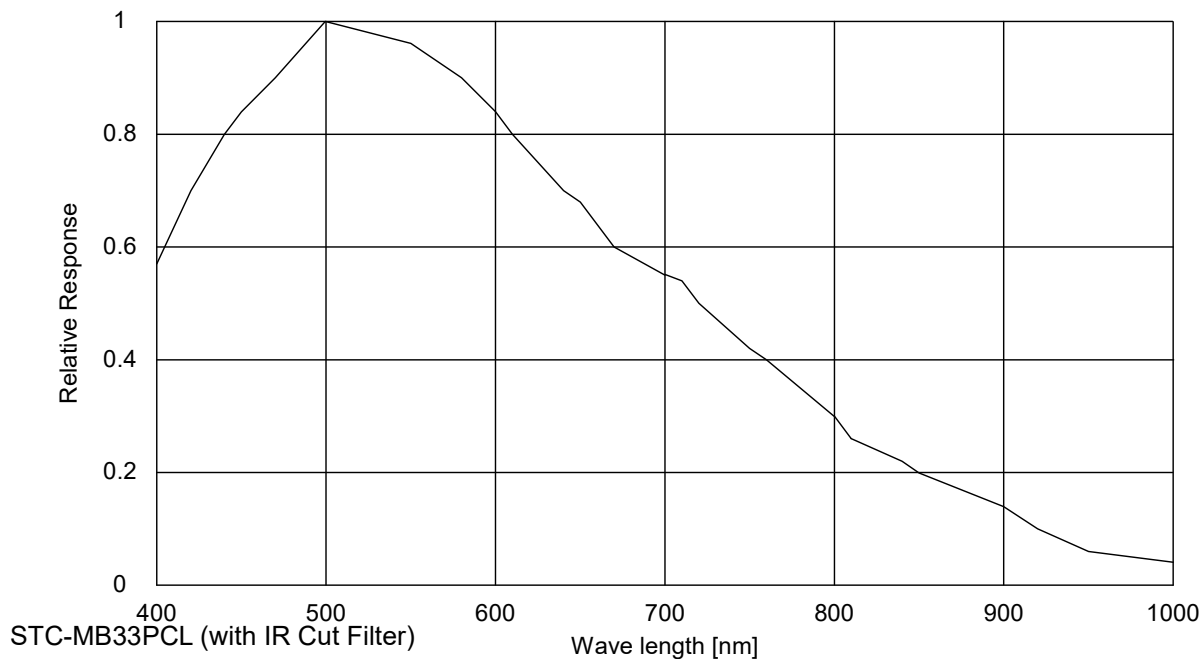
2.2 STC-MC32PCL / STC-MB33PCL

2.2.1 Electronic specifications

Model Number	STC-MC33PCL	STC-MB33PCL
Image Sensor	1/3" Progressive Color CCD (Sony: ICX424AQ)	1/3" Progressive Monochrome CCD (Sony: ICX424AL)
Image Sensor	692 (H) x 504 (V)	
Active Picture Elements	VGA Class: 648 (H) x 494 (V)	
Chip Size	5.79 (H) x 4.89 (V) mm	
Cell Size	7.4 (H) x 7.4 (V) μ m	
Scanning System	Progressive	
Scanning Method	Full scanning, Partial full scanning, 1/2 partial scanning, 1/4 partial scanning, Variable partial scanning	Full scanning, Partial full scanning, 1/2 partial scanning, 1/4 partial scanning, Variable partial scanning, Binning 1/2 partial scanning, Binning 1/4 partial scanning, Variable Binning partial scanning
Vertical Frequency (Frame rate)	31.47 (30 fps) / 62.94 (60 fps) / 94.784 (90 fps) Hz	
Horizontal Frequency	15.7343 (30 fps) / 31.4685 (60 fps) / 47.2028 (90 fps) kHz	
Pixel Frequency	12.2727 (30 fps) / 24.5454 (60 fps) / 36.8181 (90 fps) MHz	
S/N Ratio	Less than 10 Digit (gain 0 dB)	
Minimum Scene Illumination	Less than 0.1 Lux at F1.2	Less than 0.1 Lux at F1.2
Video Output	8 / 10 / 12 bit Raw, RGB Data (Base Configuration)	
TAP	1 TAP	
Shutter Speed	OFF, 1/3 to 1/40,000 seconds (30 fps) OFF, 1/7 to 1/80,000 seconds (60 fps) OFF, 1/11 to 1/120,000 seconds (90 fps) *Variable at every horizontal and clock	
ALC	Support (AE, AGC), (Default: AE: OFF, AGC: OFF)	
Gain	0 to 27 dB (Default: 0 dB)	
Gamma	1 / 0.45 (Default: 1)	
White Balance	Manual / Auto	NA
Pixel Defect Correction	Up to 64 pixels (Default: ON)	
Power	Input Voltage	DC12V +/- 10%
	Consumption	Less than 2.0 W
Operational Mode	Free run / Edge preset trigger (V reset / Non-reset) / Pulse width trigger (V reset / Non-reset)	
Communication	RS232 through 12pin connector	
Field update Function	Support	

2.2.2 Spectral Sensitivity Characteristics

STC-MB33PCL



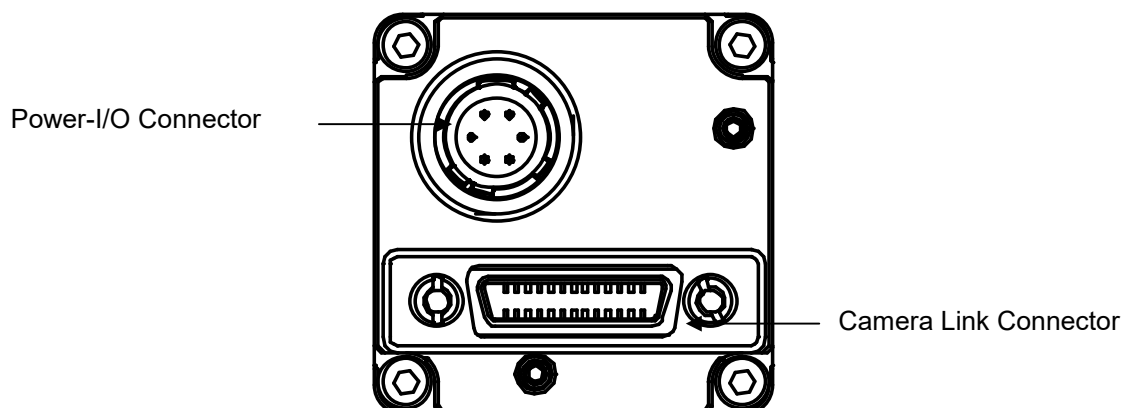
2.2.3 Mechanical Specifications

Model Number		STC-MC33PCL	STC-MB33PCL
Dimensions		28 (W) x 28 (H) x 40 (D) mm *excluding the connectors	
Lens Mount		C Mount	
Optical Filter		No IR Cut Filter	
Optical Center Accuracy		Positional accuracy in Horizontal and Vertical directions: +/- 0.31 mm Rotational accuracy of Horizontal and Vertical: +/- 2.1 deg.	
Material	Case	Aluminum alloys	
	Tripod	Polycarbonate ABS	
Interface connector		HR10A-7R-6PB (Hirose) or equivalent	
Tripod		Tripod can be attached to plates (4 screws on the bottom plate, 3 screws on the another plate)	
Weight		Approximately 40 g	

2.2.4 Environmental Specifications

Model Number		STC-MC33PCL	STC-MB33PCL
Operational Temperature		Environmental Temperature: 0 to +50 deg. C, Environmental Humidity: 0 to 85%	
Storage Temperature		Environmental Temperature: -25 to +65 deg. C, Environmental Humidity: 0 to 90%	
Vibration		20Hz to 200Hz to 20Hz (5min./cycle), acceleration 10G, XYZ 3 directions 30 min. each	
Shock		Acceleration 70G, half amplitude 6ms, XYZ 3 directions 3 times each	
Standard Compliancy		EMS: EN61000-6-2, EMI: EN55011 (Class A)	
RoHS		RoHS Compliant	

3 Common Specification



3.1 Camera Link Connector

SDR (3M) or equivalent

This product is a PoCL type.

When a frame grabber board and cable are applicable for the PoCL, the frame grabber board supplies the power to the camera. In this case, please DO NOT supply the power from the Power / IO connector.

When a frame grabber board and the cable are NOT applicable for the PoCL, please input the power from the Power / IO connector.

Pin Assignment

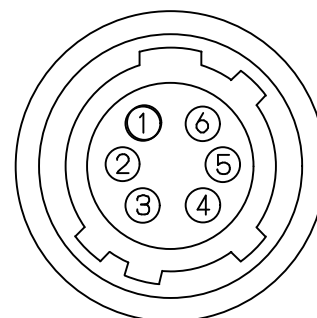
Pin No.	Signal Name	Pin No.	Signal Name
1	+12V	14	GND
2	X0-	15	X0+
3	X1-	16	X1+
4	X2-	17	X2+
5	Xclk-	18	Xclk+
6	X3-	19	X3+
7	SerTC+	20	SerTC-
8	SerTFG-	21	SerTFG+
9	CC1-(TRG)	22	CC1+(TRG)
10	CC2+	23	CC2-
11	CC3-	24	CC3+
12	CC4+	25	CC4-
13	GND	26	+12V

3.2 Power-I/O Connector

- HR10A-7R-6PB (Hirose) or equivalent
- This connector is for the power supply (12Vdc) and input /output signals.
- Use HR10A-7P-6S (Hirose) or equivalent for the cable side.

Pin Assignment

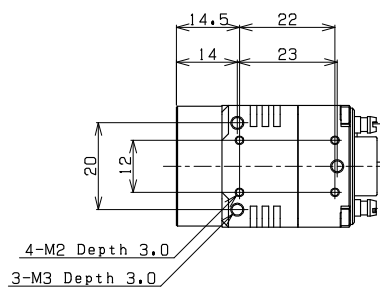
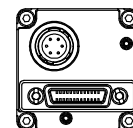
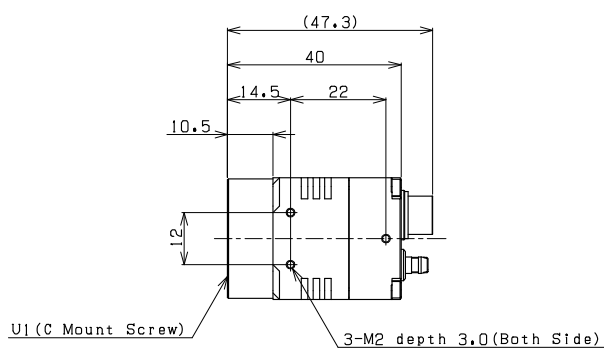
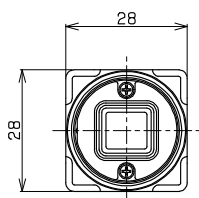
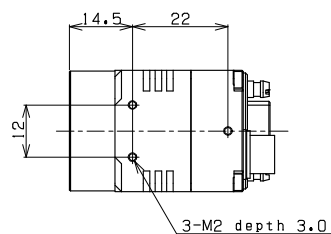
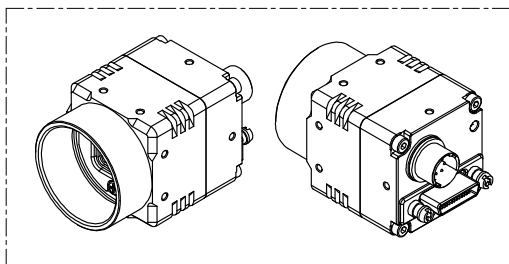
Pin Number	Signal Name	IN/OUT	Signal Voltage		
			Low Voltage	High Voltage	
1	GND	IN	0V		
2	I/O-1	IN/OUT	Input	0 ~ +0.5V	+2.5 ~ +5.0V
			Output	0V	+3.3V
3	I/O-2	IN/OUT	Input	0 ~ +0.5V	+2.5 ~ +5.0V
			Output	0V	+3.3V
4	I/O-3	IN/OUT	Input	0 ~ +0.5V	+2.5 ~ +5.0V
			Output	0V	+3.3V
5	I/O-4	IN/OUT	Input	0 ~ +0.5V	+2.5 ~ +5.0V
			Output	0V	+3.3V
6	+12Vdc	IN	+12Vdc		



- Trigger input signal can be assigned either on Camera Link connector (CC1) or on the No. 2 pin of the IO connector through the camera setting communication.

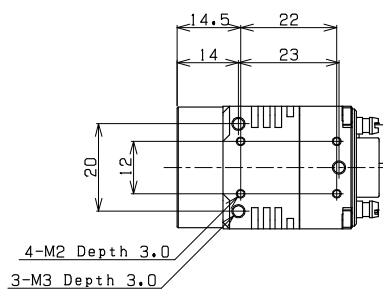
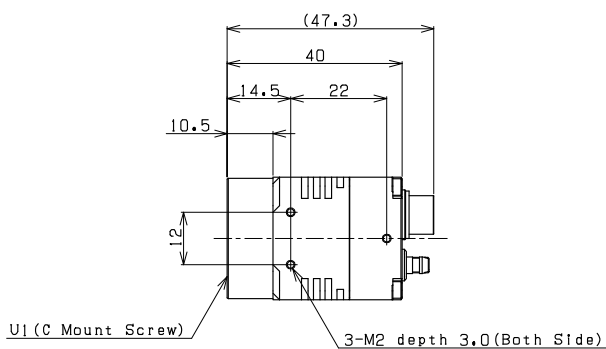
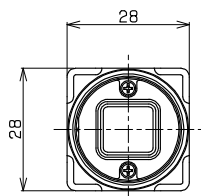
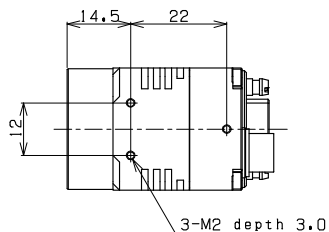
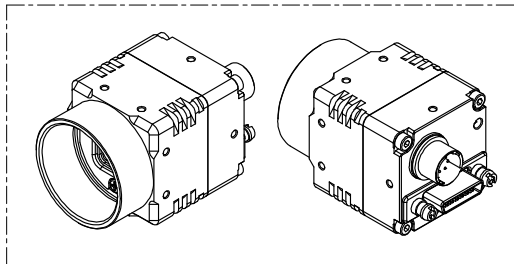
4 Dimensions

4.1 STC-MB32PCL / STC-MB33PCL



Unit: mm

4.2 STC-MC32PCL / STC-MC33PCL



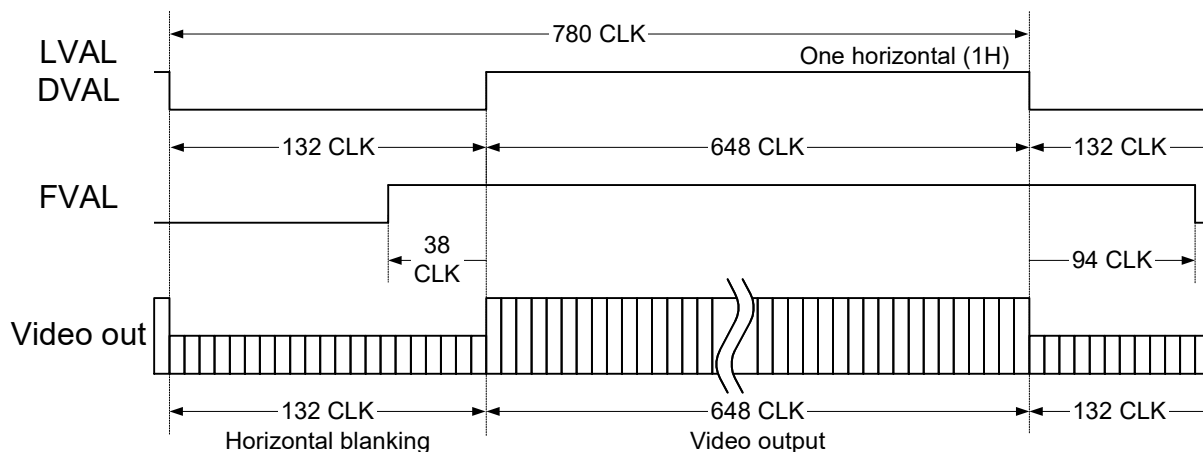
Unit: mm

5 Camera output timing Charts

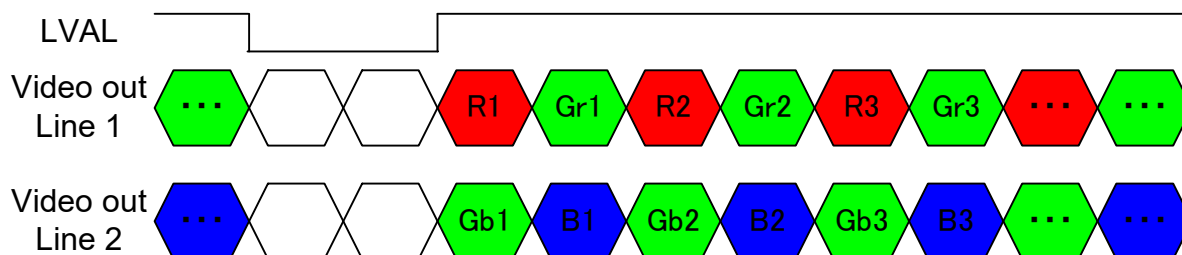
5.1 Normal mode (Setting: address: 10H: 1XX0XXXX)

5.1.1 Horizontal timing

30 fps: 1 CLK = 81.4816 nseconds
 60 fps: 1 CLK = 40.7408 nseconds
 90 fps: 1 CLK = 27.1605 nseconds



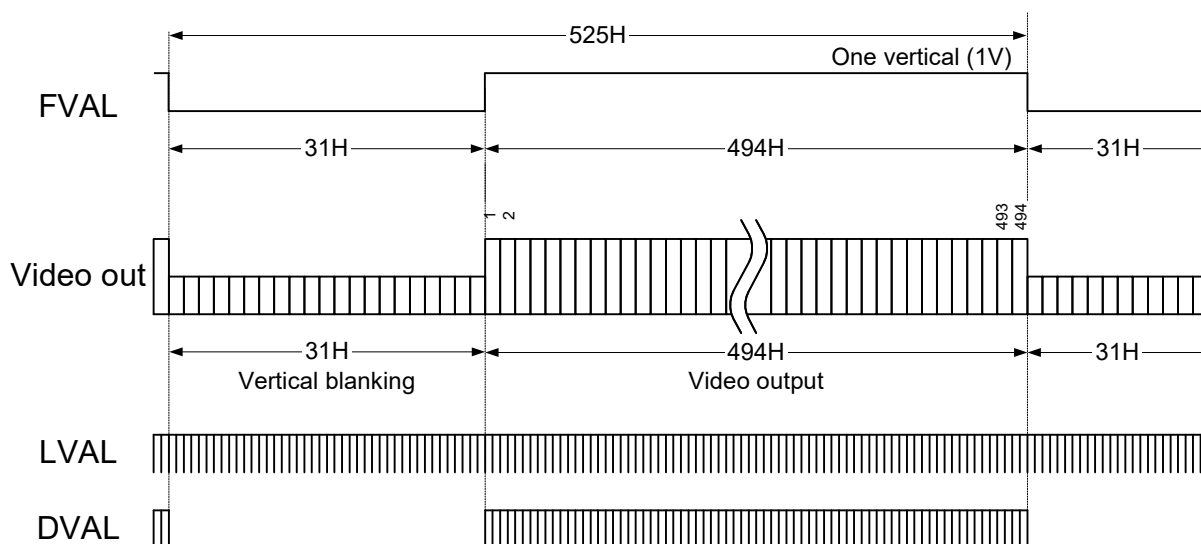
5.1.2 Bayer Pattern (Only STC-MC32PCL / STC-MC33PCL)



5.1.3 Vertical timings

5.1.3.1 Normal and full scanning (Setting: address: 10H: 1XX00XXX, 11H: X000X000)

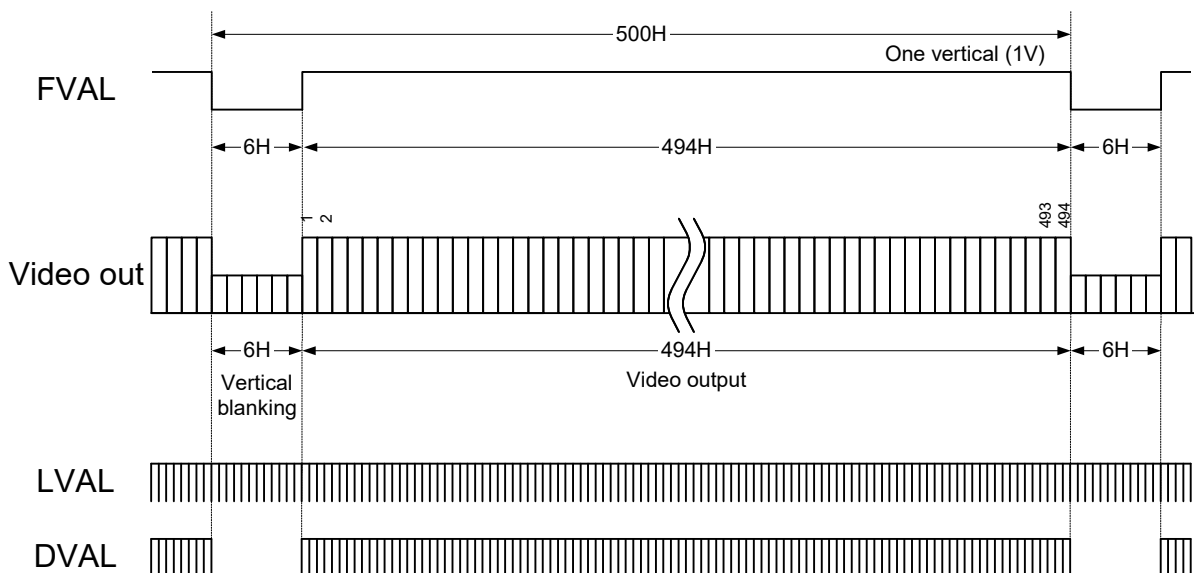
30 fps: 1 H = 63.5556 μ seconds, 29.9700 Hz
 60 fps: 1 H = 31.7778 μ seconds, 59.9400 Hz
 90 fps: 1 H = 21.1852 μ seconds, 89.9100 Hz



5.1.3.2 Partial full scanning (Setting: address:10H: 1XX01XXX, 11H: X000X000)

*This mode works faster than Normal mode for high speed driving on video blanking

30 fps: 1 H = 63.5556 μ seconds, 31.4685 Hz
 60 fps: 1 H = 31.7778 μ seconds, 62.9370 Hz
 90 fps: 1 H = 21.1852 μ seconds, 94.4055 Hz

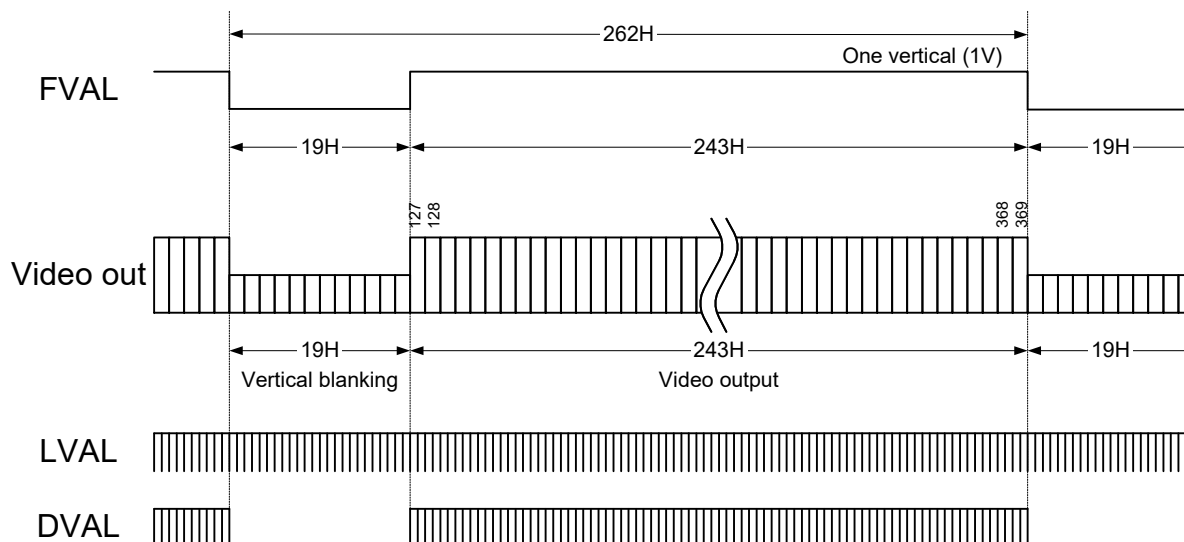


5.1.3.3 1/2 partial scanning (Setting: address:10H: 1XX01XXX, 11H: X000X001)

30 fps: 1 H = 63.5556 μ seconds, 60.0544 Hz

60 fps: 1 H = 31.7778 μ seconds, 120.108 Hz

90 fps: 1 H = 21.1852 μ seconds, 180.163 Hz

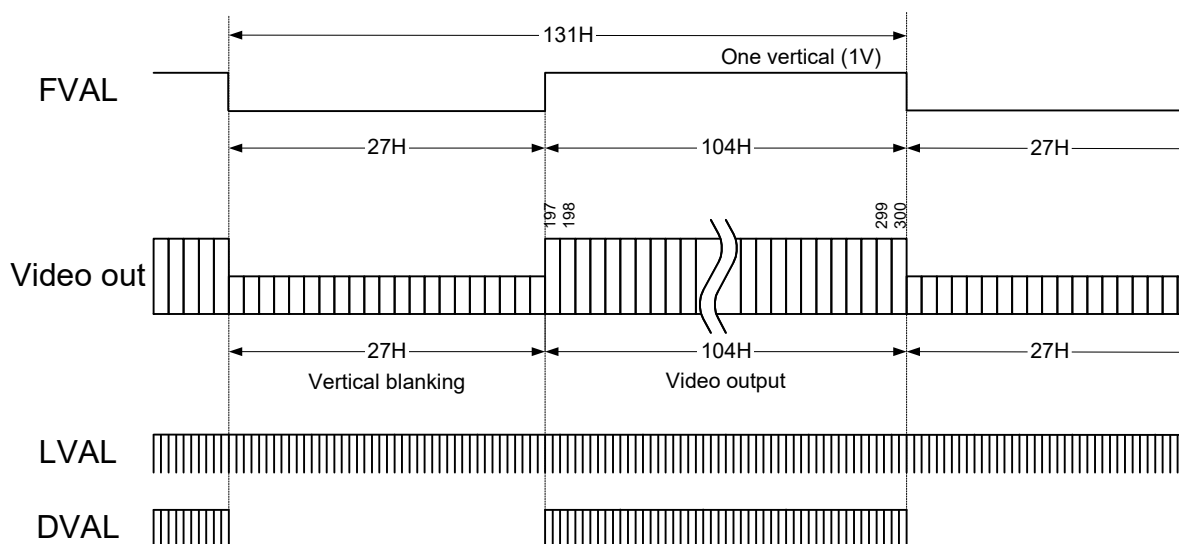


5.1.3.4 1/4 partial full scanning (Setting: address:10H: 1XX01XXX, 11H: X000X010)

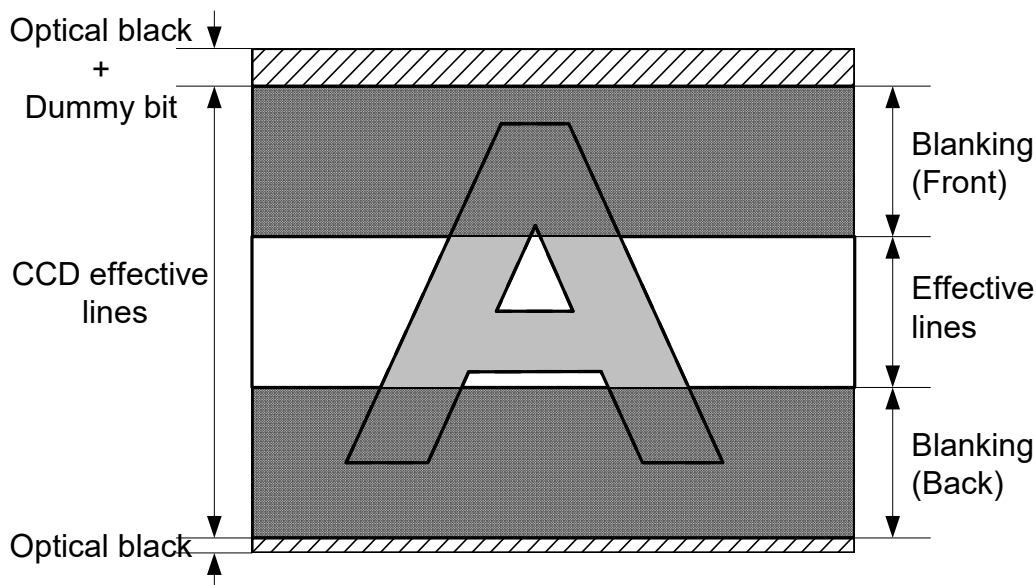
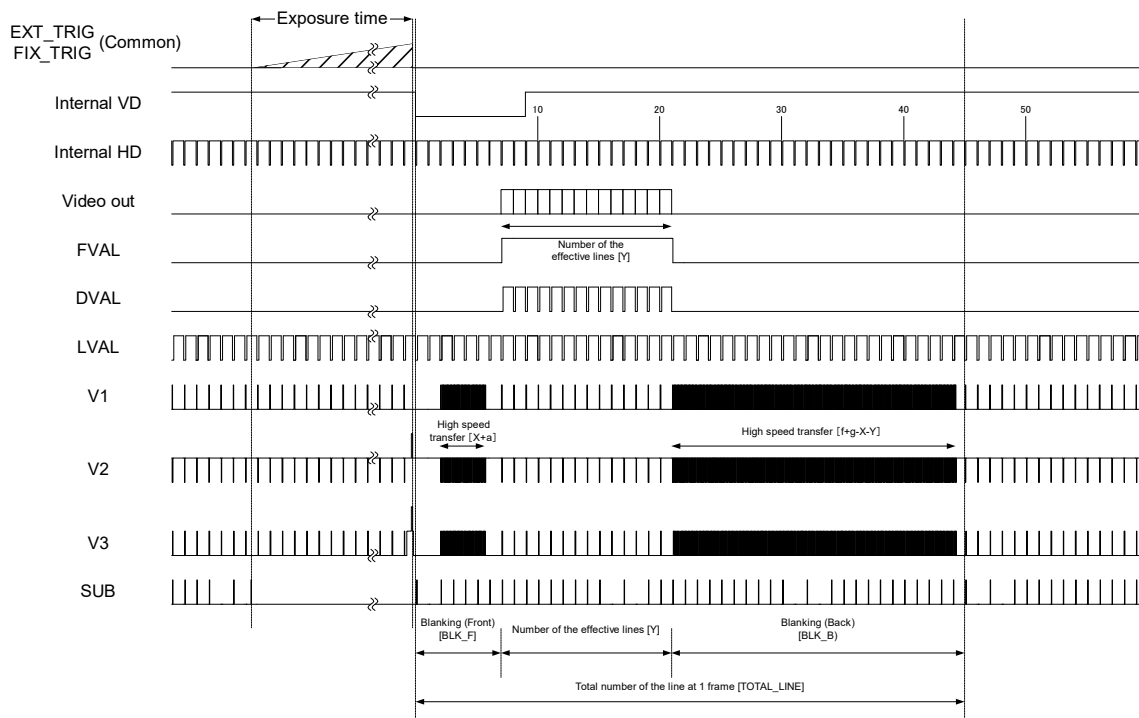
30 fps: 1 H = 63.5556 μ seconds, 120.108 Hz

60 fps: 1 H = 31.7778 μ seconds, 240.217 Hz

90 fps: 1 H = 21.1852 μ seconds, 360.326 Hz



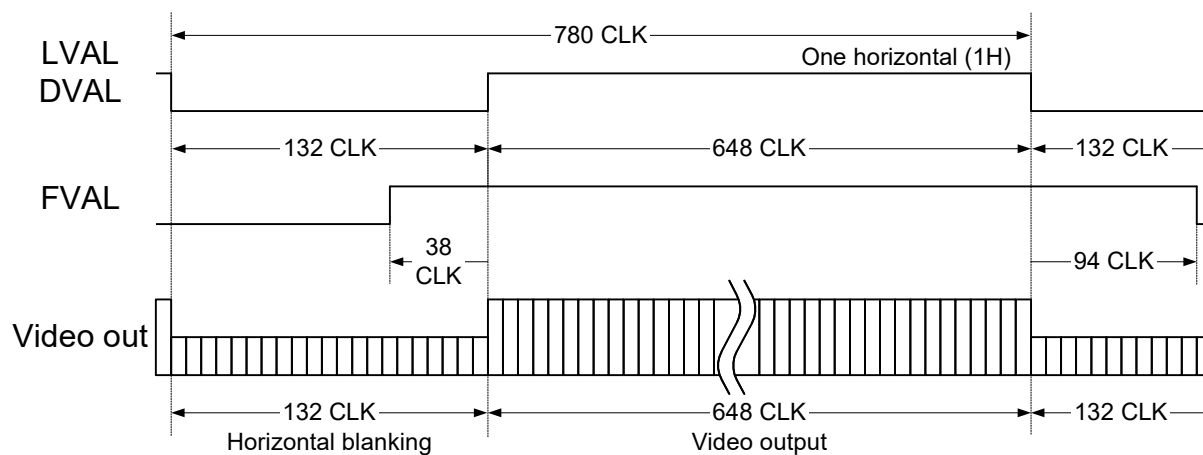
5.1.3.5 Variable partial full scanning (Setting: address: 1XX01XXX, 11H: X000X111)



5.2 Binning mode (Setting: address: 1XX1XXXX)

5.2.1 Horizontal timing

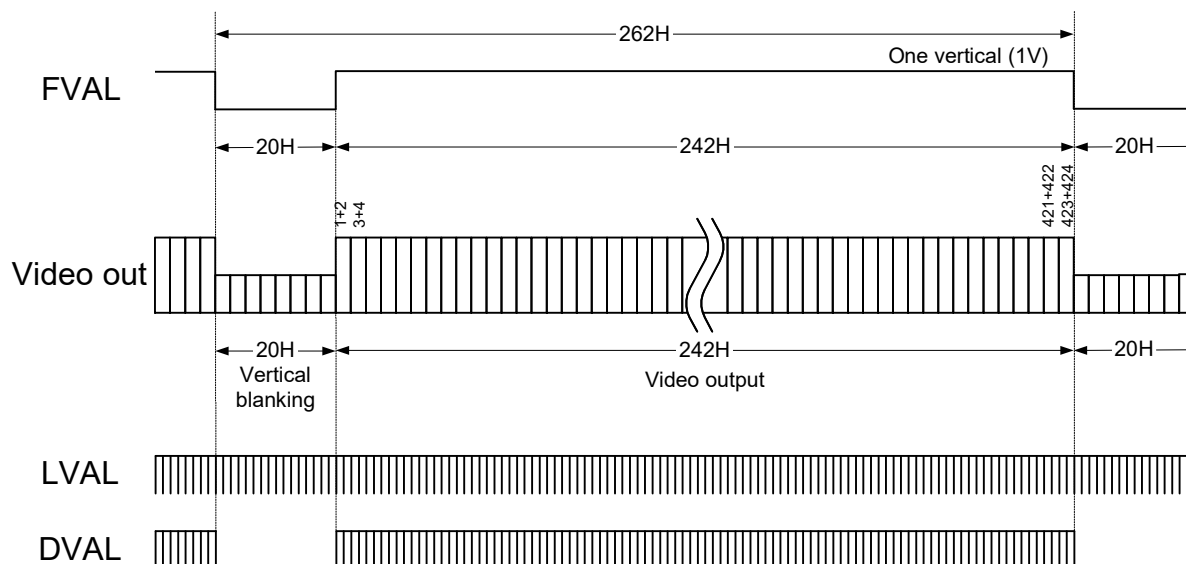
30 fps: 1 CLK = 81.4816 nseconds
 60 fps: 1 CLK = 40.7408 nseconds
 90 fps: 1 CLK = 27.1605 nseconds



5.2.2 Vertical timing

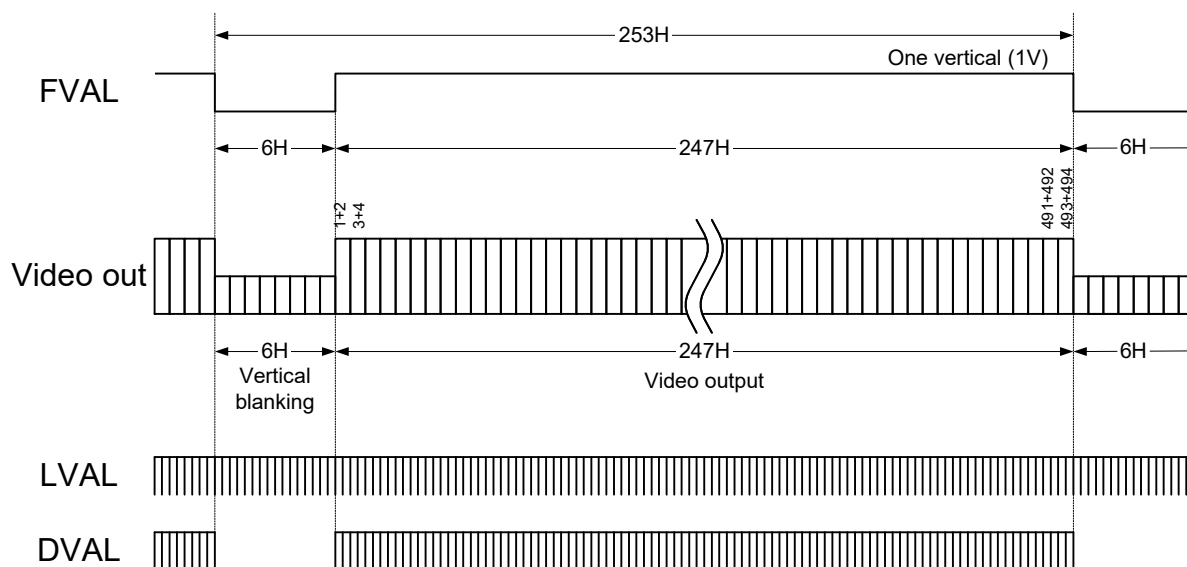
5.2.2.1 Binning full scanning (Setting: address:10H: 1XX10XXX, 11H: X000X000)

30 fps: 1 H = 63.5556 μ seconds, 60.0544 Hz
 60 fps: 1 H = 31.7778 μ seconds, 120.108 Hz
 90 fps: 1 H = 21.1852 μ seconds, 180.163 Hz



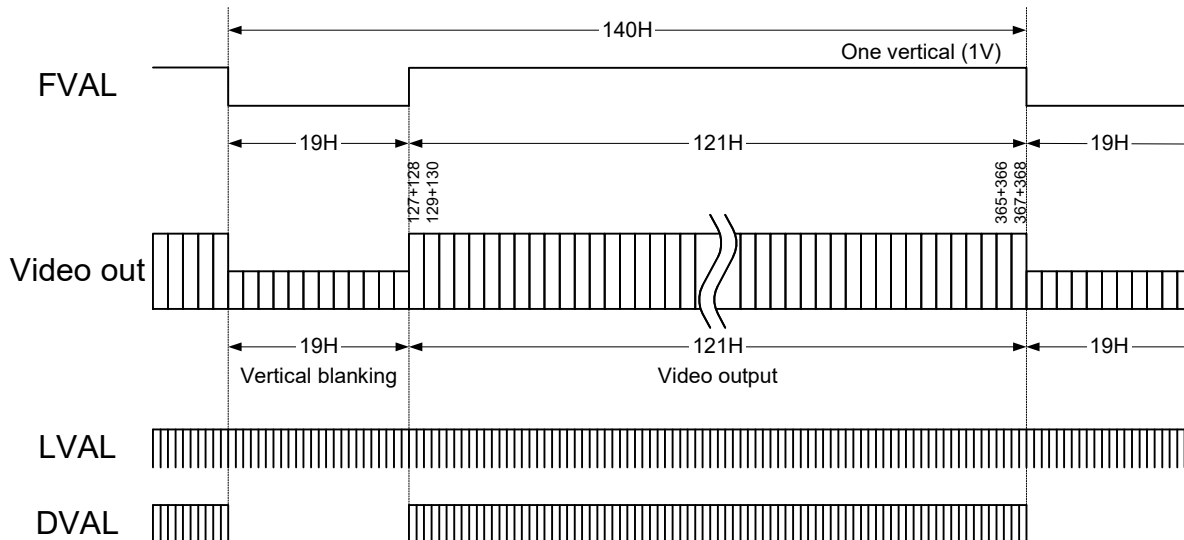
5.2.2.2 Binning partial full scanning (Setting: address:10H: 1XX11XXX, 11H: X000X000)

30 fps: 1 H = 63.5556 μ seconds, 62.1907 Hz
 60 fps: 1 H = 31.7778 μ seconds, 124.381 Hz
 90 fps: 1 H = 21.1852 μ seconds, 186.572 Hz



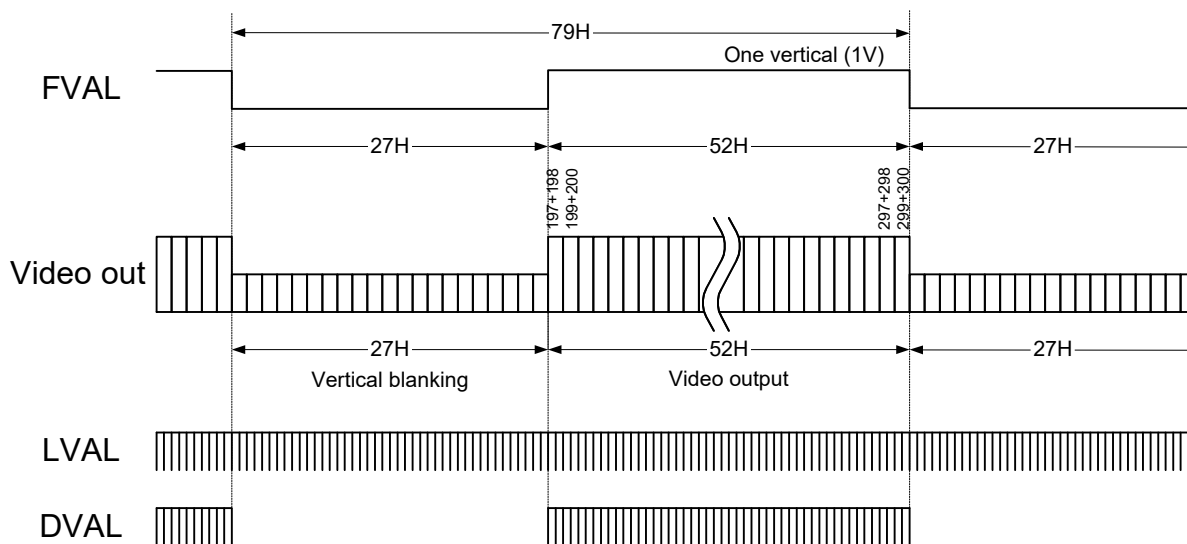
5.2.2.3 Binning 1/2 partial scanning (Setting: address:10H: 1XX11XXX, 11H: X000X001)

30 fps: 1 H = 63.5556 μseconds, 112.378 Hz
 60 fps: 1 H = 31.7778 μseconds, 224.775 Hz
 90 fps: 1 H = 21.1852 μseconds, 337.162 Hz



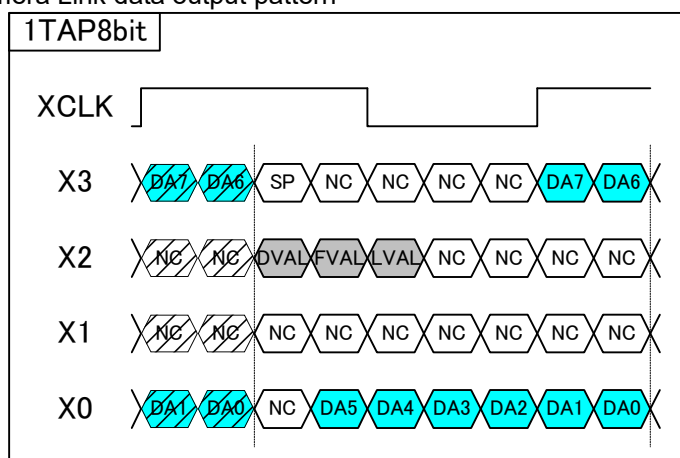
5.2.2.4 Binning 1/4 partial scanning (Setting: address:10H: 1XX11XXX, 11H: X000X010)

30 fps: 1 H = 63.5556 μseconds, 199.167 Hz
 60 fps: 1 H = 31.7778 μseconds, 398.335 Hz
 90 fps: 1 H = 21.1852 μseconds, 597.503 Hz

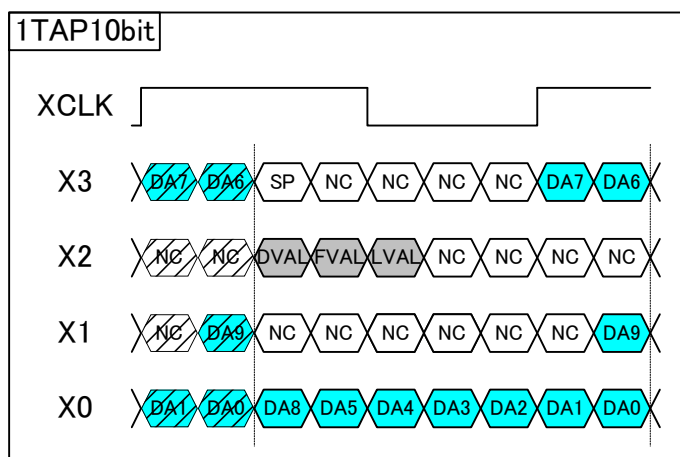


5.3 Camera Link bit assignment

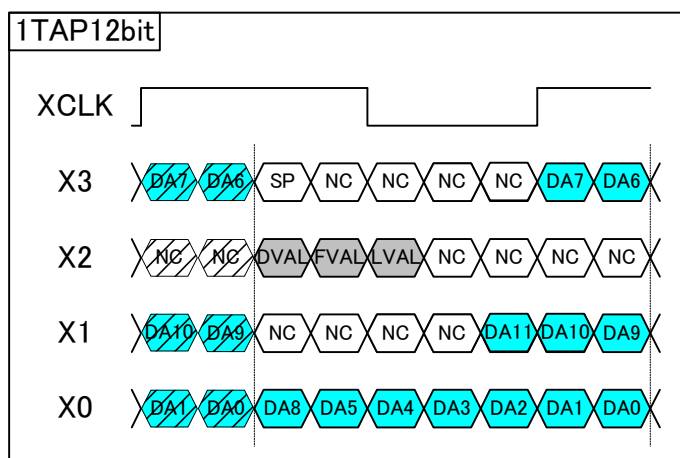
Camera Link data output pattern



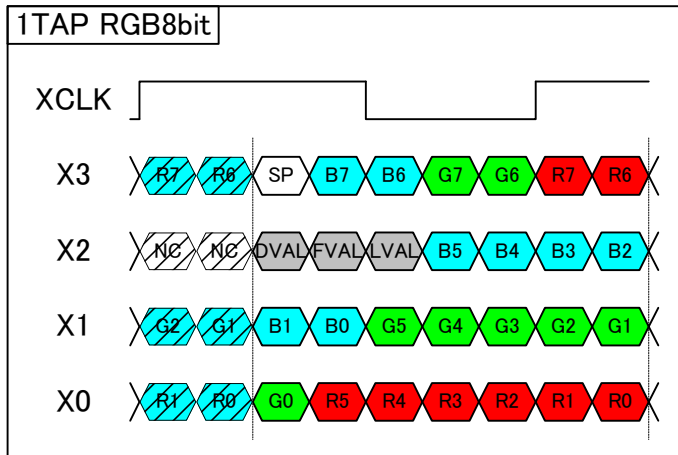
DA0 to DA7: 8bit data for one pixel



DA0 to DA9: 10bit data for one pixel

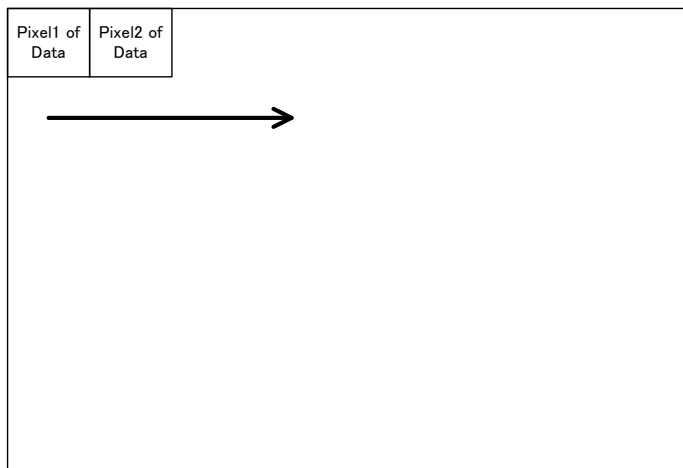


DA0 to DA11: 8bit data for one pixel



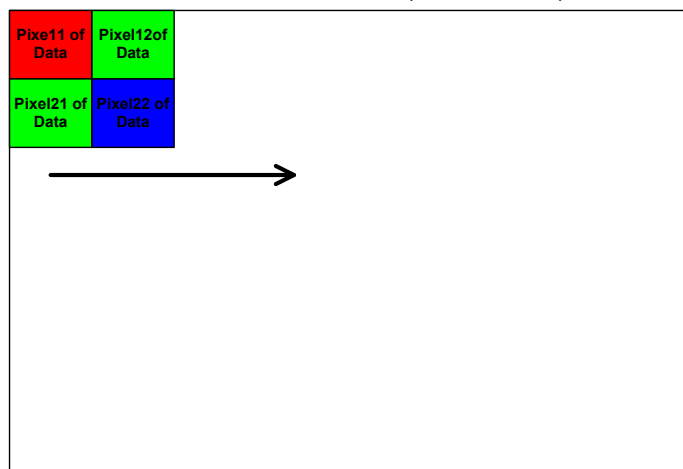
R0 to R7, G0 to G7, B0 to B7: 8bit RGB 8bit data for one pixel

5.4 Data Transfer Image
STC-MB32PCL / STC-MB33PCL (Monochrome mode)



Pixel n of Data: Transfer data on n th

STC-MC32PCL / STC-MC33PCL (Color Model)

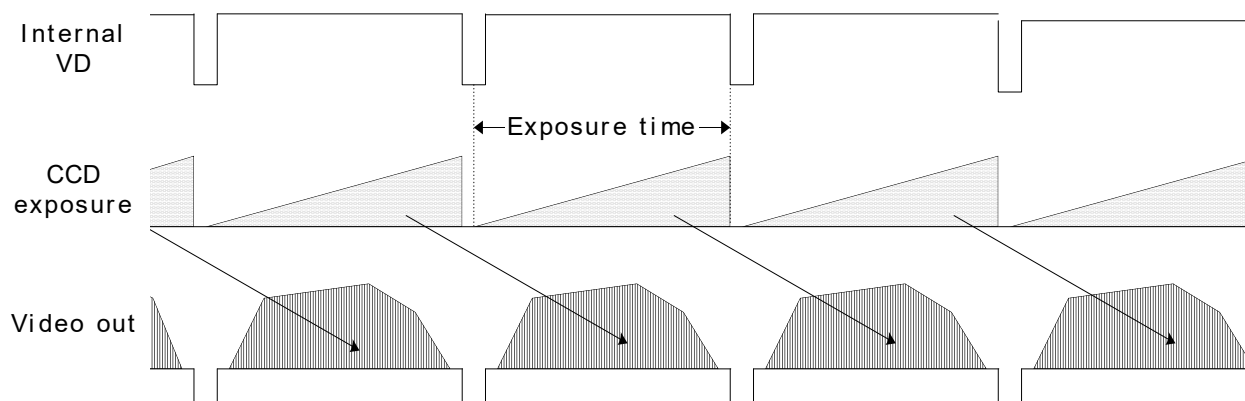


Pixel mn of Data: Transfer data on n th Row, m th column

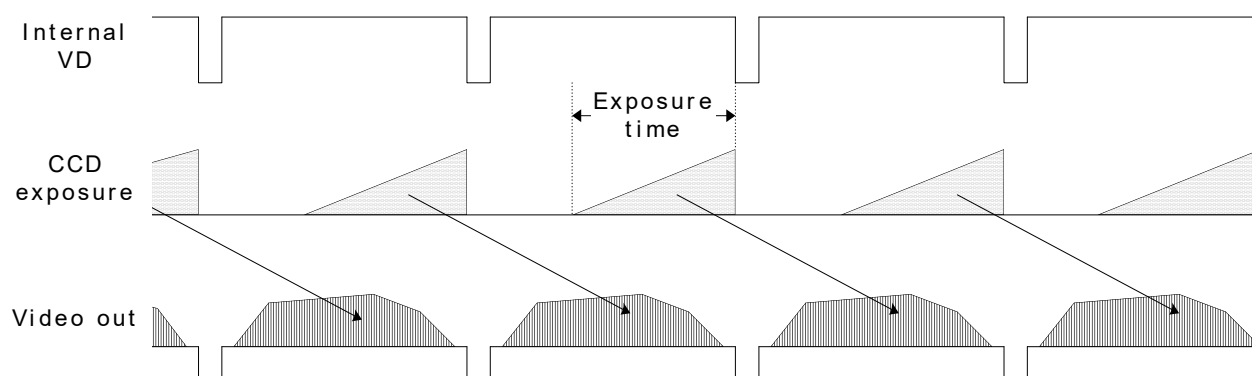
6 Camera function mode

6.1 Normal mode

6.1.1 Normal mode (Frame exposure)



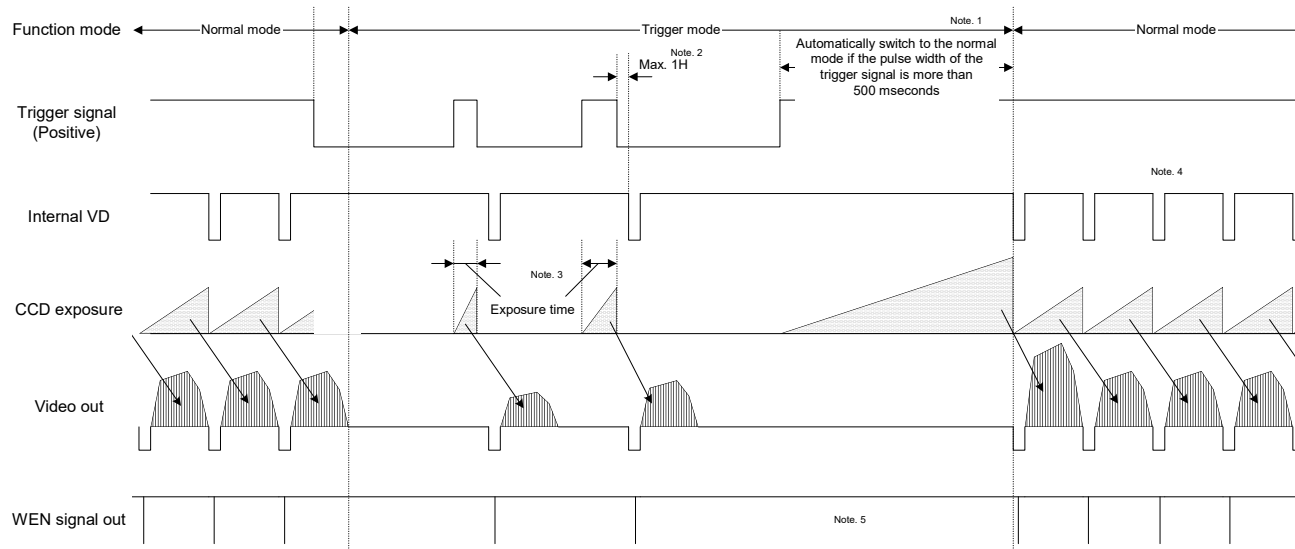
6.1.2 Normal mode (Electronic shutter)



6.2 Pulse width trigger mode

In this "Pulse width trigger mode" with positive polarity, the camera exposure starts at the rising edge the trigger signal and stops at the falling edge of the trigger signal. Therefore, in this case that the exposure time set by the high state pulse width of the trigger signal.

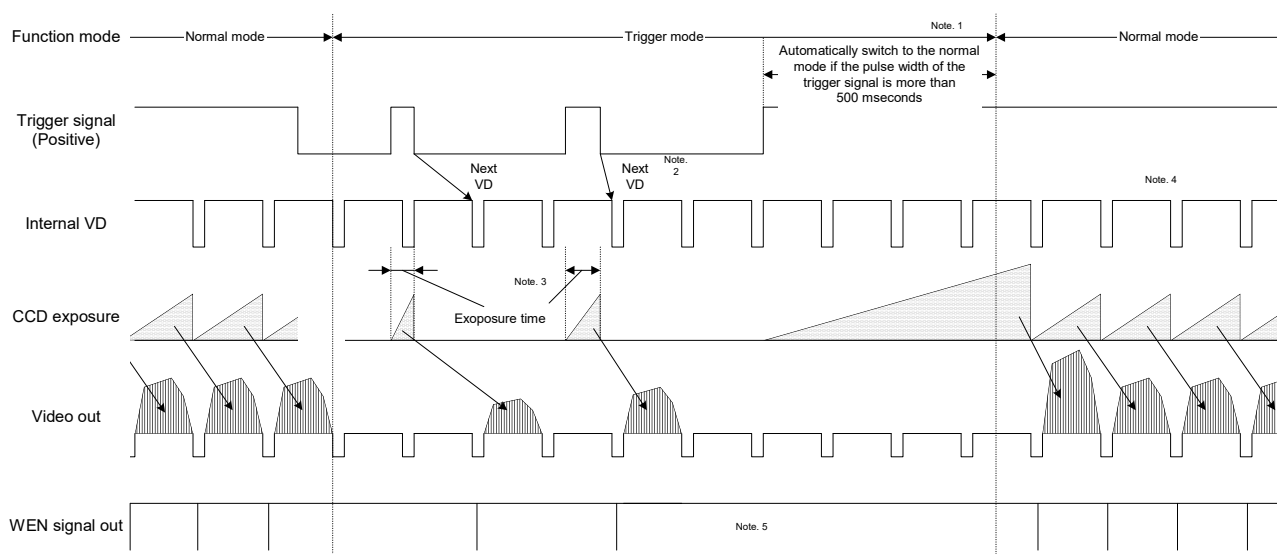
6.2.1 Pulse width trigger mode (V-Reset)



Notes:

1. The camera does NOT switch to the normal mode when the long exposure mode is selected. This timing chart shows when the long exposure mode selected.
2. The internal VD signal is reset immediately after the exposure is finished as this timing chart, and the video output signal is sent out according to that reset VD timing.
3. The exposure time is controlled by the pulse width of the trigger signal as this timing chart.
4. External VD signal input continuously during the external sync mode. External VD signal is disregard during the trigger mode.
5. The WEN signal does not output when the exposure by the trigger signal does not exists during the trigger mode.

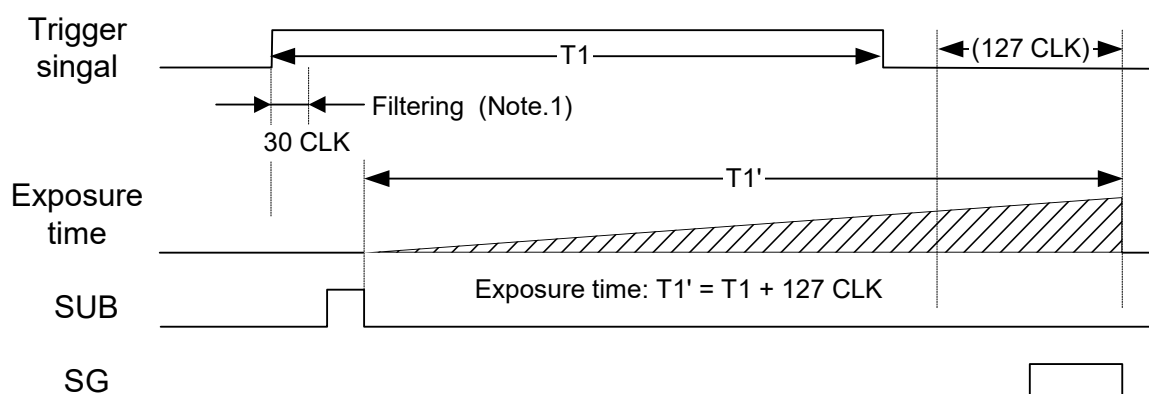
6.2.2 Pulse width trigger mode (Non-Reset)



Notes:

1. The camera does NOT switch to the normal mode when the long exposure mode is selected. This timing chart shows when the long exposure mode selected.
2. The internal VD signal does not reset by the trigger signal. The video output signal is sent out at the next VD timing.
3. The exposure time is controlled by the pulse width of the trigger signal as this timing chart.
4. External VD signal input continuously during the external sync mode. External VD signal is disregard during the trigger mode.
5. The WEN signal does not output when the exposure by the trigger signal does not exists during the trigger mode.

6.2.3 Pulse width trigger mode (Exposure timing)



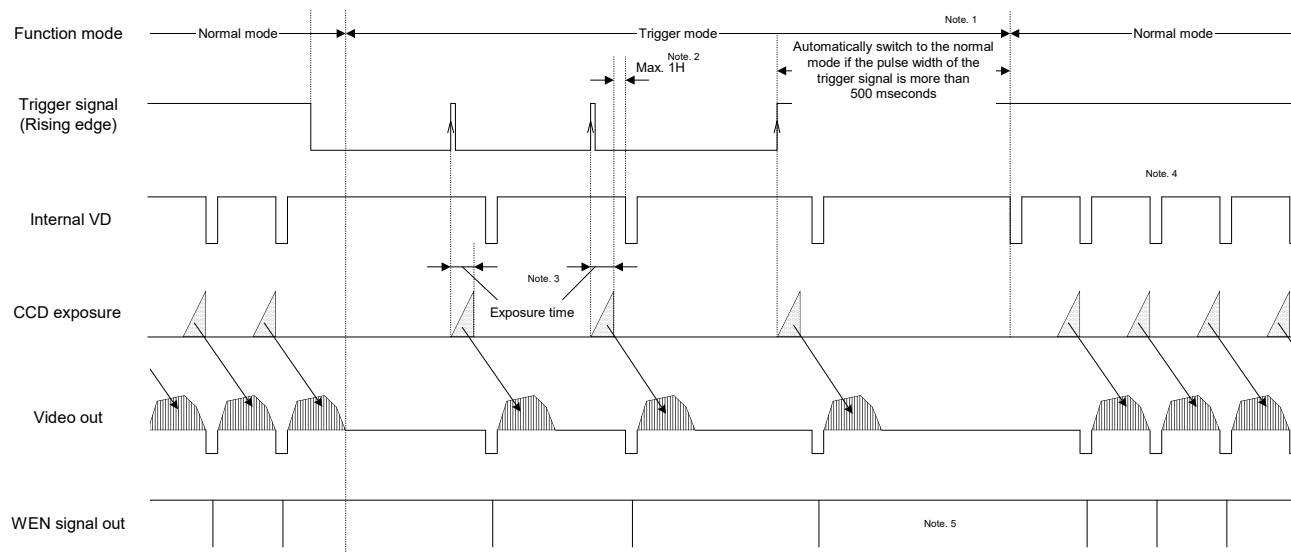
Notes:

1. The trigger signal equal to or shorter than 30 clocks is removed by the filtering system.
2. Input trigger signal has to be more than 31 clocks pulse width.
3. The exposure starts 63 clocks after the rising edge of the trigger signal.

6.3 Edge preset trigger mode

In this “Edge preset trigger mode” with positive polarity, the camera exposure starts at the rising edge the trigger signal. In this mode, the exposure duration time is based on the preset exposure time (shutter speed) by the camera setting communication or the DIP Switch on the rear panel.

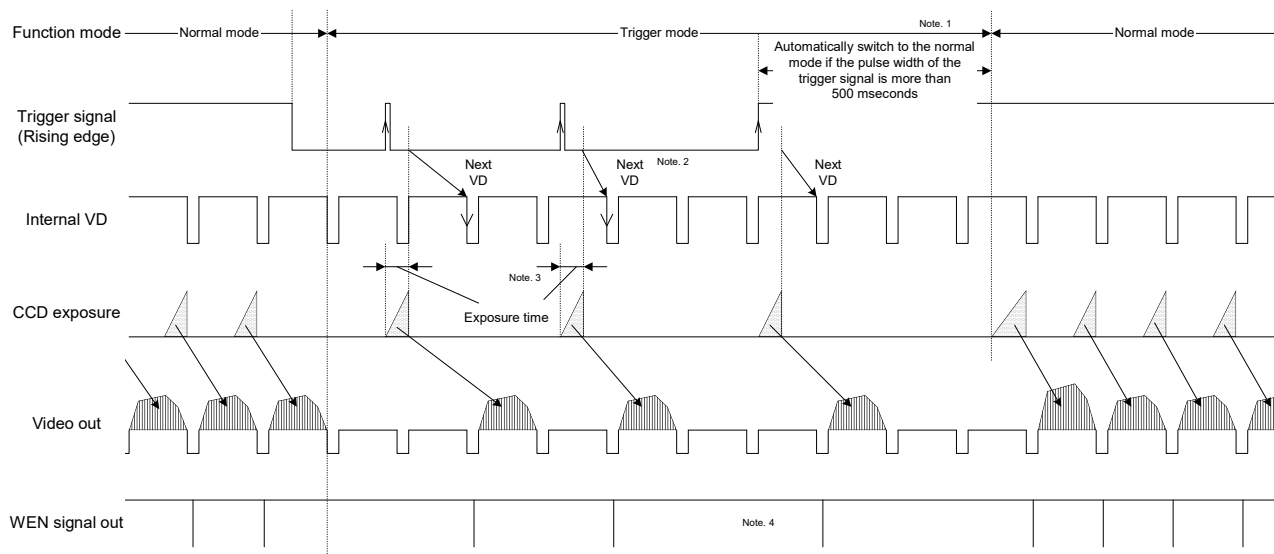
6.3.1 Edge preset trigger mode (V-Reset)



Notes:

1. The camera does NOT switch to the normal mode when the long exposure mode is selected. This timing chart shows when the long exposure mode selected.
2. The internal VD signal is reset immediately after the exposure is finished as this timing chart, and the video output signal is sent out according to that reset VD timing.
3. The exposure time is controlled by the camera setting communication (Refer to the command 20H and 21H) or the DIP Switch on the rear panel as “shutter speed”.
4. External VD signal input continuously during the external sync mode. External VD signal is disregard during the trigger mode.
5. The WEN signal does not output when the exposure by the trigger signal does not exists during the trigger mode.

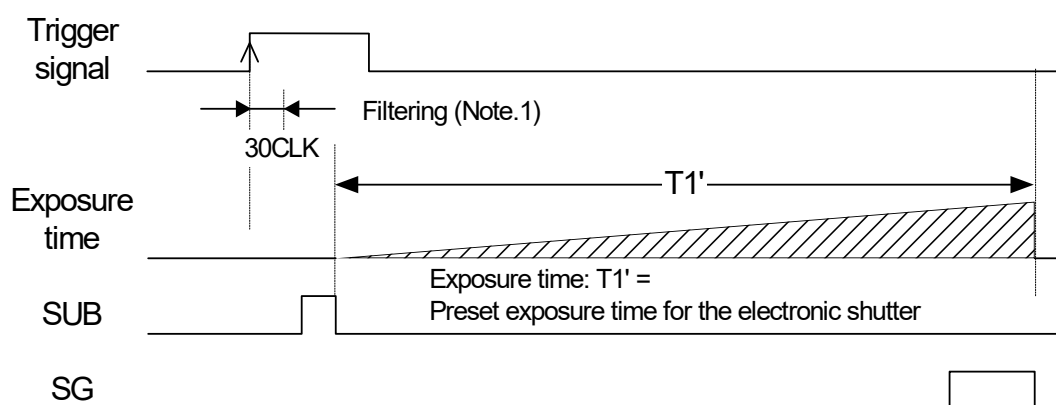
6.3.2 Edge preset trigger mode (Non-Reset)



Notes:

1. The camera does NOT switch to the normal mode when the long exposure mode is selected. This timing chart shows when the long exposure mode selected.
2. The internal VD signal does not reset by the trigger signal. The video output signal is sent out at the next internal reset VD timing.
3. The exposure time is controlled by the camera setting communication (Refer to the command 20H and 21H) or the DIP Switch on the rear panel as "shutter speed".
4. External VD signal input continuously during the external sync mode. External VD signal is disregard during the trigger mode.
5. The WEN signal does not output when the exposure by the trigger signal does not exists during the trigger mode.

6.3.3 Edge preset trigger mode (Exposure timing)



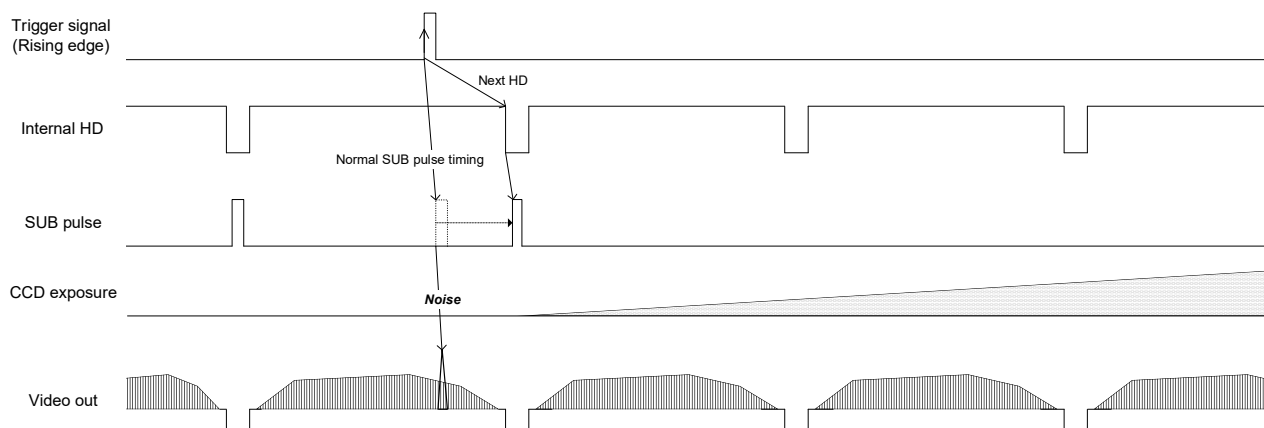
Notes:

1. The trigger signal equal to or shorter than 30 clocks is removed by the filtering system.
2. Input trigger signal has to be more than 31 clocks pulse width.
3. The exposure starts 63 clocks after the rising edge of the trigger signal.

6.4 H reset mode

Normally, the video noise appears when the beginning of the trigger signal is applied before finishing the video out of the previous frame. This noise is caused by the SUB pulse, which is activated to clear all residual charges on CCD prior to a new exposure. By selecting this "H reset mode", the camera automatically holds the actual activation of the trigger until the next horizontal blanking period. By doing this, the SUB pulse is activated during the horizontal blanking period and the noise in the image can be avoided.

Note: Due to the principal of this operation, there can be maximum 1H of delay of the actual trigger signal.



7 The communication protocol specifications

This camera has the communication function that enables external devices like PC control the camera functions. Please use "CLCtrl2" communication software or use following the communication protocol to communicate to the camera.

Note. 1) The communication problem may occur under the following conditions:

1. When the external sync frequency is illegal (more than 1% off from the specified frequency).
2. When external sync is unstable (In another word the bad external sync signal).
3. About for one second after switching from/to external sync mode to/from internal sync mode.
4. About for one second after switching frame rate.

7.1 The communication method

UART (RS232C), Binary communication

7.2 The communication settings

	Settings
Baud rate	9,600bps / 38,400bps / 57,600bps / 115,200bps
Data bit	8bit
Parity	None
Stop bit	1bit
Flow control	None

7.1 The camera control commands

7.1.1 The camera commands list

Note. 1: The data unit of the each command is 1byte (8bit).

Note. 2: The data can be saved to the EEPROM if "x" in the "Save to EEPROM" column in the list.

Note. 3: The camera is operating with the data of the EEPROM when the power on the camera.

Command No.	R/W	EEPROM	Function	Initial data	Data range
00 - 0FH			Reserved (Please do not use these)	-	-
10H	R/W	○	The camera function mode 1 (8bit: D[7..0])	9	
11H	R/W	○	The camera function mode 2 (8bit: D[7..0])	0	
12H	R/W	○	The camera function mode 3 (8bit: D[7..0])	0	
13H	R/W	○	The camera function mode 4 (8bit: D[7..0])	0	
14H	R/W	○	The communication mode (8bit: D[7..0])	1	
15 - 1FH			Reserved (Please do not use these)	-	-
20H	R/W	○	The exposure time (H) of the electronic shutter (16bit: D[7..0])	0	0 to 4095
21H	R/W	○	The exposure time (H) of the electronic shutter (16bit: D[15..8])		
22H	R/W	○	The exposure time (CLK) of the electronic shutter (16bit: D[7..0])	0	0 to 779
23H	R/W	○	The exposure time (CLK) of the electronic shutter (16bit: D[15..8])		
24H	R/W	○	The start line of the variable partial scanning (16bit: D[7..0])	0	0 to 493
25H	R/W	○	The start line of the variable partial scanning (16bit: D[15..8])		
26H	R/W	○	The effective lines of the variable partial scanning (16bit: D[7..0])	494	1 to 494
27H	R/W	○	The effective lines of the variable partial scanning (16bit: D[15..8])		
28H	R/W	○	The delay time of the trigger (8bit: D[7..0])	0	0 to 255
29 - 2FH			Reserved (Please do not use these)	-	-
30H	R/W	○	CDS gain (8bit: D[7..0])	0	0 to 255
31H	R/W	○	The digital gain (8bit: D[7..0])	Factory Setting	-
32H	R/W	○	The gain offset (6bit: D[5..0])	Factory Setting	-
33 - 37H			Reserved (Please do not use these)	-	-
38H	R/W	○	The clamp level (8bit: D[7..0])	128	0 to 255
39H			Reserved (Please do not use these)	-	-
3AH	R/W	○	R Gain (8bit: D[7..0]) (Only available for Color model)	0	0 to 255
3BH	R/W	○	B Gain (8bit: D[7..0]) (Only available for Color model)	0	0 to 255
3CH	R/W	○	Gr Gain (8bit: D[7..0]) (Only available for Color model)	0	0 to 255
3DH	R/W	○	Gb Gain (8bit: D[7..0]) (Only available for Color model)	0	0 to 255
3E - 7FH			Reserved (Please do not use these)	-	-

Command No.	R/W	EEPROM	Function	Initial data	Data range
80H	R/W	×	EEPROM control (8bit: D[7..0])		
81 - 9FH			Reserved (Please do not use these)	-	-
A0H	W	○	Pixel defect correction mode Setting (8bit: D[7..0])	1	-
A1H	W	○	Pixel defect number (0 to 15)設定 (8bit: D[7..0])	0	0 to 63
A2H	W	○	Horizontal coordinate (Write) Lower (16bit: D[7..0])	0	0 to 65536
A3H	W	○	Horizontal coordinate (Write) Upper (16bit: D[15..8])		
A4H	W	○	Vertical coordinate (Write) Lower (16bit: D[7..0])	0	0 to 65536
A5H	W	○	Vertical (Write) Upper (16bit: D[15..8])		
A6H	R	○	Horizontal coordinate (Read) Lower (16bit: D[7..0])	0	-
A7H	R	○	Horizontal coordinate (Read) Upper (16bit: D[15..8])		
A8H	R	○	Vertical coordinate (Read) Lower (16bit: D[7..0])	0	-
A9H	R	○	Vertical coordinate (Read) Upper (16bit: D[15..8])		
AA - EFH	-	-	Reserved (Please do not use these)	-	-
F0H	R/W	X	The signals of the power/IO connector (8bit: D[7..0])		
F1 - FFH			Reserved (Please do not use these)	-	-

Command No.	Command descriptions																																												
1CH: [7..0]	[The maximum value on AGC] Initial data : [7..0] = 255, Data range : 0 to 255 Set the maximum value on AGC (Auto Gain Control).																																												
1DH: [7..0]	[The target value on AGC] Initial data : [7..0] = 128, Data range : 0 to 255 Set the target value on AGC (Auto Gain Control).																																												
1EH: ALC[7..0]	[A The ALC mode setting] Initial data : [7..0] = 0, Data range : 0 to 3 Set the ALC mode. D[7...0] <table border="1" style="width: 100%; text-align: center;"> <tr> <td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> </table> <table border="1" style="width: 100%; margin-top: 5px;"> <tr> <td>D7 to D2:</td> <td>No function</td> <td colspan="2">Set always "000000"</td> </tr> <tr> <td>D1:</td> <td>AGC (Auto Gain Control)</td> <td>0: OFF</td> <td>1: ON</td> </tr> <tr> <td>D0:</td> <td>AE (Auto Exposure)</td> <td>0: OFF</td> <td>1: ON</td> </tr> </table> <p>When Long exposure is Enable with AE function, then exposure time is controlled over frame rate. Thus frame rate would be changed by exposure time.</p>	D7	D6	D5	D4	D3	D2	D1	D0	D7 to D2:	No function	Set always "000000"		D1:	AGC (Auto Gain Control)	0: OFF	1: ON	D0:	AE (Auto Exposure)	0: OFF	1: ON																								
D7	D6	D5	D4	D3	D2	D1	D0																																						
D7 to D2:	No function	Set always "000000"																																											
D1:	AGC (Auto Gain Control)	0: OFF	1: ON																																										
D0:	AE (Auto Exposure)	0: OFF	1: ON																																										
1FH: WB[7..0]	[WB] Initial data : [7..0] = 0 Set the White Balance. D[7...0] <table border="1" style="width: 100%; text-align: center;"> <tr> <td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> </table> <table border="1" style="width: 100%; margin-top: 5px;"> <tr> <td>D7</td> <td>Save the current WB gain value on preset</td> <td colspan="2">0 -> 1: Save the current WB gain value on preset(Automatic 0 clear when WB completed)</td> </tr> <tr> <td>D6</td> <td>No function</td> <td colspan="2">Set always "0"</td> </tr> <tr> <td>D5 to D4</td> <td>Select the location on WB gain preset</td> <td>00: No function</td> <td>01: Preset 0</td> </tr> <tr> <td></td> <td></td> <td>10: Preset 1</td> <td>11: Preset 2</td> </tr> <tr> <td>D3:</td> <td>Push to set WB</td> <td colspan="2">0 -> 1: Execute (Automatic 0 clear when WB completed)</td> </tr> <tr> <td>D2:to D0</td> <td>WB Mode Setting</td> <td>000:Manual</td> <td>001: Preset 0</td> </tr> <tr> <td></td> <td></td> <td>010: Preset 1</td> <td>011: Preset 2</td> </tr> <tr> <td></td> <td></td> <td>100:ATW</td> <td>101: Push to set WB</td> </tr> <tr> <td></td> <td></td> <td>110: OFF</td> <td>111: OFF</td> </tr> </table>	D7	D6	D5	D4	D3	D2	D1	D0	D7	Save the current WB gain value on preset	0 -> 1: Save the current WB gain value on preset(Automatic 0 clear when WB completed)		D6	No function	Set always "0"		D5 to D4	Select the location on WB gain preset	00: No function	01: Preset 0			10: Preset 1	11: Preset 2	D3:	Push to set WB	0 -> 1: Execute (Automatic 0 clear when WB completed)		D2:to D0	WB Mode Setting	000:Manual	001: Preset 0			010: Preset 1	011: Preset 2			100:ATW	101: Push to set WB			110: OFF	111: OFF
D7	D6	D5	D4	D3	D2	D1	D0																																						
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		010: Preset 1	011: Preset 2																																										
		100:ATW	101: Push to set WB																																										
		110: OFF	111: OFF																																										

Command No.	Command descriptions
20H: SVR[7..0] 21H: SVR[15..8]	<p>[The exposure time (H) of the electronic shutter] Initial data: SVR[15..0] = 0, data range: 0 to 4095 Sets the preset shutter speed for electronic shutter.</p> <p>Exposure time (shutter speed) = SVR[15..0] x (1H cycle) + SHR[15..0] x (1CLK cycle) The camera works with the shutter off (Frame exposure) when this value sets 0 and the value of SHR[] is 0. The camera works with minimum shutter speed when this value sets 0 and the value of SHR[] is 1 to 368.</p> <p>Automatically sets 4095 when sets more then 4095.</p>
22H: SHR[7..0] 23H: SHR[15..8]	<p>[The exposure time (CLK) of the electronic shutter] Initial data: SHR[15..0] = 0, data range: 0 to 779 Sets the preset shutter speed for electronic shutter.</p> <p>Exposure time (shutter speed) = SVR[15..0] x (1H cycle) + SHR[15..0] x (1CLK cycle) The camera works with the shutter off (Frame exposure) when this value sets 0 and the value of SVR[] is 0. The camera works with minimum shutter speed when this value sets 1 to 779 and the value of SVR[] is 0.</p> <p>Automatically sets 779 when sets more the 779.</p>
24H: PSR[7..0] 25H: PSR[15..8]	<p>[The start line of the variable partial scanning] Initial data: PSR[15..0] = 0, data range: 0 to 493 Sets the start line of the variable partial scanning.</p> <p>Actual start line of the partial scanning = this value + 1</p> <p>Automatically sets 493 when sets more then 493. The camera works with the full scanning when (PSR[] + PWR[]) is more than 493.</p>
26H: PWR[7..0] 27H: PWR[15..8]	<p>[The effective lines of the variable partial scanning] Initial data: PWR[15..0] = 494, data range: 1 to 494 Sets the number of the effective lines (image height) of the variable partial scanning.</p> <p>Automatically sets 494 when sets more then 494. The camera works with the full scanning when (PSR[] + PWR[]) is more than 494.</p>
28H: DLY[7..0]	<p>[The delay time for the trigger] Initial data: DLY[7..0] = 0, data range: 0 to 255 Sets the delay time that is from the trigger signal input to start exposure.</p> <p>Delay time = 61 CLK x DLY[7..0] (useconds) (CLK = pixel clock) 61 x 0.02716 x DLY (useconds)</p>

Command No.	Command descriptions
30H: PGA[7..0]	<p>[CDS gain] Initial data: PGA[7..0] = 0, data range: 0 to 255 Sets the CDS gain (programmable gain).</p> <p>CDS gain = $0.0351 \times (\text{PGA}[7..0] \times 3 + \text{GOFs}[7..0])$ (dB)</p> <p>* GOFs[7..0]: The gain offset (The value of the address 32H)</p>
31H: DGB[7..0]	<p>[The digital gain] Initial data: DGB[7..0] = The factory adjusted value (The value of the address 0EH)</p> <p>Video level = $(\text{Input video level} - \text{clamp level}) \times (1 + \text{DGB}[7..0] / 128) + \text{clamp level}$</p>
32H: GOFs[7..0]	<p>[The gain offset] Initial data: GOFs[7..0] = The factory adjusted value (The value of the address 0FH), data range: 0 to 255</p>
38H: CLAMP[7..0]	<p>[The clamp level] Initial data: CLAMP[7..0] = 128, data range: 0 to 255 Sets the clamp level (The clamp level of the black signal).</p> <p>Clamp level = $\text{CLAMP}[7..0] / 4$ (at 8bit output) Clamp level = $\text{CLAMP}[7..0] / 16$ (at 10bit output) Clamp level = $\text{CLAMP}[7..0]$ (at 12bit output)</p>
3AH: RG[7..0]	<p>[R gain for the white balance] Only available for Color model Initial data: RG[7..0] = 0, data range: 0 to 255</p>
3BH: BG[7..0]	<p>[B gain for the white balance] Only available for Color model Initial data: BG[7..0] = 0, data range: 0 to 255</p>
3CH: GRG[7..0]	<p>[Gr gain for the white balance] Only available for Color model Initial data: GRG[7..0] = 0, data range: 0 to 255</p>
3DH: GBG[7..0]	<p>[Gb gain for the white balance] Only available for Color model Initial data: GBG[7..0] = 0, data range: 0 to 255</p>

Command No.	Command descriptions																										
A0H: PDC0[7..0]	<p>[Pixel defect correction mode Setting] Initial data : PDC0[7..0] = 0, Data range: 0 to 7 D[7..0]</p> <table border="1"> <tr> <td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> </table> <table border="1"> <tr> <td>D7</td> <td>Write compensate coordinate</td> <td>0→1 : Write (data will be deleted camera inside after writing) *Data of pixel defect number on A2 to A5 is written into Pixel defect number on A1</td> </tr> <tr> <td>D6:</td> <td>Read compensate coordinate</td> <td>0→1 : Read (data will be deleted camera inside after read out) *Data of pixel defect number on A1 is written into register A6 to A9</td> </tr> <tr> <td>D5</td> <td>Save compensate coordinate into EEPROM</td> <td>0→1 : Read (data will be deleted camera inside after read out) *All of coordinate information(16 points) are saved into EEPROM</td> </tr> <tr> <td>D4~D2</td> <td>No function</td> <td>Set always "000"</td> </tr> <tr> <td>D1</td> <td>Show compensate pixel</td> <td>0: OFF 1: ON</td> </tr> <tr> <td>D0</td> <td>Pixel defect correction</td> <td>0: OFF 1: ON</td> </tr> </table>	D7	D6	D5	D4	D3	D2	D1	D0	D7	Write compensate coordinate	0→1 : Write (data will be deleted camera inside after writing) *Data of pixel defect number on A2 to A5 is written into Pixel defect number on A1	D6:	Read compensate coordinate	0→1 : Read (data will be deleted camera inside after read out) *Data of pixel defect number on A1 is written into register A6 to A9	D5	Save compensate coordinate into EEPROM	0→1 : Read (data will be deleted camera inside after read out) *All of coordinate information(16 points) are saved into EEPROM	D4~D2	No function	Set always "000"	D1	Show compensate pixel	0: OFF 1: ON	D0	Pixel defect correction	0: OFF 1: ON
D7	D6	D5	D4	D3	D2	D1	D0																				
D7	Write compensate coordinate	0→1 : Write (data will be deleted camera inside after writing) *Data of pixel defect number on A2 to A5 is written into Pixel defect number on A1																									
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D4~D2	No function	Set always "000"																									
D1	Show compensate pixel	0: OFF 1: ON																									
D0	Pixel defect correction	0: OFF 1: ON																									
A1H: PDC1[7..0]	<p>[Pixel defect number] Initial data: PDC1[7..0] [7..0] = 0, Data range: 0 to 63 D[7..0]</p> <table border="1"> <tr> <td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td> </tr> </table> <table border="1"> <tr> <td>D7 ~ D6</td> <td>No function</td> <td>Set always "00"</td> </tr> <tr> <td>D5~ D0:</td> <td>EEPROM sync register</td> <td>Pixel defect number (0~63)</td> </tr> </table>	D7	D6	D5	D4	D3	D2	D1	D0	D7 ~ D6	No function	Set always "00"	D5~ D0:	EEPROM sync register	Pixel defect number (0~63)												
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A2H: PDC_WX[7..0] A3H: PDC_WX[15..8]	<p>[Horizontal coordinate (Write)] Initial data : PDC_WX[15..0] = 0, Data range: Enable Horizontal pixel number This sets the compensate pixel's horizontal coordinate.</p>																										
A4H: PDC_WY[7..0] A5H: PDC_WY[15..8]	<p>[Vertical coordinate (Write)] Initial data : PDC_WY[15..0] = 0, Data range: Enable Vertical pixel number This sets the compensate pixel's vertical coordinate.</p>																										
A6H: PDC_RX[7..0] A7H: PDC_RX[15..8]	<p>[Horizontal coordinate (Read)] Initial data : PDC_RX[15..0] = 0 This obtains the compensate pixel's horizontal coordinate.</p>																										
A8H: PDC_RY[7..0] A9H: PDC_RY[15..8]	<p>[Vertical coordinate (Read)] Initial data : PDC_RY[15..0] = 0 This obtains the compensate pixel's vertical coordinate.</p>																										

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