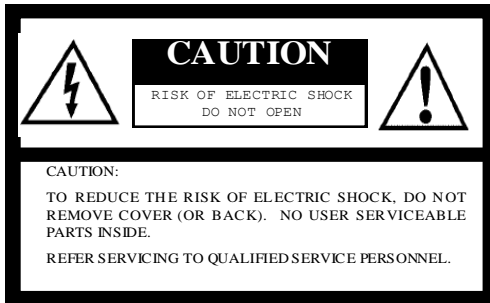




STC-POCL33A
STC-POCLC33A
User Guide

VGA CCD, Color / Monochrome
PoCL Camera Link Camera

Safety Precautions



For U.S.A.

Warning:

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

Warning:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

Product Precautions

- Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.
- Do not pull or damage the camera cable.
- During camera use, do not wrap the unit in any material. This will cause the internal temperature of the unit to increase.
- Do not expose the camera to moisture, or do not try to operate it in wet areas.
- Do not operate the camera beyond its temperature, humidity and power source ratings.
- While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the CCD or filter area and scratching or damaging this area.
- Do not keep the camera under the following conditions:
 - In wet, moist, and high humidity areas
 - Under hot direct sunlight
 - In high temperature areas
 - Near an object that releases a strong magnetic or electric field
 - Areas with strong vibrations
- Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.

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I. Connector Specifications

- Camera Link connector: SDR (3M) equivalent

CAUTION: This product is PoCL type. Please use this camera with the cable and the frame grabber board for PoCL.

- B. IO Connector: HR10A-7R-6PB (Hirose) or equivalent
This connector is the input and output signals. Trigger input and sync input/output signals can be assigned through the camera setting communication.

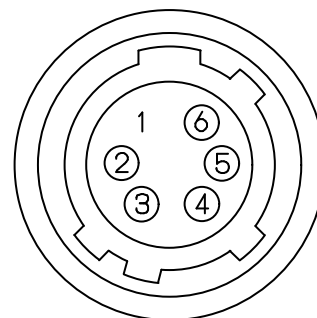
A. Pin Assignment

1. Camera Link Connector

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

2. IO Connector

Pin No.	Signal Name	IN/OUT	Voltage		
				Low Voltage	High Voltage
1	GND	IN	0V		
2	I/O-1	IN/OUT	IN	0 to +0.5V	+2.5 to +5.0V
			OUT	0V	+3.3V
3	I/O-2	IN/OUT	IN	0 to +0.5V	+2.5 to +5.0V
			OUT	0V	+3.3V
4	I/O-3	IN/OUT	IN	0 to +0.5V	+2.5 to +5.0V
			OUT	0V	+3.3V
5	TRG OUT	OUT	OUT	0V	+3.3V
6	N.C.				



Note:

1. The trigger input signal can be assigned either on the Camera Link connector (CC1) or on the No. 2 pin of the connector through the camera setting communication.
2. The external sync signals (HD and VD) can be assigned on the following connectors through the camera setting communication.
 - Camera Link connector (CC2: HD signal input, CC3: VD signal input) or
 - IO connector (No. 4: HD signal input/output, No. 3: VD signal input/output)

B. The signals of the IO connector

The input and output signals of the IO connector can be changed through the camera setting communication.

	F0H.3-0 setting	Pin No.2 (SP4)	Pin No.3 (SP3)	Pin No.4 (SP2)	Pin No.5 (SP1)
The signals 1 (Factory default setting) This is for when the system requires trigger signal input /output and HD / VD signal input / output	0	Trigger signal input	VD signal input / output	HD signal input / output	Trigger signal output
The signals 2 This is for the factory test DO NOT USE this	1				
The signals 3 This is for checking the status of CC1 to 4	2	CC4 output	CC3 output	CC2 output	CC1 output
The signals 4 This is for when the system requires the exposure time	3	FVAL signal output	SG signal output	SUB signal output	CC1 output MSB
The signals 5 This is for checking the difference of the image signal and signals	4	FVAL signal output	LVAL signal output	DVAL signal output	Image signal (MSB) output
The signals 6 This is for when the system required the exposure time	5	Positive HD signal output	Exposure time	Trigger signal output	CC1 output
The signals 7 This is for when system requires HD / VD signal input / output	6	VD signal output	VD signal input	HD signal Input	HD signal output
The signals 8 This is for the factory test DO NOT USE this	7				

Note 1: Please change "F0H" address data of the register when changing the signals of the IO connector.
Please change "COH" address data of the EEPROM when saving the signals of the IO connector settings.
"F0H" address data could not save to the EEPROM.

Note 2: Output trigger signal has the following delay from the trigger signal input:
30CLK (Approximately 2.4 useconds) at 30fps
30CLK (Approximately 1.2 useconds) at 60fps
30CLK (Approximatley 815nseconds) at 90 fps

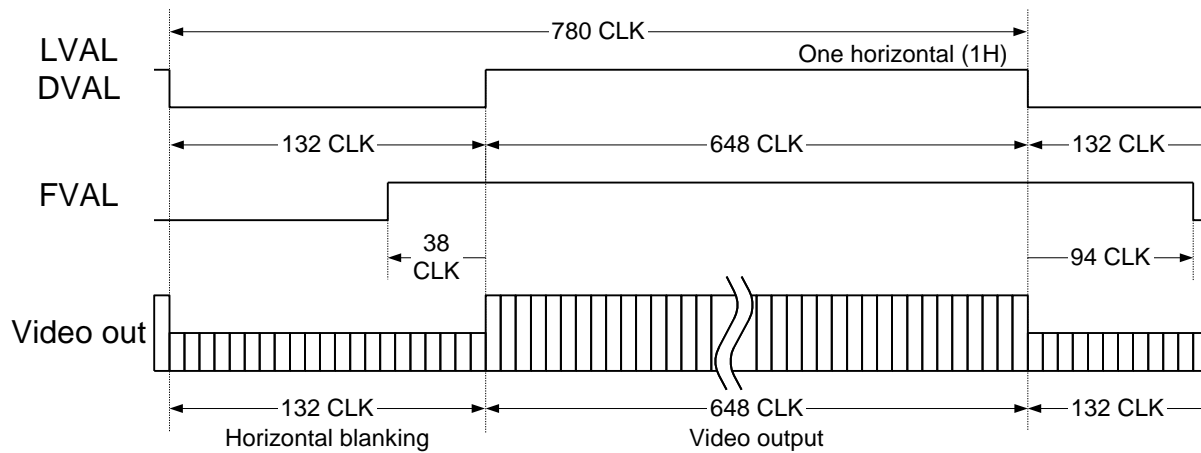
Note 3: Please change "13H.7" when using HD/VD signals input/output from the IO connector.
Please chage "11H.7" for input/ output for HD/VD signals when selecting the signal1 in the above chart.

II. Camera Output Timing Charts

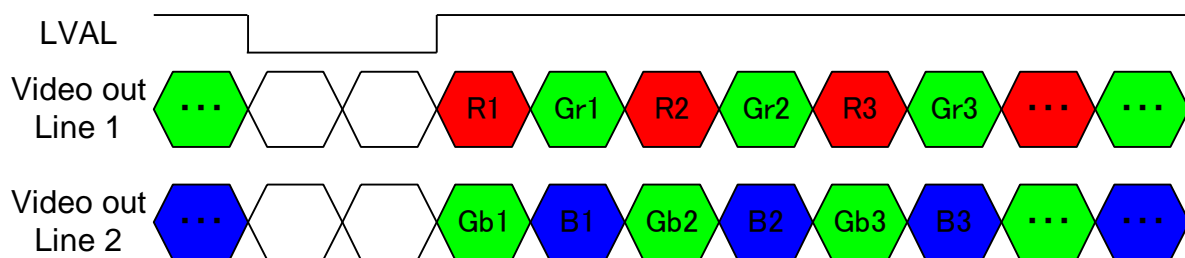
A. Normal Mode (Setting: address: 10H, value: 1XX0XXXX)

1. Horizontal Timing

1 CLK = 81.4816 nsecond at 30fps
 1 CLK = 40.7408 nsecond at 60fps
 1 CLK = 27.1605 nsecond at 90fps



2. Color Bayer Order (This information is only for STC-POCLC33A)

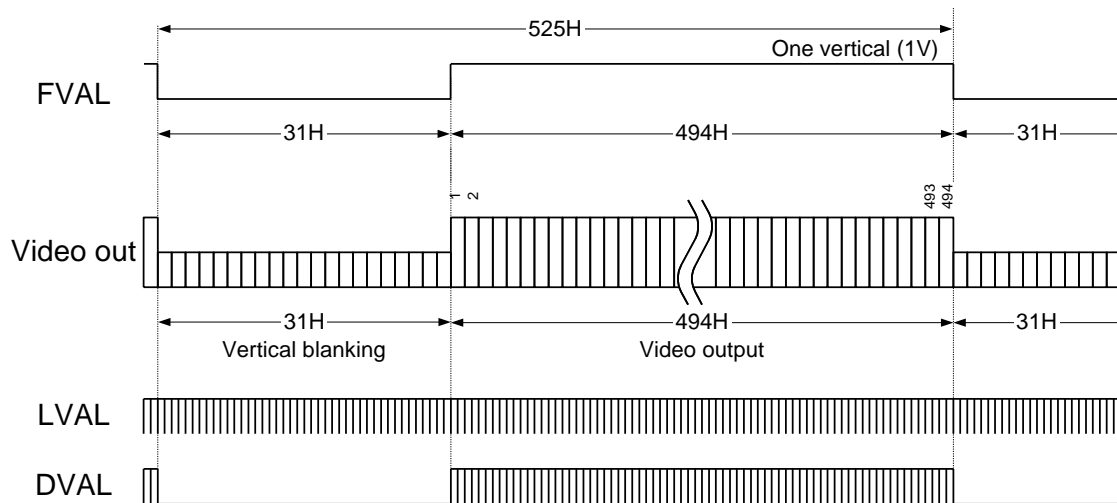


3. Vertical Timing

a. Normal Full Scanning

(Settings: address: 10H, value: 1XX00XXX; address: 11H, value: XXX0X000)

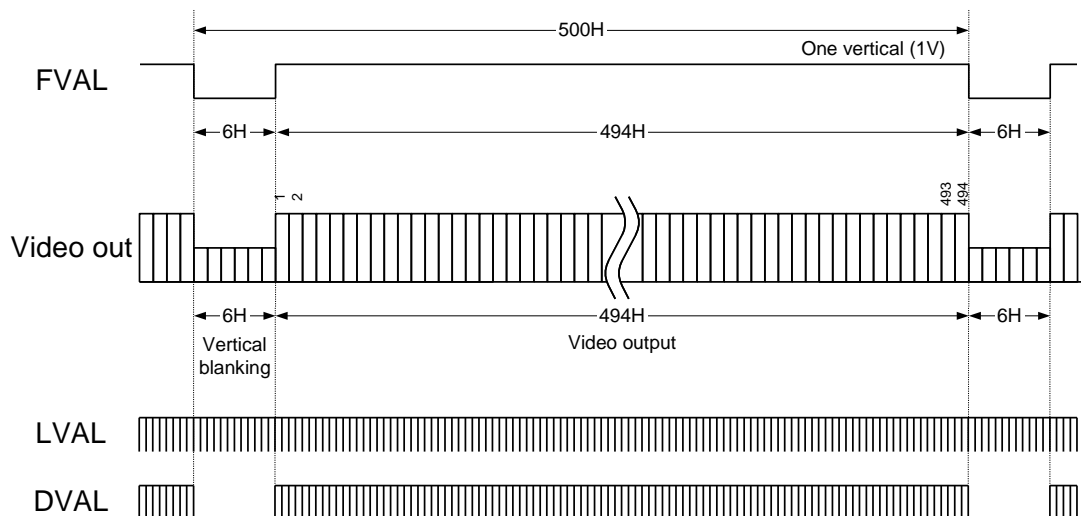
1H = 63.5556 μ second, 29.9700 Hz at 30fps
 1H = 31.7778 μ second, 59.9400 Hz at 60fps
 1H = 21.1852 μ second, 89.9100 Hz at 90fps



b. Partial Full Scanning

(Settings: address: 10H, value: 1XX01XXX; address: 11H, value: XXX0X000)

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



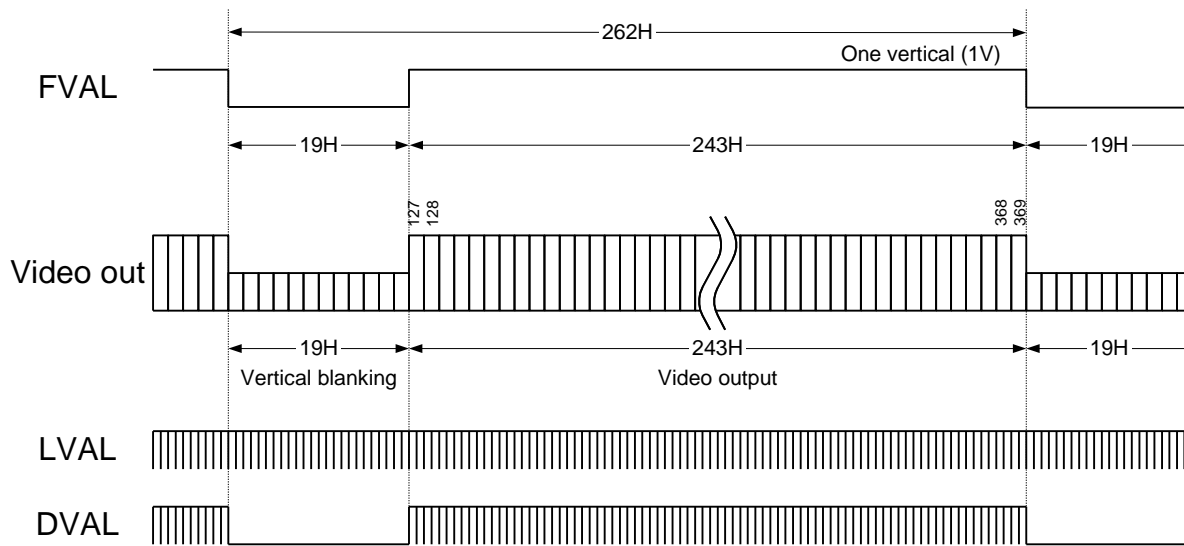
c. ½ Partial Scanning

(Settings: address: 10H, value: 1XX01XXX; address: 11H, value: XXX0X001)

1H = 63.5556 μsecond, 60.0544 Hz at 30fps

1H = 31.7778 μsecond, 120.108 Hz at 60fps

1H = 21.1852 μsecond, 180.163 Hz at 90fps



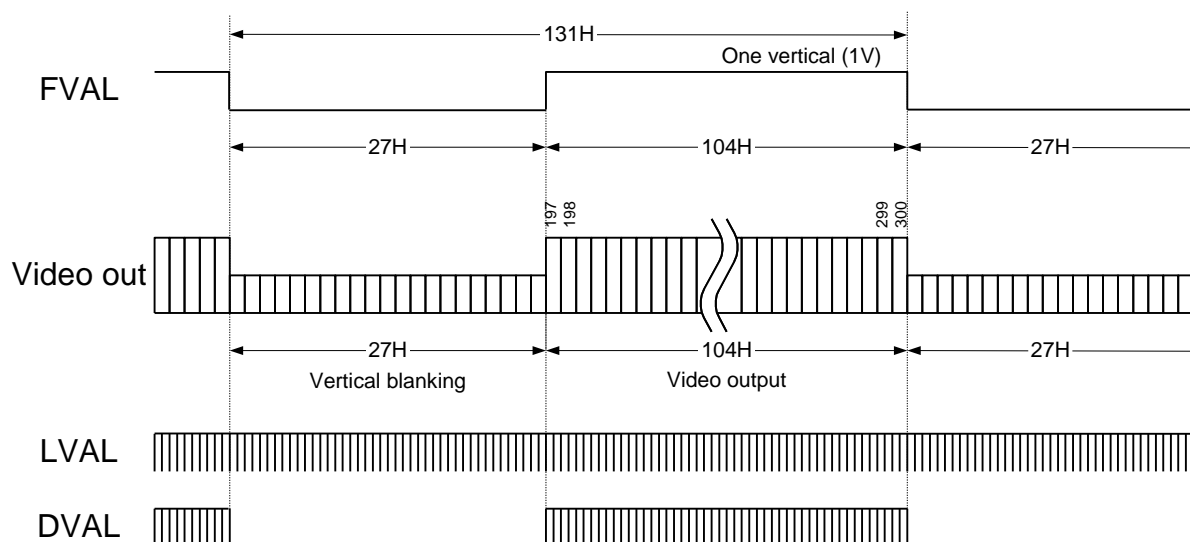
d. ¼ Partial Scanning

(Settings: address: 10H, value: 1XX01XXX; address: 11H, value: XXX0X010)

1H = 63.5556 μsecond, 120.108 Hz at 30fps

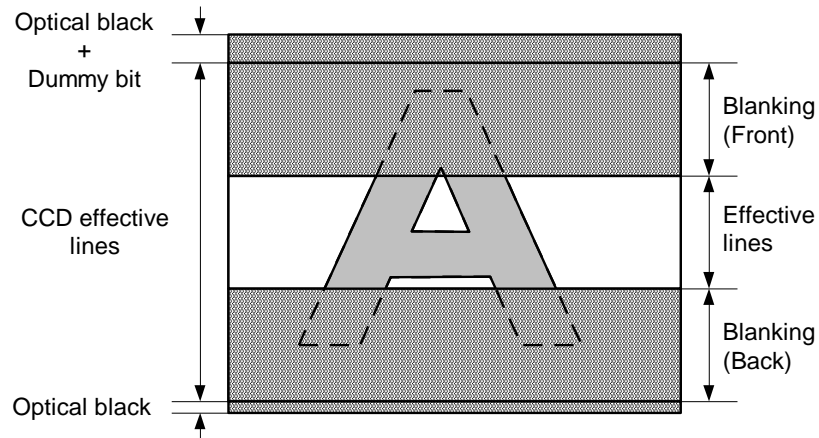
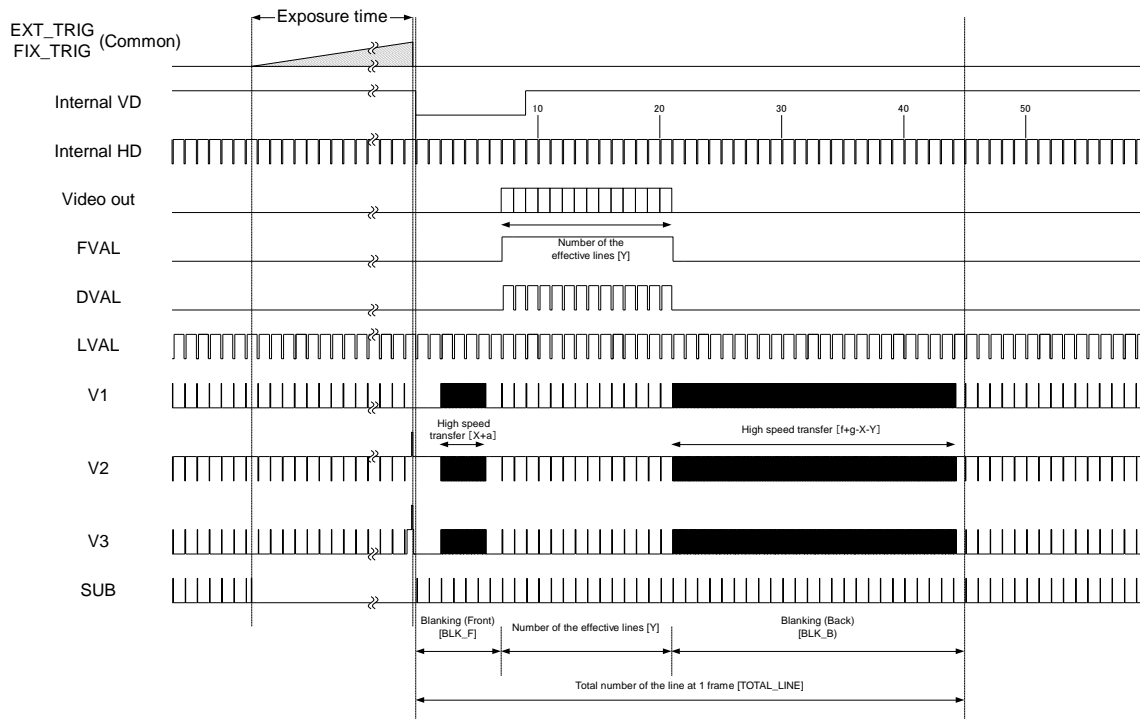
1H = 31.7778 μsecond, 240.217 Hz at 60fps

1H = 21.1852 μsecond, 360.326 Hz at 90fps



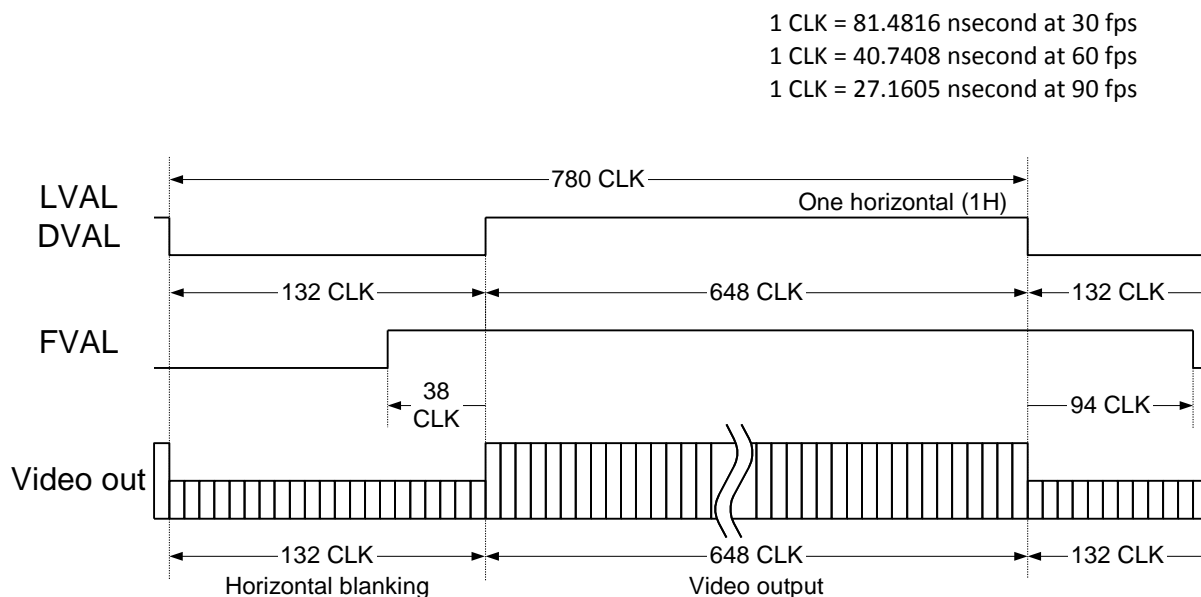
e. Variable Partial Scanning

(Settings: address: 10H, value: 1XX01XXX; address: 11H, value: XXX0X111)



B. Binning Mode (Setting: address: 10H, value: 1XX1XXXX)

1. Horizontal Timing

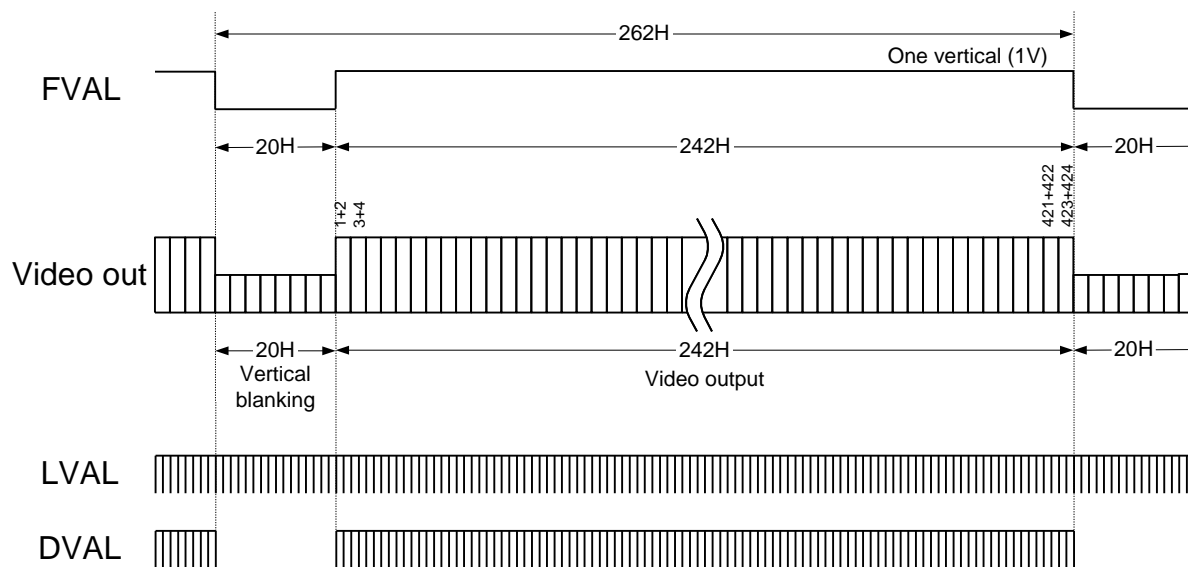


2. Vertical Timings

a. Binning Full Scanning

(Settings: address: 10H, value: 1XX10XXX; address: 11H, value: XXX0X000)

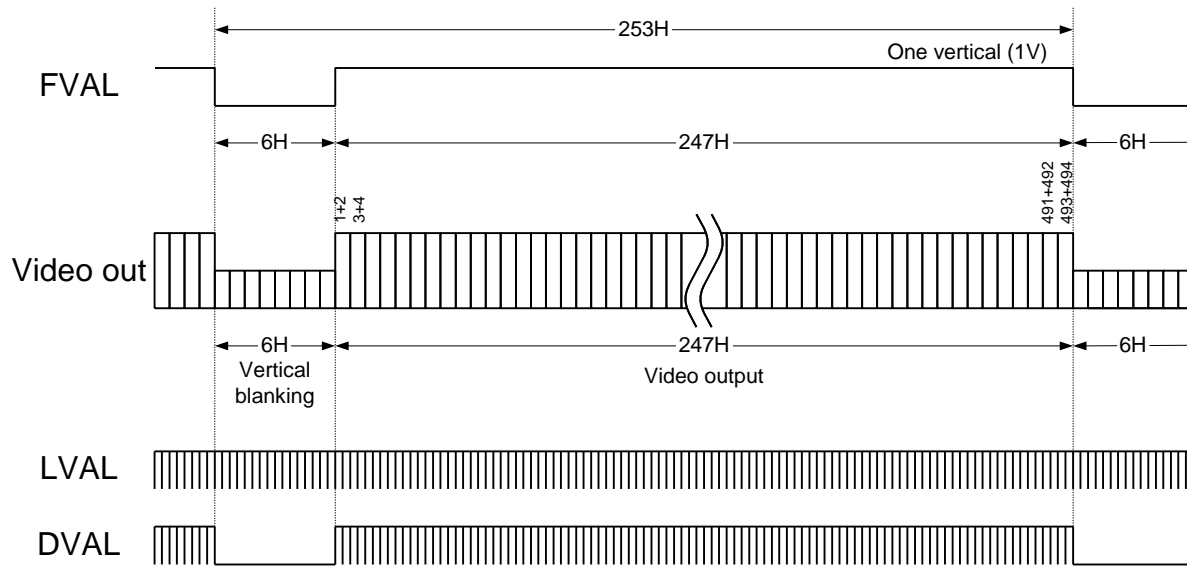
1 H = 63.5556 μ second, 60.0544 Hz at 30 fps
1 H = 31.7778 μ second, 120.108 Hz at 60 fps
1 H = 21.1852 μ second, 180.163 Hz at 90 fps



b. Binning Partial Scanning

(Settings: address: 10H, value: 1XX11XXX; address: 11H, value: XXX0X000)

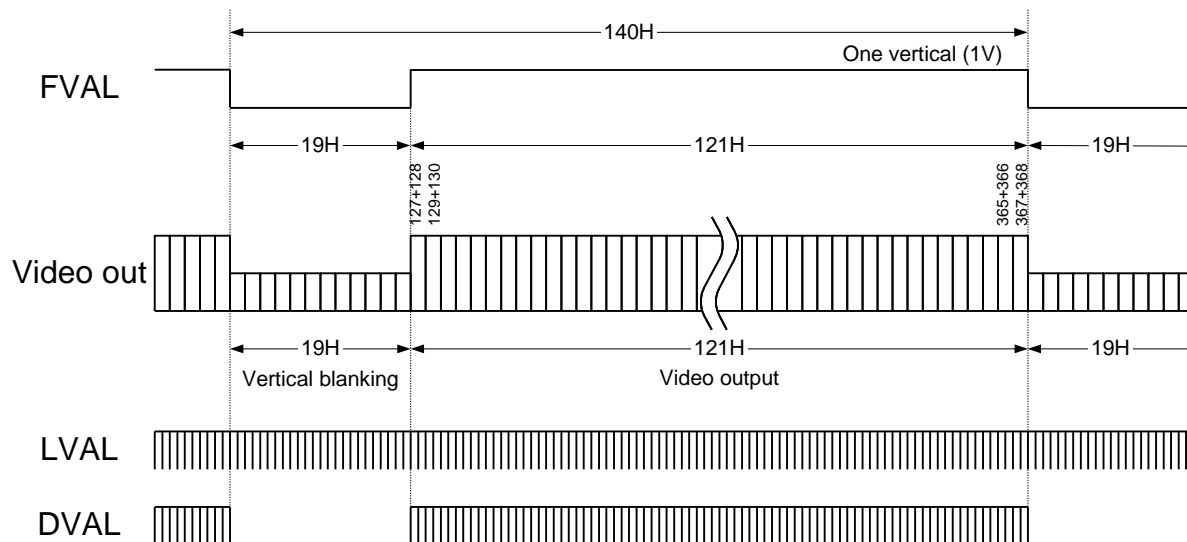
1 H = 63.5556 μ second, 62.1907 Hz at 30 fps
 1 H = 31.7778 μ second, 124.381 Hz at 60 fps
 1 H = 21.1852 μ second, 186.572 Hz at 90 fps



c. Binning 1/2 Partial Scanning

(Settings: address: 10H, value: 1XX11XXX; address: 11H, value: XXX0X001)

1 H = 63.5556 μ second, 112.378 Hz at 30 fps
 1 H = 31.7778 μ second, 224.775 Hz at 60 fps
 1 H = 21.1852 μ second, 337.162 Hz at 90 fps



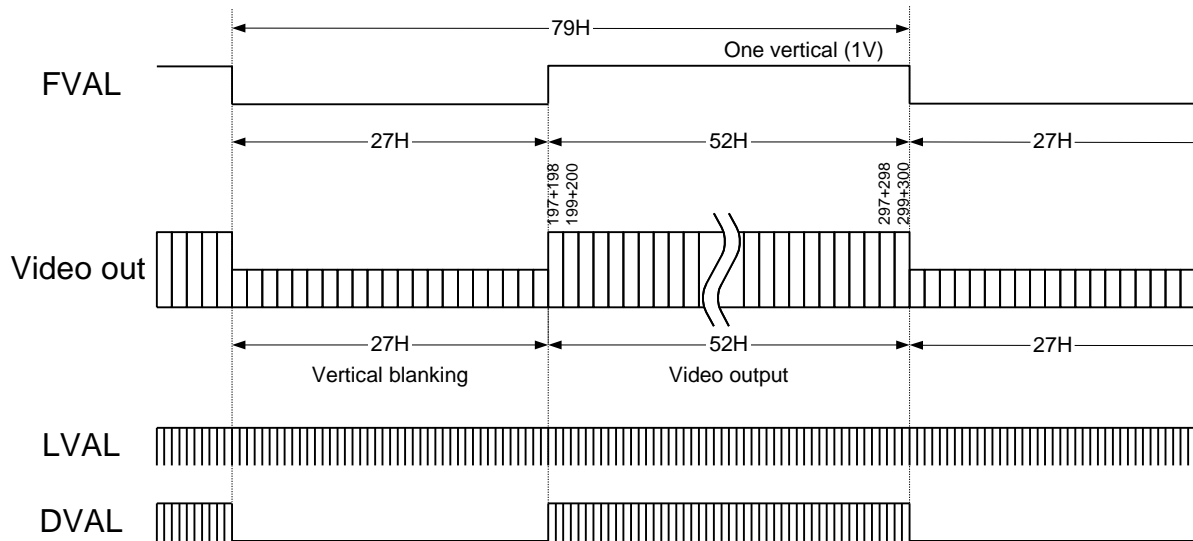
d. Binning ¼ Partial Scanning

(Settings: address: 10H, value: 1XX11XXX; address: 11H, value: XX0X010)

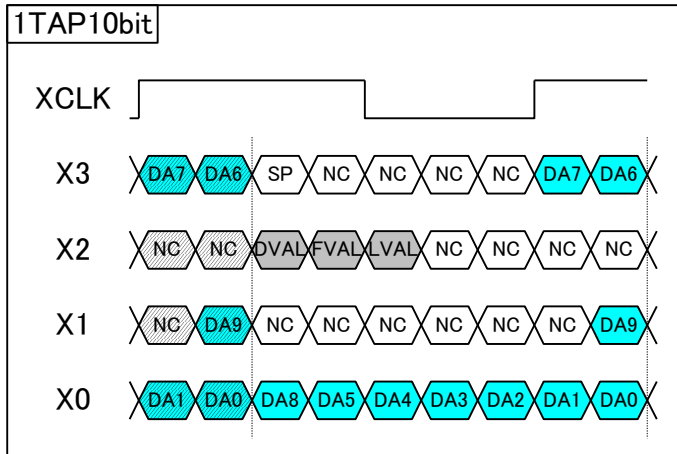
1 H = 63.5556 μ second, 199.167 Hz at 30 fps

1 H = 31.7778 μ second, 398.335 Hz at 60 fps

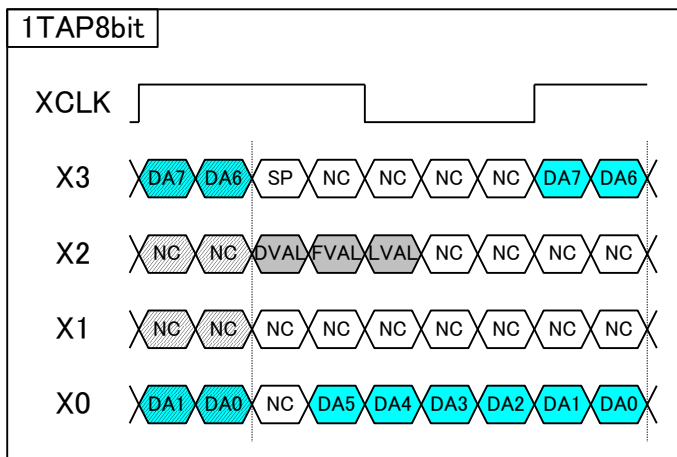
1 H = 21.1852 μ second, 597.503 Hz at 90 fps



C. The Data Order of the CameraLink Output



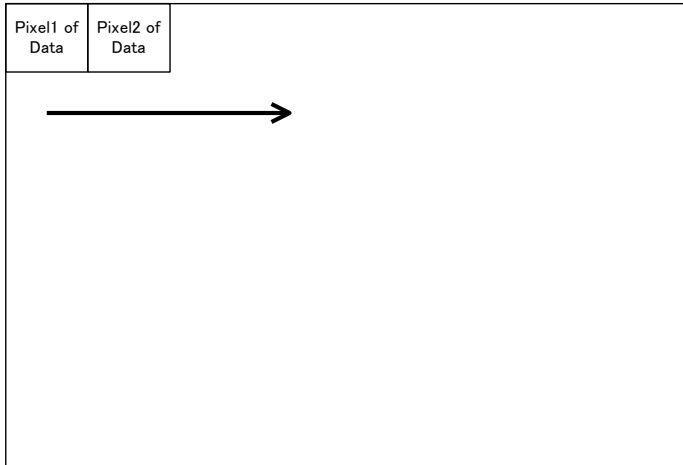
DA0 to DA9: 10bit data for one pixel



DA0 to DA7: 8bit data for one pixel

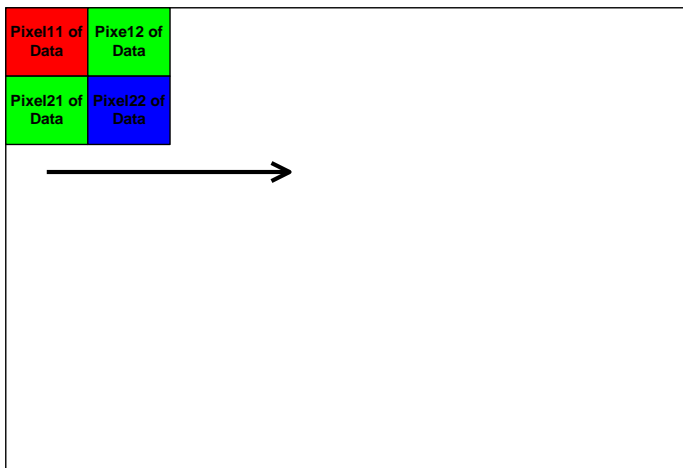
D. Transferring Image

STC-POCL33A (Monochrome)



Pixeln of Data: The transferring pixel
n: The order number

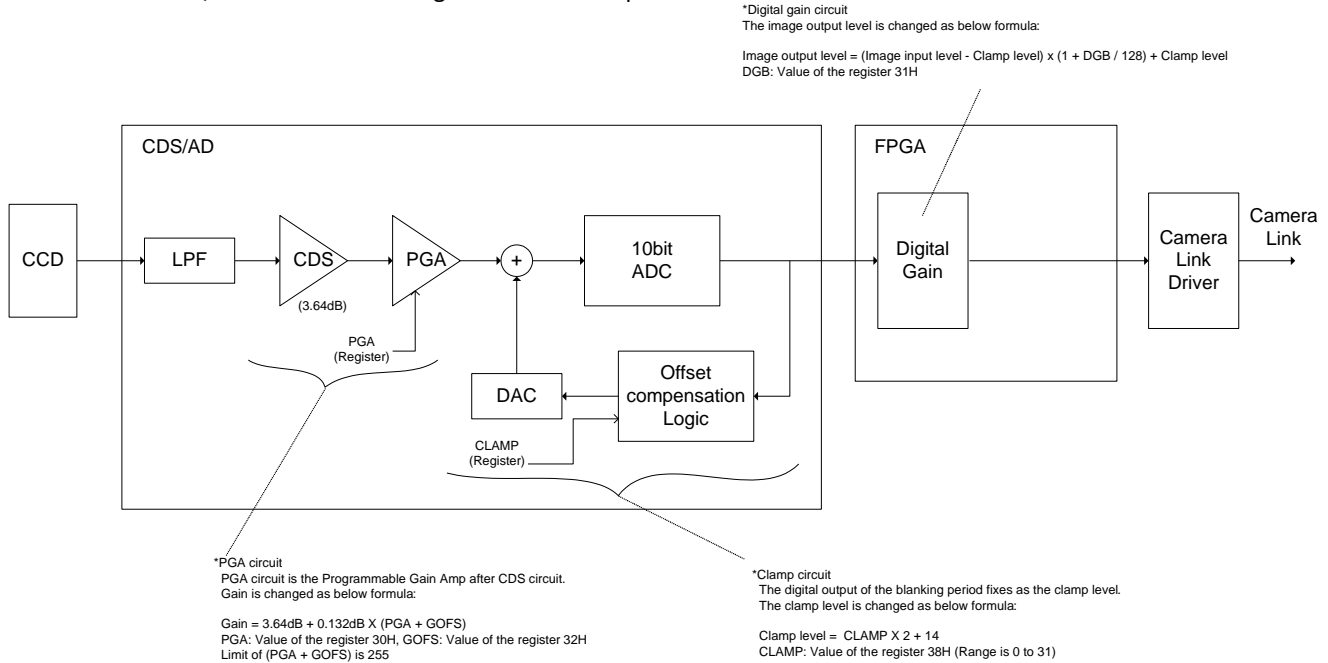
STC-POCLC33A (Color)



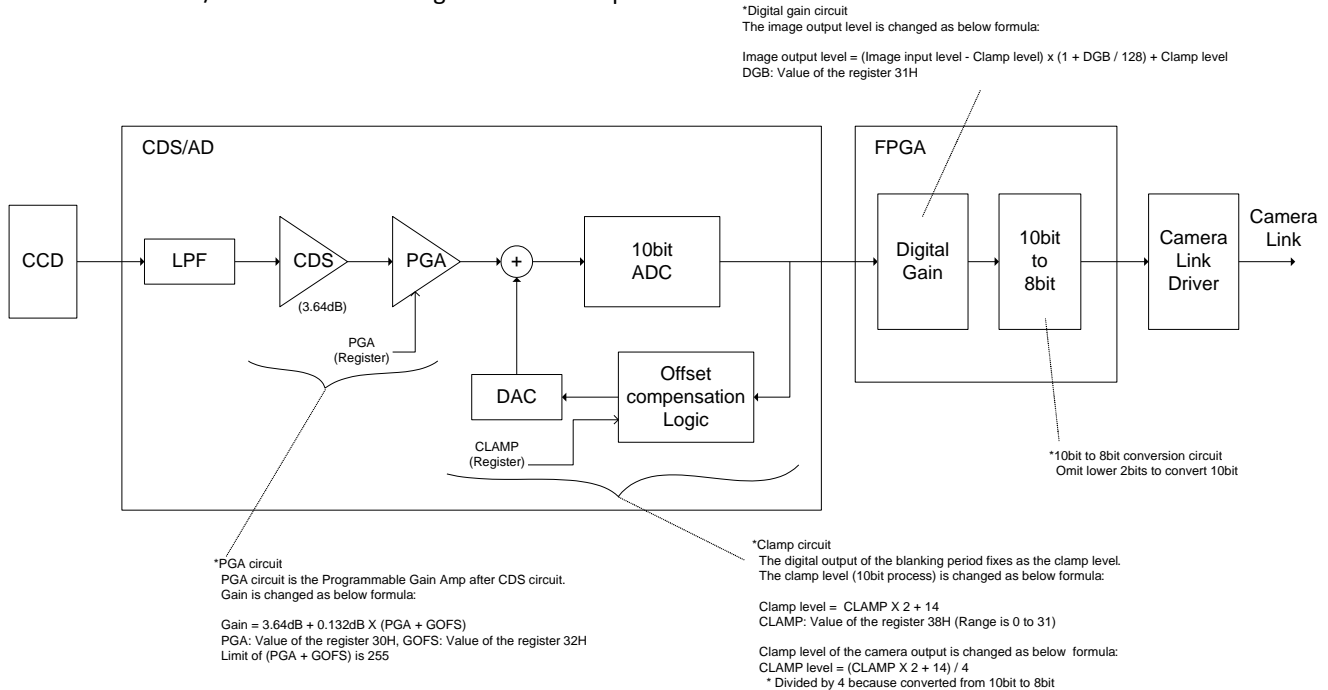
Pixelmn of Data: The transferring pixel
m: The line number
n: The order number

E. Block Diagram

1. STC-POCL33A/POCLC33A Block Diagram at 10bit Output



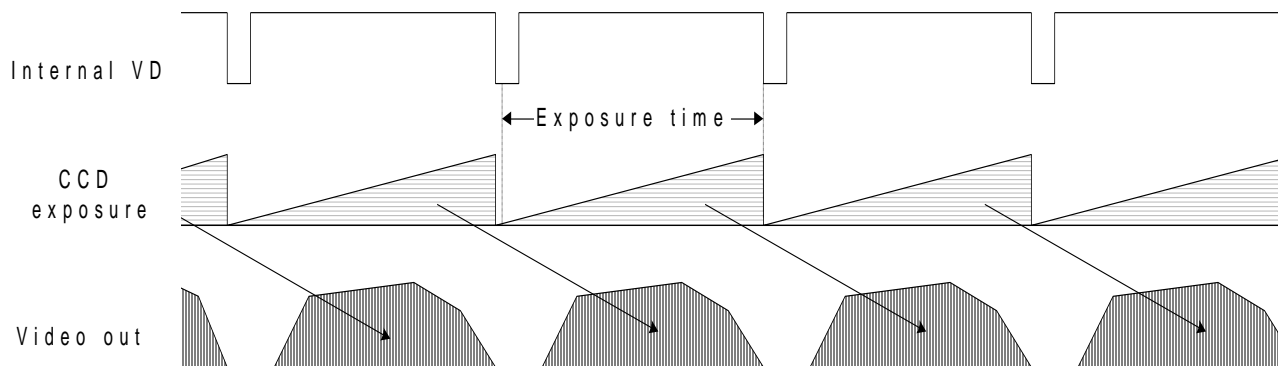
2. STC-POCL33A/POCLC33A Block Diagram at 8bit Output



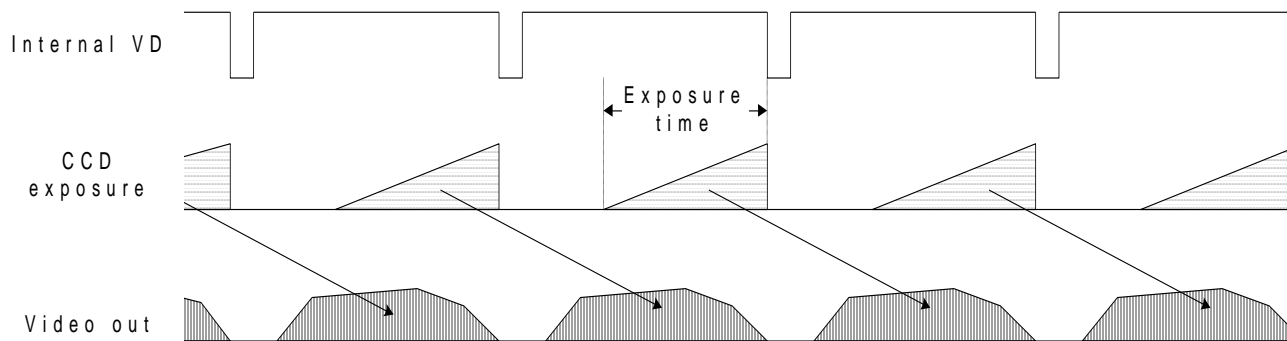
III. Camera Function Modes

A. Normal Mode

1. Normal Mode (Frame Exposure)



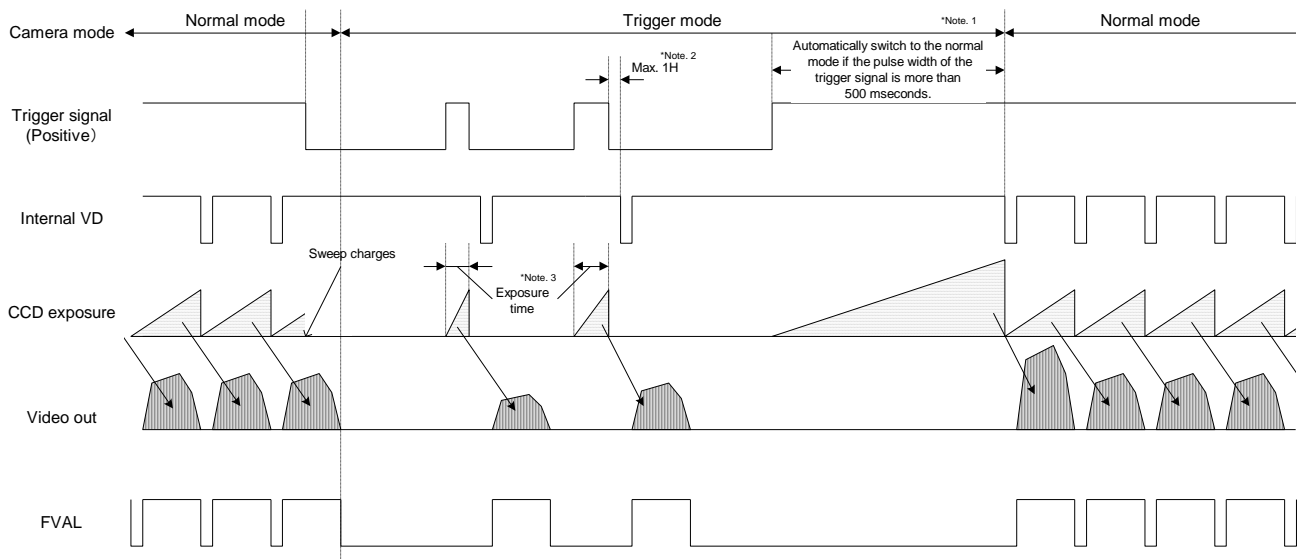
2. Normal Mode (Electronic Shutter)



B. Pulse Width Trigger Mode

In this trigger mode with positive polarity, the camera exposure starts at the rising edge of the trigger pulse and stops at the falling edge of the trigger pulse. Therefore, if exposure positive polarity is selected, the exposure periods are the high states of the trigger pulse.

1. Pulse Width Trigger Mode (V-Reset)

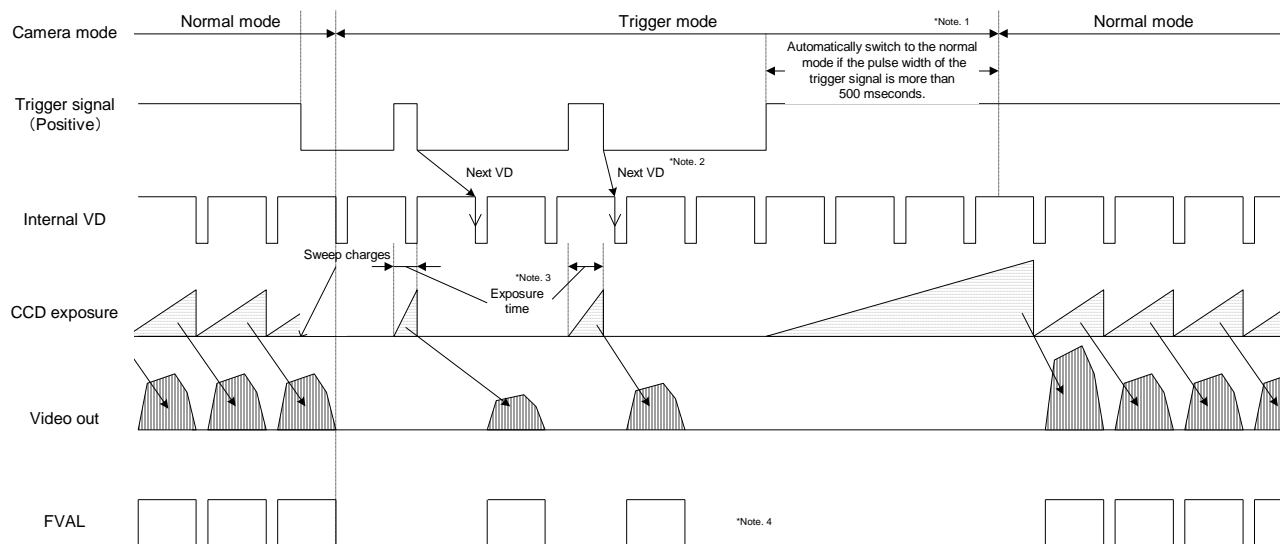


Note 1: The camera does NOT switch to the normal mode when the long exposure mode is set.

Note 2: The video output is going to be V reset by the next internal HD signal immediately after the exposure is finished.

Note 3: The exposure time is set by the pulse width of the trigger signal.

2. Pulse Width Trigger Mode (Non-Reset)



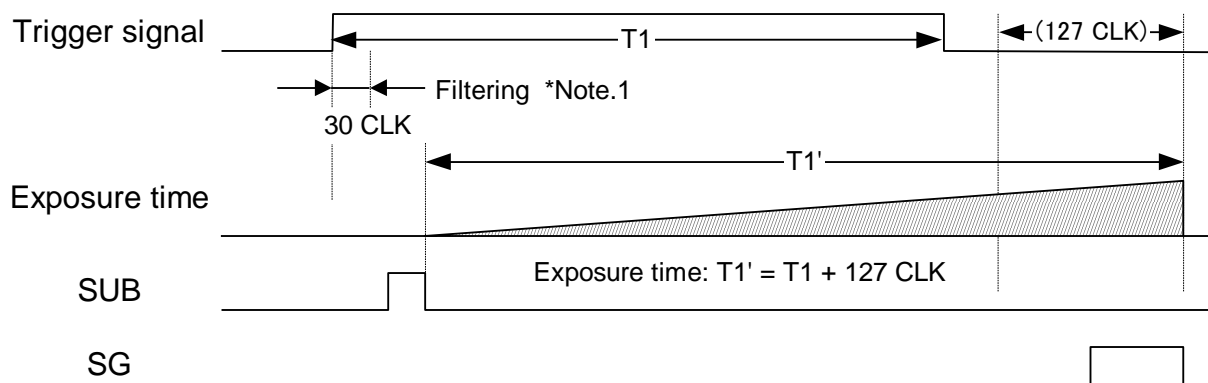
Note.1: The camera does NOT switch to the normal mode when the long exposure mode is set.

Note.2: The video output is going to be V reset by the internal VD signal after the exposure is finished.

Note.3: The exposure time sets by the pulse width of the trigger signal.

Note.4: FVAL signal does NOT output if NO exposure with the trigger signal while the trigger mode.

3. Pulse Width Trigger Mode (Exposure Timing)



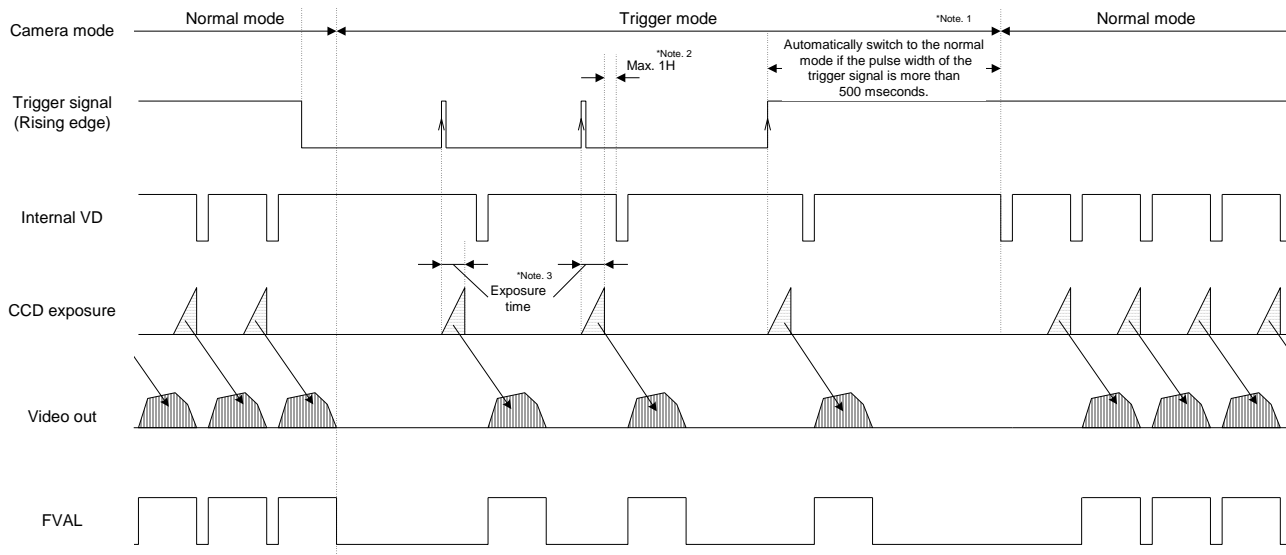
Note.1: The trigger signal is removed by the filtering if the pulse width of the input trigger signal is less than 30 CLK. Please input the trigger signal has more than 31 CLK pulse width.

Note.2: The exposure is going to start 63 CLK after the rising edge of the trigger signal.

C. Edge Preset Trigger Mode

In this trigger mode, the camera exposure starts at the rising edge of the trigger pulse. Exposure duration time is preset by the DIP Switch settings.

1. Edge Preset Trigger Mode (V-Reset)

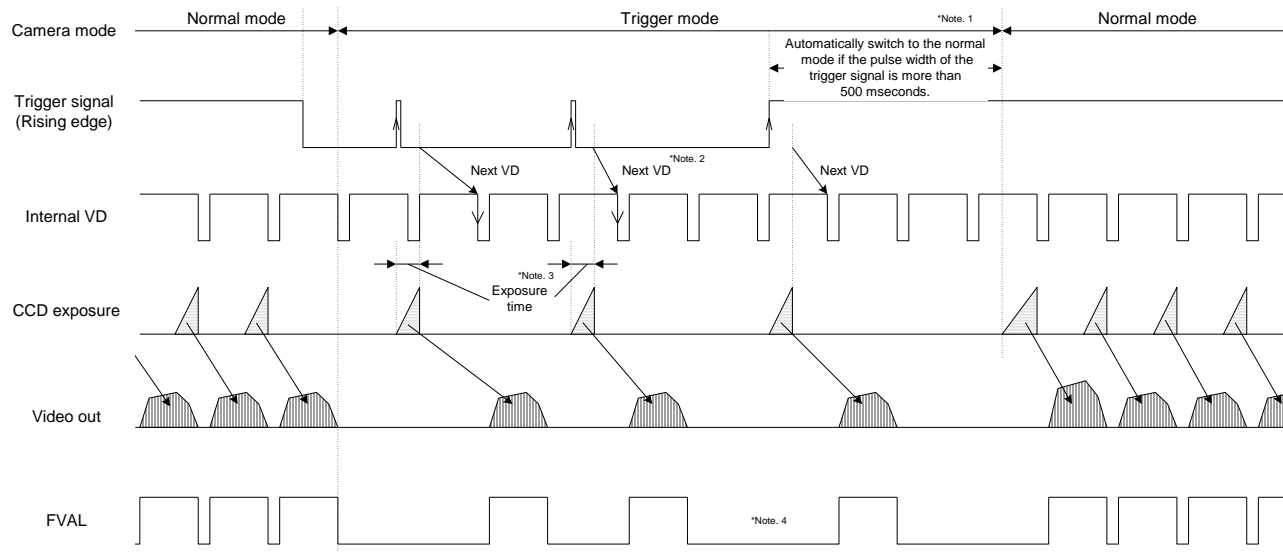


Note.1: The camera does NOT switch to the normal mode when the long exposure mode is set.

Note.2: The video output is going to be V reset by the next internal HD signal immediate after the exposure is finished.

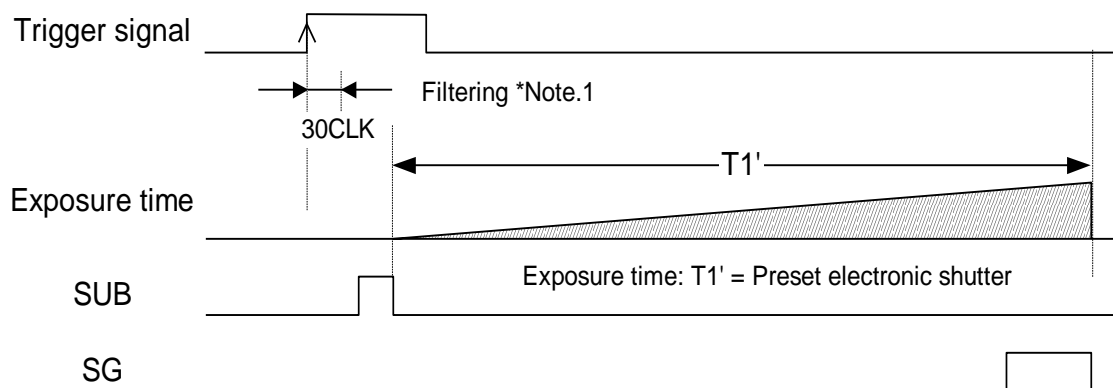
Note.3: The exposure time sets by the preset electronic shutter speed.

2. Edge Preset Trigger Mode (Non-Reset)



- Note.1: The camera does NOT switch to the normal mode when the long exposure mode is set,
- Note.2: The video output is going to be V reset by the internal VD signal after the exposure is finished.
- Note.3: The exposure time sets by the preset electronic shutter speed.
- Note.4: FVAL signal does NOT output if NO exposure with the trigger signal while the trigger mode.

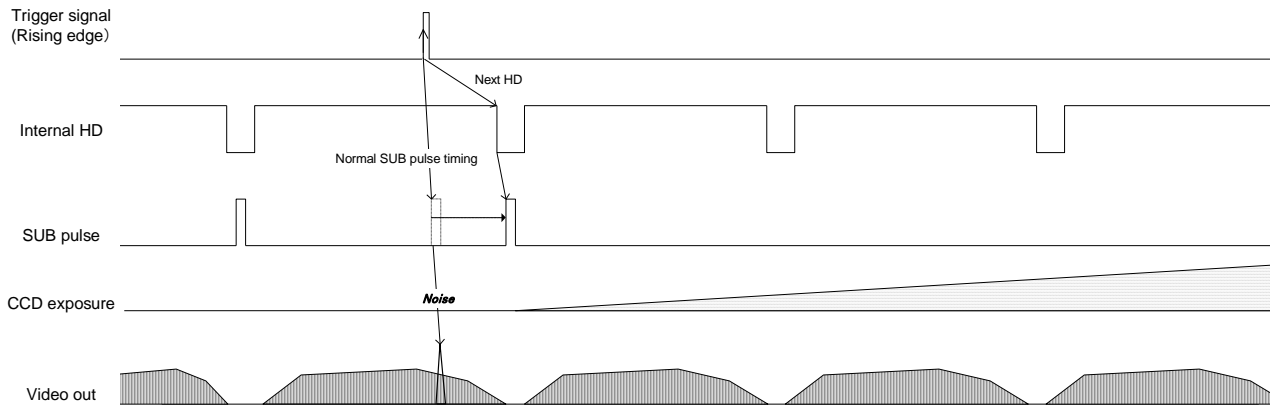
3. Edge Preset Trigger Mode (Exposure Timing)



- Note.1: The trigger signal is removed by the filtering if the pulse width of the input trigger signal is less than 30 CLK
Please input the trigger signal has more than 31 CLK pulse width.
- Note.2: The exposure is going to start 63 CLK after the rising edge of the trigger signal.

D. H Reset Mode

In this mode, the exposure can start during the video out from the camera without horizontal noises.
The SUB pulse is generated to sweep the charges during the horizontal blanking to prevent any horizontal noises.
Horizontal noise in the image is caused when the SUB pulse is generated during the video out in normal mode, in which case the H Reset mode is OFF.
The maximum delay to start exposure from the trigger inputs in 1H.



IV. The Communication Protocol Specifications

This camera has the communication function that enables the external device (i.e.: the PC) control the camera function. Please use "CLCtrl" communication software or use following the communication protocol to communicate to the camera.

Note: 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 (bad external sync signal).
3. Approximately 1 second after switching from/to external sync mode to/from internal sync mode.
4. Approximately 1 second after switching the frame rate.

A. The Communication Method

UART (RS232C), Binary communication

B. The Communication Settings

	Settings
Baud Rate	9,600bps / 38,400bps
Data Bit	8bit
Parity	None
Stop Bit	1bit
Flow Control	None

C. The Communication Format

1. Format for Sending Data from the PC to the Camera is as follows:

a. Sending the read command

SOF	Device Code	Read	Page Selection	Command Code	Data Length	Data	EOF
(8bit)	(6bit)	(1bit)	(1bit)	(8bit)	(8bit)	(10bit)	(8bit)

b. Sending the write command

SOF	Device Code	Write	Page Selection	Command Code	Data Length	Data	EOF
(8bit)	(6bit)	(1bit)	(1bit)	(8bit)	(8bit)	(Data Length Byte)	(8bit)

2. Format for Receiving Data from the PC to the Camera is as follows:

a. After sending the read command

SOF	Device Length	Data	EOF
(8bit)	(8bit)	(Data Length Byte)	(8bit)

b. After sending the write command

SOF	Device Length	Receiving Code	EOF
(8bit)	(8bit) "00"	(8bit)	(8bit)

3. Camera Control Command

Name	Descriptions
SOF	Start of Frame The setting (or receiving) the value is always "02H".
Device Code	Set the device code of the camera as "000000"
Read / Write	Set (or receive) "0" when sending a read command Set (or receive) "1" when sending a write command
Page Selection	Set "0" when access to the command register of the camera Gets current data from the command register when sent read command. The data of the command register is replaced by the sent data when sent write command. The data of the EEPROM is not replaced. Set "1" when access to the EEPROM of the camera. The camera works with the data of the EPROM when the power on the camera. GEets the data from the EEPROM when sent read. The data of the EEPROM is replaced by sent data when sent write command. The camera sends the receiving code as "01H" to the PC after the data of the EEPROM is replaced. The camera rejects other commands white tehe data of the EEPROM is being replaced (approximately 5msec / byte)
Command Code	Please refer to the following page.
Data Length	Data length (Unit: byte) Receiving data The data length depends on the command after the read command is sent. The data length is "00H" after the write command is sent. Sending Data The data length is 1 byte when the read command is sent. The data length is depending on the command when the write command is sent.
Data	The value of the data depends on the command
EOF	End of the Frame Set (or receive) the value is always "03H"
Receiving Code	Result of the sending command 01H: OK (ACK) 10H: Receiving problem (NAC) 11H: Communication problem

4. Example Command

Send the read command to read the 00H address data of the register

02, 00, 00, 01, 00, 03

SOF, (Device code / Read / Register), Command code, Data length, Data, EOF

The return command

02, 01, 00, 03

D. The Camera Control Commands

1. The Camera Command List

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

Note 2: The data can be saved to the EEPROM is “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.	Read / Write	Save to EEPROM	Function	Initial data	Data range
00 to 0BH			Reserved	-	-
0CH	Read / Write	x	The signals of the IO connector at power on (8bit: D[7..0])		
0D to 0FH			Reserved	-	-
10H	Read / Write	x	The camera function mode 1 (8bit: D[7..0])	9	
11H	Read / Write	x	The camera function mode 2 (8bit: D[7..0])	0	
12H	Read / Write	x	The camera function mode 3 (8bit: D[7..0])	0	
13H	Read / Write	x	The camera function mode 4 (8bit: D[7..0])	0	
14H	Read / Write	x	The communication mode (8bit: D[7..0])	1	
15 to 1FH			Reserved	-	-
20H	Read / Write	x	The exposure time (H) of the electronic shutter (16bit: D[7..0])	0	0 to 4095
21H	Read / Write	x	The exposure time (H) of the electronic shutter (16bit: D[15..8])		
22H	Read / Write	x	The exposure time (CLK) of the electronic shutter (16bit: D[7..0])	0	0 to 779
23H	Read / Write	x	The exposure time (CLK) of the electronic shutter (16bit: D[15..8])		
24H	Read / Write	x	The start line of the variable partial scanning (16bit: D[7..0])	0	0 to 493
25H	Read / Write	x	The start line of the variable partial scanning (16bit: D[15..8])		
26H	Read / Write	x	The effective lines of the variable partial scanning (16bit: D[7..0])	494	0 to 494
27H	Read / Write	x	The effective lines of the variable partial scanning (16bit: D[15..8])		
28H	Read / Write	x	The delay time for the trigger (8bit: D[7..0])	0	0 to 31
29 - 2FH			Reserved	-	-
30H	Read / Write	x	CDS gin (8bit: D[7..0])	0	0 to 255
31H	Read / Write	x	The digital gain (8bit: D[7..0])	The factory adjusted value	-
32H	Read / Write	x	The gain offset (8bit: D[7..0])	The factory adjusted value	-
33 to 37H			Reserved	-	-
38H	Read / Write	x	The clamp level (8bit: D[7..0])	9	0 to 31
39 to 7FH			Reserved	-	-
80H	Read / Write		EEPROM control (8bit: D[7..0])		
81 to EFH			Reserved	-	-
F0H	Read / Write		The signals of the IO connector (8bit: D[7..0])		
F1 to FFH			Reserved	-	-

Command No.	Command Description								
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: 0 to 494</p> <p>Sets the number of the effective lines (image height) of the variable partial scanning.</p> <p>Automatically sets 494 when sets more than 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 31</p> <p>Sets the delay time that is from the trigger signal input to start exposure.</p> <p>Delay time = 148CLK x DLY[7..0] (usecond) (CLK = pixel clock)</p>								
30H: PGA[7..0]	<p>[CDS gain] Initial data: PGA[7..0] = 0, data range: 0 to 255</p> <p>Sets the CDS gain (programmable gain).</p> <p>CDS gain = 3.64 + 0.132 x (PGA[7..0] + GOFs[7..0]) (dB) *GOFs[7..0]: The gain offset (The value of the address 32H) *Automatically sets 255 when PGA [7..0] + GOFs [7..0] is more than 255.</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 = (Input video level – clamp level) x (1+DGB[7..0] / 128) + 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] = 9, data range: 0 to 31</p> <p>Sets the clamp level (The clamp level of the black signal).</p> <p>Clamp level = (CLAMP[7..0] x 2 + 14) / 4 (at 8bit output) Clamp level = CLAMP[7..0] x 2 + 14 (at 10bit output)</p>								
80H: E2P[7..0]	<p>[EEPROM control] Initial data: E2P[7..0] = 0</p> <p>D[7..0]</p> <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> <p>D7 to D2: No Function <u>Please set as 000000</u> D1: Register synchronous update with the EEPROM data <u>0: Prohibited</u> 1: Accept D0: Write control to the EEPROM <u>0: Prohibited</u> 1: Accept</p> <p>Note: 1. This bit is cleared to “0” automatically by the internal process after the execution of the command. 2. By synchronizing to the EEPROM read/write access, the subject control register is also updated.</p>	D7	D6	D5	D4	D3	D2	D1	D0
D7	D6	D5	D4	D3	D2	D1	D0		
FOH: OUTSEL[7..0]	<p>[The signals of the IO connector] Initial data: OUTSEL[7..0] = The value of COH</p> <p>D[7..0]</p> <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> <p>D7 to D4: No Function <u>Please set as 0000</u> D3 to D0: The signals of the IO connector selection Please refer to “The Signals of the IO connector” Initial data: 0000, data range: 0000 to 0111</p> <p>Note: Change the COH address data of the register and save to EEPROM when saving the signal of the IO connector</p>	D7	D6	D5	D4	D3	D2	D1	D0
D7	D6	D5	D4	D3	D2	D1	D0		

to the EEPROM.

Revisions

Rev	Date	Changes	Note
1.0	2009/12/26	New Document	All of these changes were received at once on Jul 13, 2010.
1.1	2010/03/26	Update IV-D-1: Changed the default value for CLAMP level) IV-D-2: Changed the CDS gain, digital gain and clamp level) II-E: Block Diagram	
1.2	2010/04/08	Update II-E: Amended Block Diagram	
1.3	2010/05/13	Update I-B: The signals of the power/IO connector	

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