SENTECH OMRON

Small Cubic Type
2Meg / 4Meg CMOS Color / Monochrome
Camera Link Camera

STC-CMB200PCL / STC-CMB200PCL-NIR (2Meg, Monochrome)
STC-CMC200PCL (2Meg, Color)
STC-CMB401PCL / STC-CMB401PCL-NIR (4Meg, Monochrome)
STC-CMC401PCL (4Meg, Color)

Product Specifications and Users guide

OMRON SENTECH CO., LTD.

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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
- Apply the power that satisfies the requirements specified in this document to the camera.
- 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.
- The camera is a general-purpose electronic device; using the camera for the equipment that may threaten human life or cause dangers to human bodies directly in case of failure or malfunction of the camera is not guaranteed. Use the camera for special purposes at your own risk.

1. Introduction

This document describes the specifications and users guide of cameras as bellow.

STC-CMB200PCL/STC-CMB200PCL-NIR	(2M Monochrome / Near IR)
STC-CMC200PCL	(2M Color)
STC-CMB401PCL/STC-CMB401PCL-NIR	(4M Monochrome / Near IR)
STC-CMC401PCL	(4M Color)

1.1. Features

- CMOS Sensor(Global Shutter)
- Camera Link (Full, Medium, Base Configuration)
- 10,8,4,2 TAP
- 2 x 2, 4 x 4 , 8 x 8 Binning and 2 x 2, 4 x 4 , 8 x 8 Subsampling
- PoCL
- Support Near IR Sensor

2M pixel model of cameras are Camera Link camera on COMS Sensor (Global Shutter). Full, Medium, Base Configuration are available. The maximum allowed frame rate is 333.3 fps on 2M pixel model (8bit,10TAP)
4M pixel model of cameras are Camera Link camera on COMS Sensor (Global Shutter). Full, Medium, Base Configuration are available. The maximum allowed frame rate is 179.2 fps on 4M pixel model (8bit,10TAP)

1.2. Naming Specification

STC-CMxxxxPCL-x

None: Standard
NIR: Near IR

Sensor Size
3: 1/3 inch
0: 2/3 inch
1:1 inch

Resolution
3 : VGA
20: 2M Pixel
40: 4M Pixel

C: Color

2. Specifications

2.1. Electronic specifications / Mechanical specifications / Environmental specifications

2.1.1. STC-CMB200PCL (2Meg, Monochrome) / STC-CMB200PCL-NIR (2Meg, Near IR) / STC-CMC200PCL (2Meg, Color)

Product			STC-CMC200PCL		STC-CMB200PCL
Electronic specifications	Imager		2/3" Meg color progressive CMOS (CMOSIS: CMV2000)		2/3" Meg monochrome progressive CMOS (CMOSIS: CMV2000)
	Active picture elements		2048 (H) x 1088 (V)		
	Chip size		11.264×5.984 mm		
	Cell size		5.5 (H) x 5.5 (V) µm		
	Scanning system		Progressive		
	Scanning method		Full scanning, Variable ROI		Full scanning, Variable ROI Binning scanning, Binning variable ROI *1
	Pixel frequency of the sensor	1X2-1Y 1X4-1Y 1X8-1Y 1X10-1Y	(8bit/10bit): (8bit/10bit): (8bit): (8bit):	10.625MHz (2,048 x 1,088), 21.250MHz (1,024 x 1,088), 42.500MHz (512 x 1,088) 21.250MHz (2,048 x 1,088), 42.500MHz (1,024 x 1,088) 42.500MHz (2,048 x 1,088) 48.000MHz (2,040 x 1,088)	
	Frame rate Vertical frequency of the Camera Link output	1X2-1Y 1X4-1Y 1X8-1Y 1X10-1Y	(8bit/10bit): (8bit/10bit): (8bit): (8bit):	73.8fps (2,048 x 1,088),147.6fps (1,024 x 1,088),295.1fps (512 x 1,088) 147.6fps (2,048 x 1,088), 295.1fps (1,024 x 1,088) 295.1fps (2,048 x 1,088) 333.3fps (2,040 x 1,088)	
	Horizontal frequency of the Camera Link output	1X2-1Y 1X4-1Y 1X8-1Y 1X10-1Y	(8bit/10bit): (8bit/10bit): (8bit): (8bit):	82kHz (2,048 x 1,088), 164kHz (1,024 x 1,088), 329kHz (512 x 1,088) 164kHz (2,048 x 1,088), 329kHz (1,024 x 1,088) 329kHz (2,048 x 1,088) 372kHz (2,040 x 1,088)	
	Pixel frequency o the Camera Link output	1X2-1Y 1X4-1Y 1X8-1Y 1X10-1Y	(8bit/10bit): (8bit/10bit): (8bit): (8bit):	85MHz/42.5MHz 85MHz/42.5MHz 85MHz/42.5MHz 85MHz/42.5MHz	
	Noise level (8bit output)		Less than 3 Digit (Gain 0 dB)		
	Dynamicrange		60 dB		
	Minimum scene illumination *Near IR model (-NIR)		2 Lux at F1.2		1 Lux at F1.2
			-		TBD Lux at F1.2
	Sync. System		Internal		
	Video output	'@8bit output	10TAP / FULL / MIDEUM / BASE configuration		
		'@10bit output	MIDEUM / BASE configuration		
	Shutter speed		45 seconds to 21u seconds (Variable at line), from 22 u seconds (Variable at usec)		
	Digital gain		1x to 5x		
	Gamma		1.0		
	Power	Input voltage	12Vdc ± 10% (PoCL or Power/IO connector)		
		Consumption	Less than 3.0 W		
	Operation mode		Free-run, Edg		
	Communication				
Mechanical specifications	Dimensions		40 (W) x		
	Optical filter				
	Material				
	Lens mount				
	Interface connector		C Power/IO		
	Weight				
Environmental specifications	Operational temperature				
	Storage temperature				
	Vibration		20Hz to 200Hz to 20Hz		
	Shock		Acceleration 3		
	Standard compliancy		EM		
	RoHS				

*1: Binning support on 8,10bit

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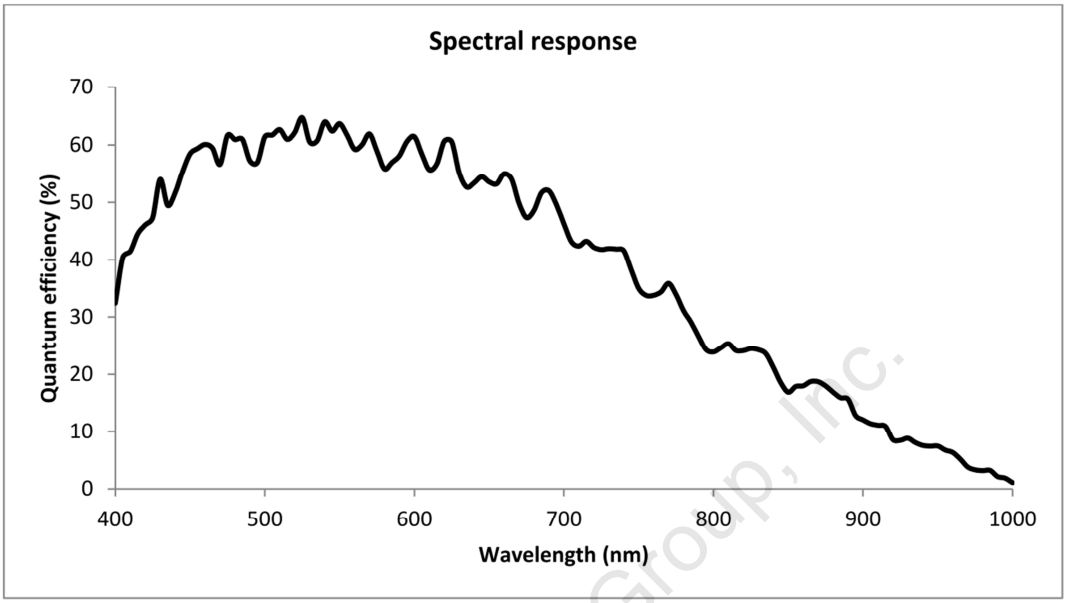
2.1.2 STC-CMB401PCL (4Meg, Monochrome) / STC-CMB401PCL-NIR (4Meg,Near IR) /STC-CMC401PCL (4Meg, Color)

Product		STC- CMC401PCL	STC- CMB401PCL
Electronic specifications	Imager	1" 4Meg color progressive CMOS (CMOSIS: CMV4000)	1" 4Meg monochrome progressive CMOS (CMOSIS: CMV4000)
	Active picture elements	2048 (H) x 2048 (V)	
	Chip size	11.264×11.264 mm	
	Cell size	5.5 (H) x 5.5 (V) µm	
	Scanning system	Progressive	
	Scanning method	Full scanning, Variable ROI	Full scanning, Variable ROI Binning scanning, Binning variable ROI*1
	Pixel frequency of the sensor	1X2-1Y (8bit/10bit): 10.625MHz (2,048 x 2,048), 21.250MHz (1,024 x 2,048), 42.500MHz (512 x 2,048) 1X4-1Y (8bit/10bit): 21.250MHz (2,048 x 2,048), 42.500MHz (1,024 x 2,048) 1X8-1Y (8bit): 42.500MHz (2,048 x 2,048) 1X10-1Y (8bit): 48.000MHz (2,040 x 2,048)	
	Frame rate Vertical frequency of the Camera Link output	1X2-1Y (8bit/10bit): 39.7fps (2,048 x 2,048), 79.2fps (1,024 x 2,048), 158.6fps (512 x 2,048) 1X4-1Y (8bit/10bit): 79.3fps (2,048 x 2,048), 158.6fps (1,024 x 2,048) 1X8-1Y (8bit): 158.6fps (2,048 x 2,048) 1X10-1Y (8bit): 179.2fps (2,040 x 2,048)	
	Horizontal frequency of the Camera Link output	1X2-1Y (8bit/10bit): 82kHz (2,048 x 2,048), 164kHz (2,024 x 1,048), 329kHz (512 x 2,048) 1X4-1Y (8bit/10bit): 164kHz (2,048 x 2,048), 329kHz (1,024 x 2,048) 1X8-1Y (8bit): 329kHz (2,048 x 2,048) 1X10-1Y (8bit): 372kHz (2,040 x 2,048)	
	Pixel frequency o the Camera Link output	1X2-1Y (8bit/10bit): 85MHz/42.5MHz 1X4-1Y (8bit/10bit): 85MHz/42.5MHz 1X8-1Y (8bit): 85MHz/42.5MHz 1X10-1Y (8bit): 85MHz/42.5MHz	
	Noise level (8bit output)	Less than 3 Digit (Gain 0 dB)	
	Dynamicrange	60 dB	
	Minimum scene illumination *Near	Less than 1 Lux at F1.2	Less than 1 Lux at F1.2 TBD Lux at F1.2
	Sync. System	Internal	
	Video output '@8bit output	10TAP / FULL / MIDEUM / BASE configuration	
	Video output '@10bit output	MIDEUM / BASE configuration	
	Shutter speed	45 seconds to 25.8u seconds (Variable at line)	
	Digital gain	1x to 4x	
	Gamma	1.0	
	Power Input voltage	12Vdc ± 10% (PoCL or Power/IO connector)	
	Power Consumption	Less than 3.2 W	
	Operation mode	Free-run, Ed	
	Communication		
Mechanical specifications	Dimensions	40 (W)	
	Optical filter		
	Material		
	Lens mount		
	Interface connector	(Power/IC	
	Weight		
Environmental specifications	Operational temperature		
	Storage temperature		
	Vibration	20Hz to 200Hz to 20Hz	
	Shock	Acceleration	
	Standard compliancy	E	
	RoHS		

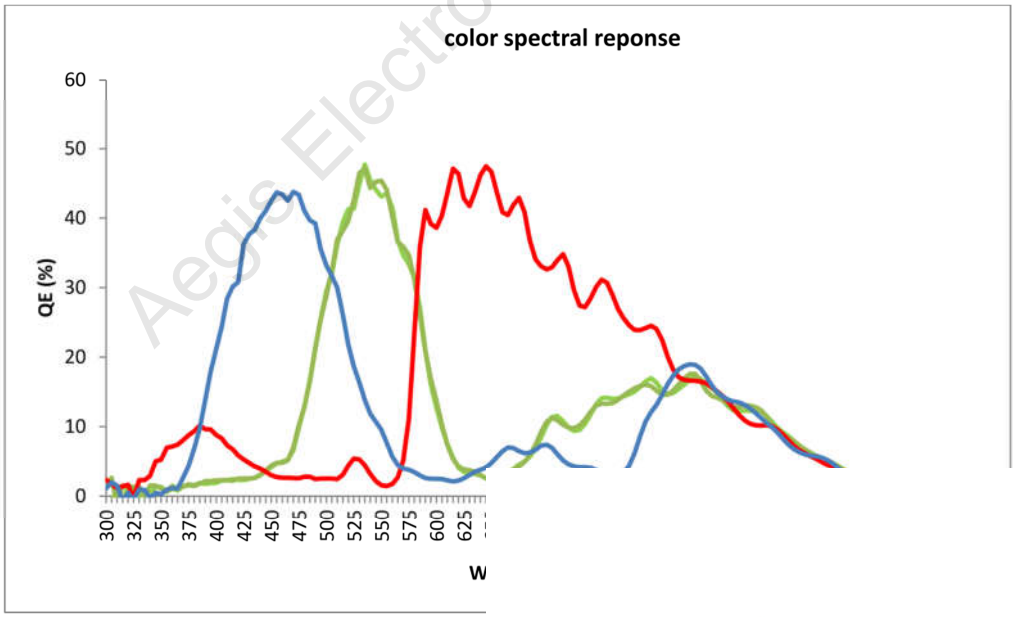
*1: Binning support on 8,10bit

2.2 Spectral Sensitivity Characteristics

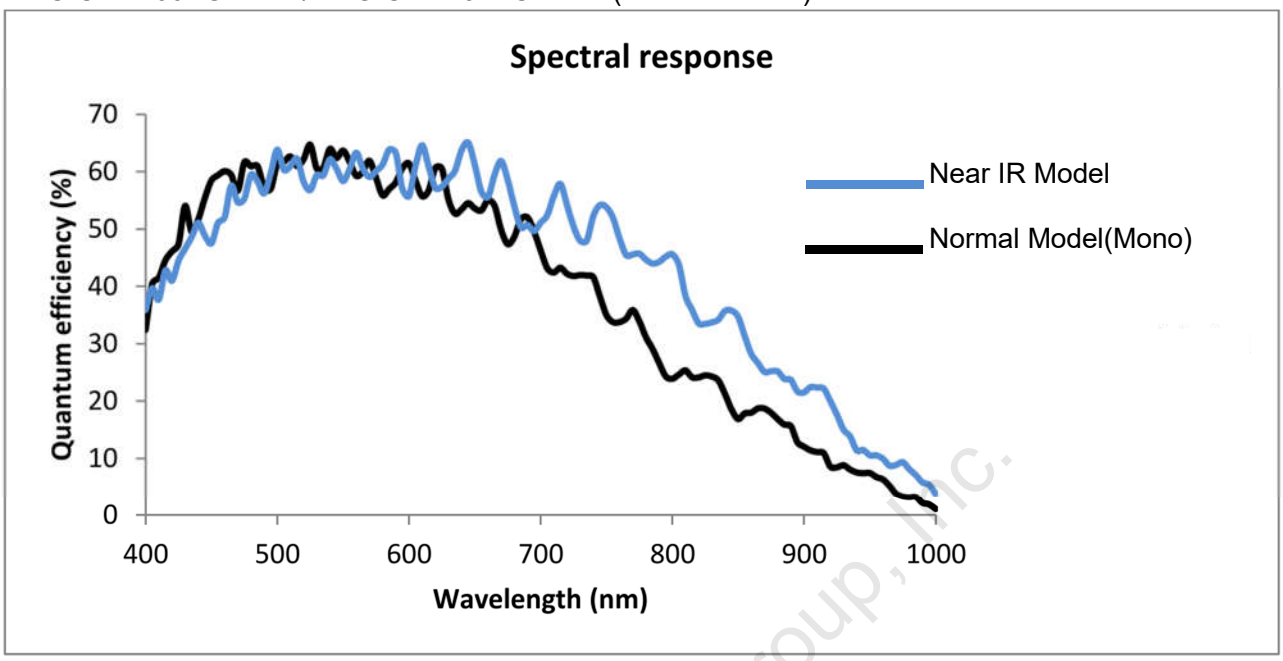
2.2.1 STC-CMB200PCL / STC-CMB401PCL



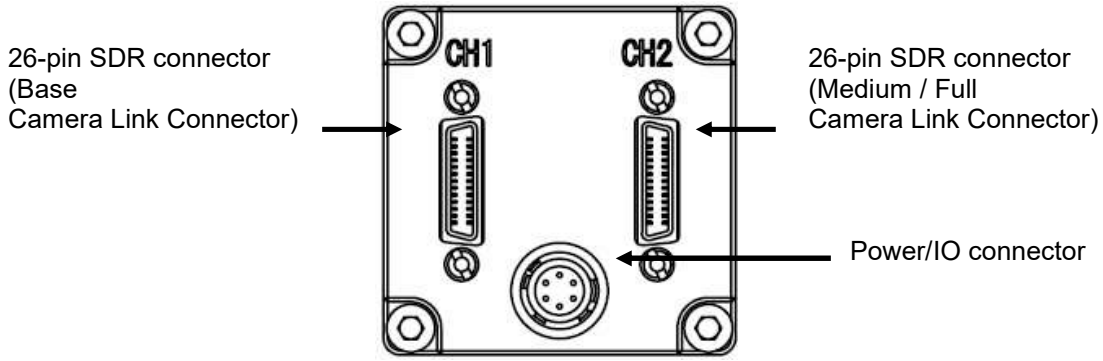
2.2.2 STC-CMC200PCL / STC-CMC401PCL



2.2.3 STC-CMB200PCL NIR / STC-CMB401PCL-NIR (Near IR model)



2.3 Connector specifications



2.3.1 Camera Link connectors:

SDR (3M) equivalent x 2

(CAUTION)
This product is PoCL type.
When the frame grabber board and the 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 the frame grabber board and the cable are NOT applicable for the PoCL, please input the power from the Power/IO connector.

Pin assignment

Base 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

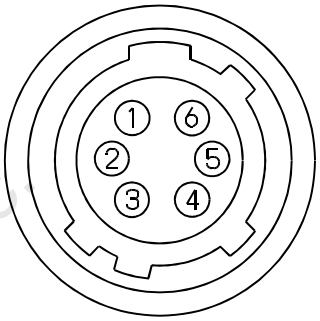
Medium / Full Camera Link Connector

Pin No.	Signal Name	Pin No.	Signal Name
1	+12V	14	GND
2	Y0-	15	Y0+
3	Y1-	16	Y1+
4	Y2-	17	Y2+
5	Yclk-	18	Yclk+
6	Y3-	19	Y3+
7	100Ω	20	100Ω
8	Z0-	21	Z0+
9	Z1-	22	Z1+
10	Z2-	23	Z2+

2.3.2 Power/IO connector: HR10A-7R-6PB (Hirose) or equivalent.
This connector is for 12Vdc power input and the input and output signals.
The trigger input and sync input /output signals can be assigned through the camera setting communication.

Pin assignment

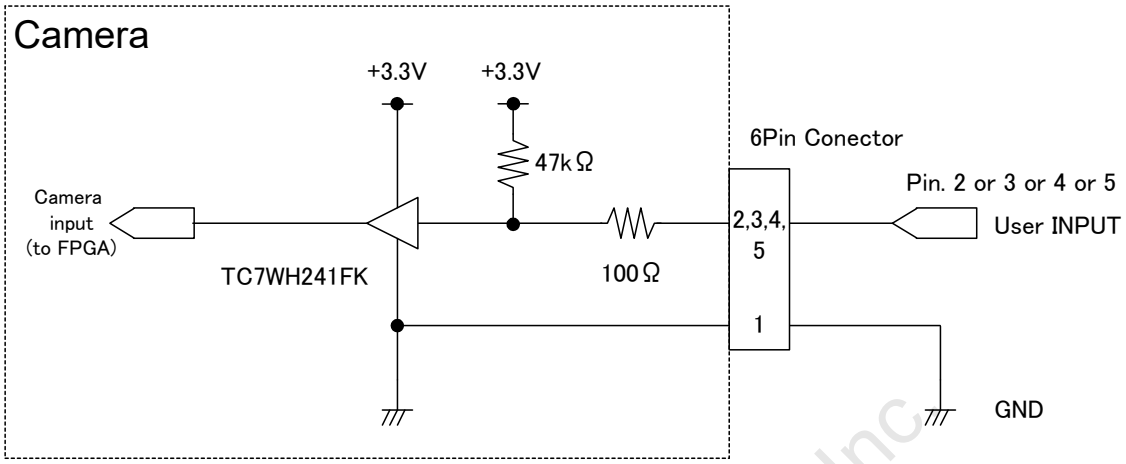
Pin No	Signal Name	IN/OUT		Voltage	
				LowVoltage	HighVoltage
1	GND	IN	0V		
2	SP-4	IN/OUT	IN	0 ～ +0.99V	+2.3 ～ +5.0V
			OUT	0V	+3.3V
3	SP-3	IN/OUT	IN	0 ～ +0.99V	+2.3 ～ +5.0V
			OUT	0V	+3.3V
4	SP-2	IN/OUT	IN	0 ～ +0.99V	+2.3 ～ +5.0V
			OUT	0V	+3.3V
5	SP-1	IN/OUT	IN	0 ～ +0.99V	+2.3 ～ +5.0V
			OUT	0V	+3.3V
6	+12Vdc	IN	+12Vdc		



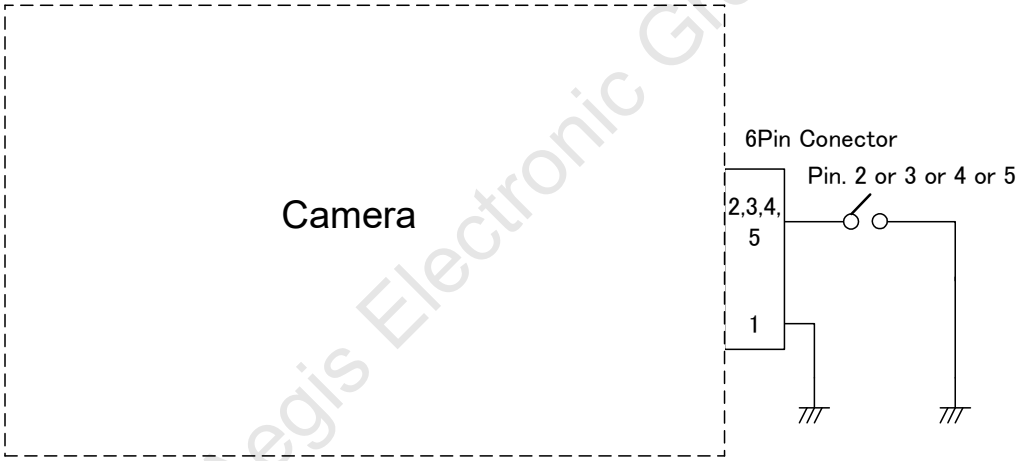
(Note 1)
Trigger input signal can be assigned either on Camera Link connector (CC1) or on the No. 2 pin of the power/IO connector through the camera setting communication.

As for the actual setting of hardware trigger, please refer to **0.**エラー! 参照元が見つかりません。

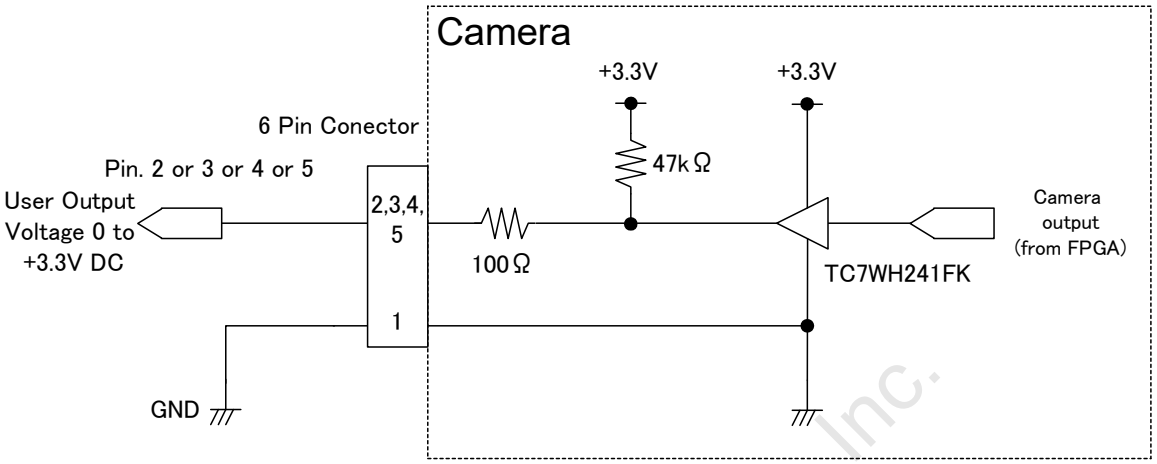
Input Signal Circuit



Input Signal Circuit Examples

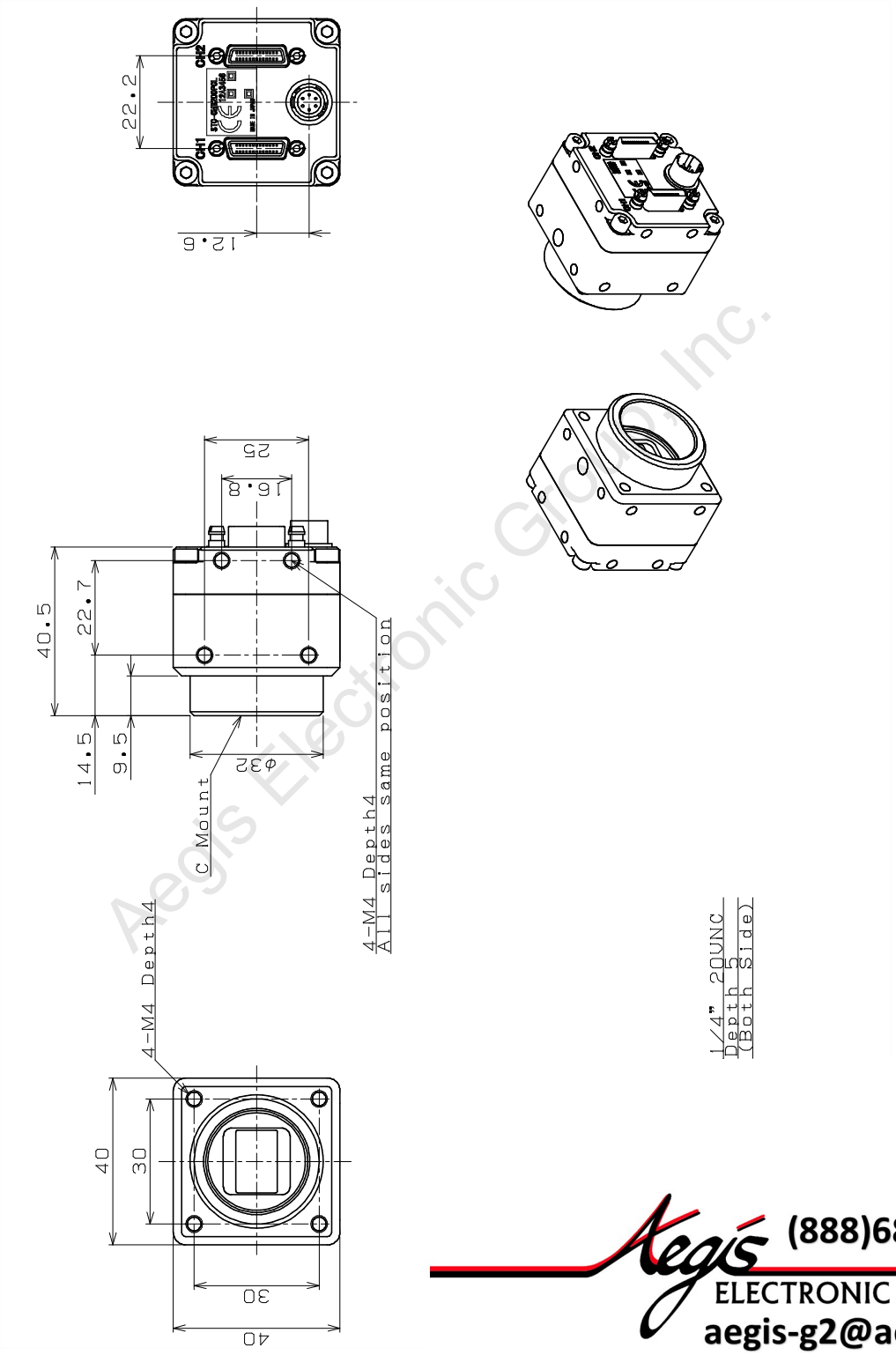


Output Signal Circuit/ Examples

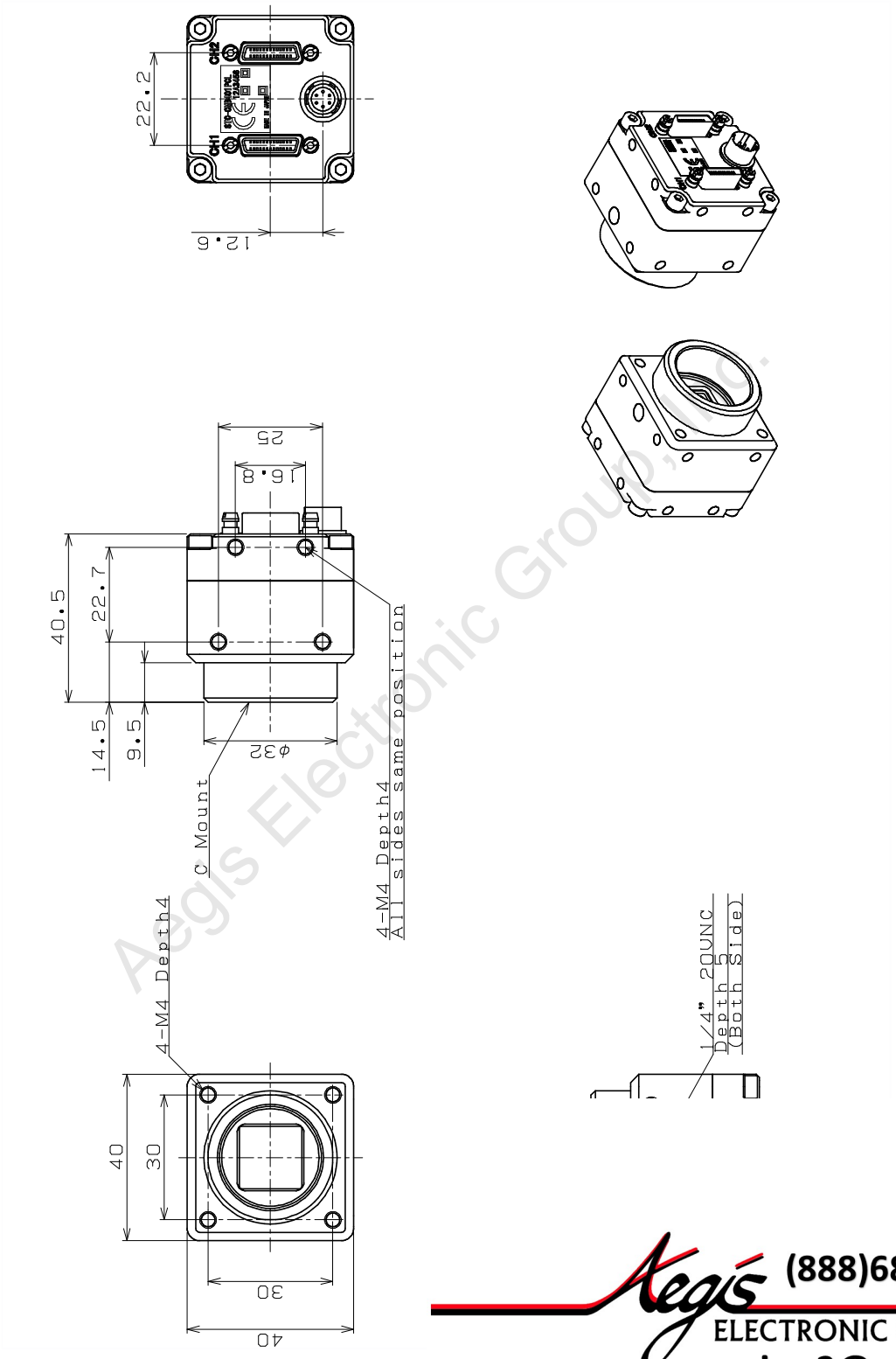


3. Dimensions

3.1. STC-CMB200PCL / STC-CMB200PCL-NIR / STC-CMC200PCL



3.2 STC-CMB401PCL / STC-CMB401PCL-NIR / STC-CMC401PCL



4. Camera Installation

For the installation of this camera, these equipment as bellow are required.

- Control software or Serial communication software to access the camera register.
  As for using the software, please refer to the **0.**

  Control Software. As for accessing the register, please refer to the **7.The communication protocol specifications**.
- Camera Link Cable x 2 (SDR Connector : Camera side)
  When using on Full Configuration, please use the cable that has qualification.
- Frame Graber should support **Full, Medium, Base Configuration.** When using the PoCL, Frame Graber should support PoCL.

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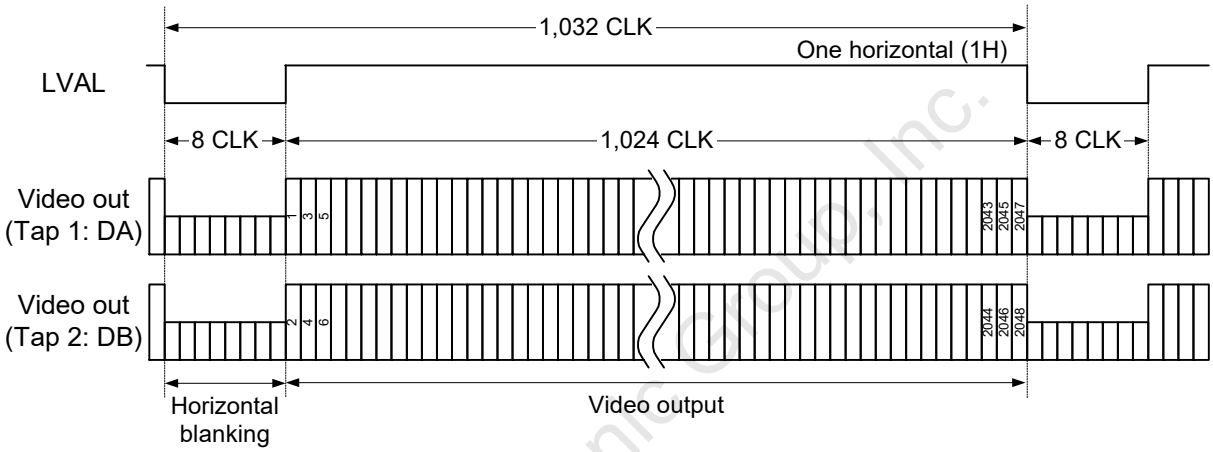
5. The camera output timing charts

5.1. The horizontal timings (STC-CMB/CMC200PCL, CMB/CMC401PCL)

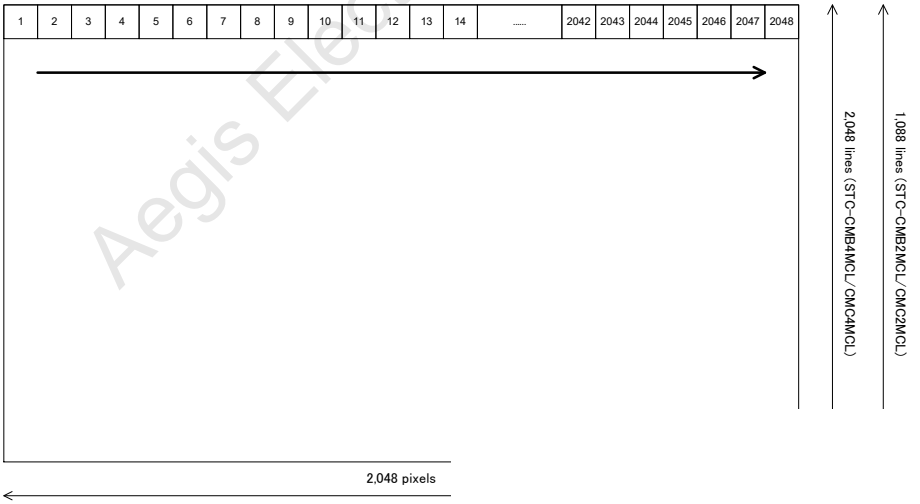
As for the vertical timing, please refer to **5.2.エラー! ブックマークが自己参照を行っています。**. Highs Speed Clock and Low Speed Clock are existed as Pixel Clock.

51.1 2 Taps (1X2-1Y) / Horizontal 2,048 pixels

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

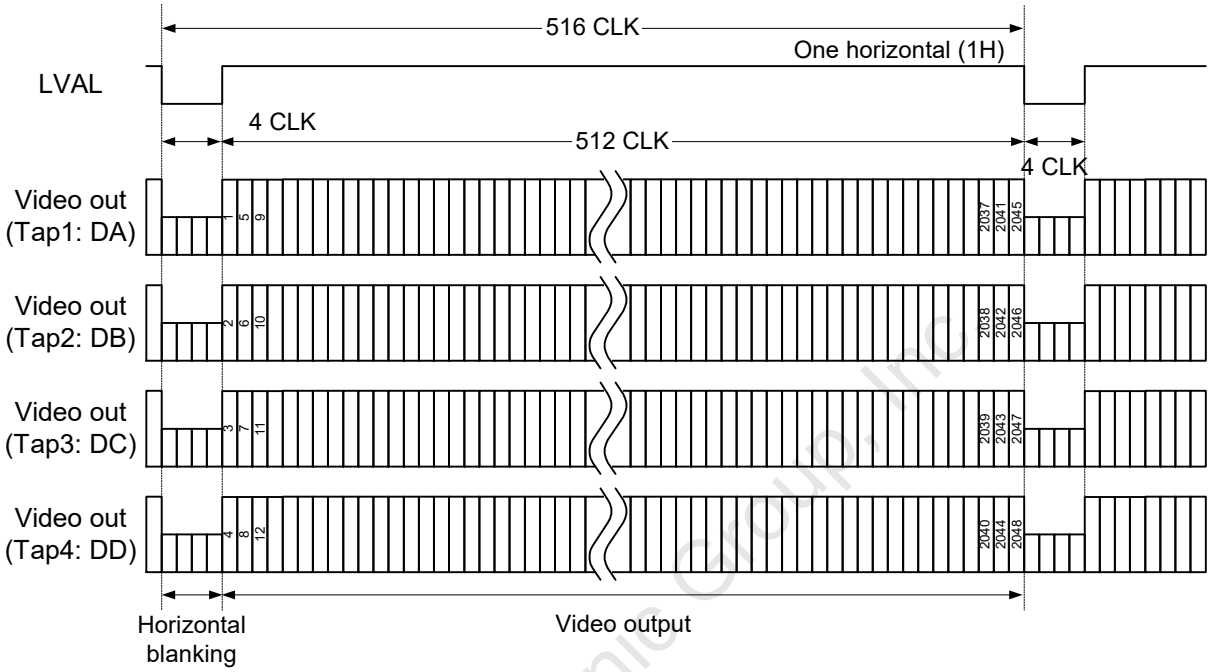
1	3	5	7

TAP2: DB output pixels

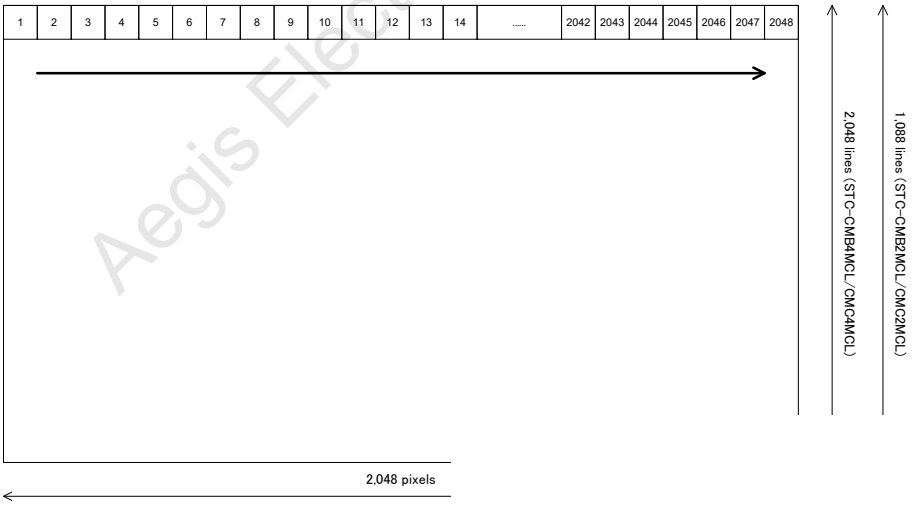
2	4	6	8

5.1.2 4Taps (1X4-1Y) / Horizontal 2,048 pixels

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

1	5	9	13

TAP2: DB output pixels

2	6	10	14

TAP3: DC output pixels

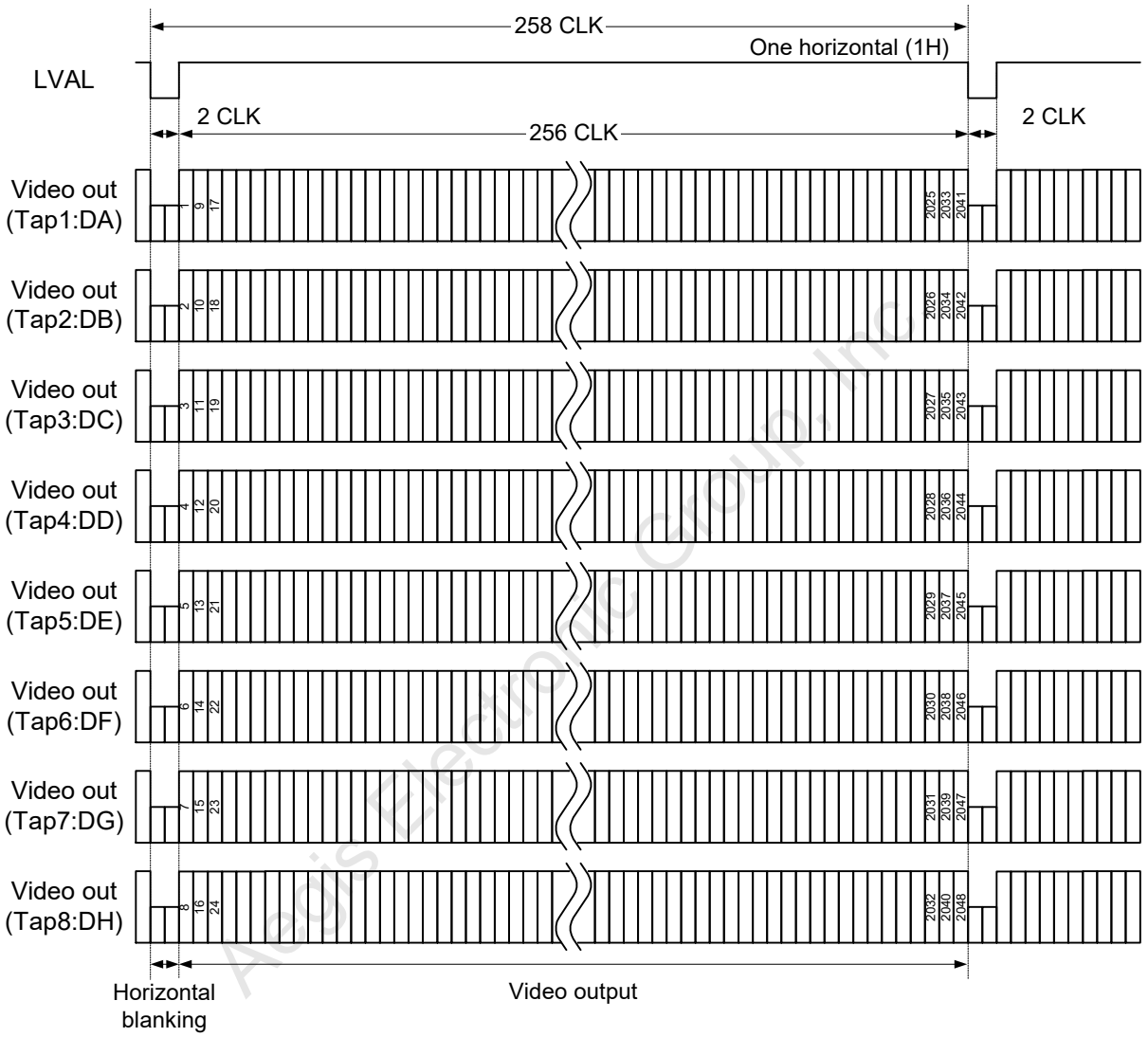
3	7	11	15

TAP4: DD output pixels

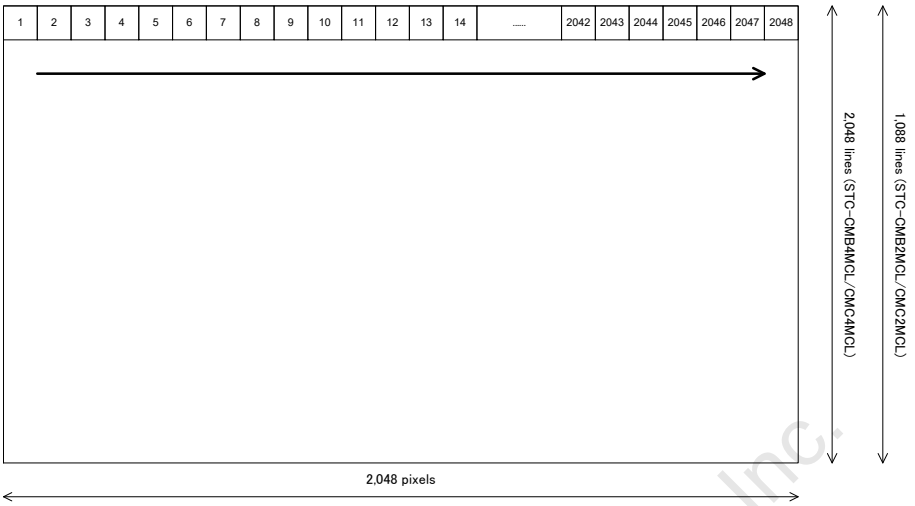
4	8	12	16

5.1.3 8 Taps (1X8-1Y) / Horizontal 2,048 pixels

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



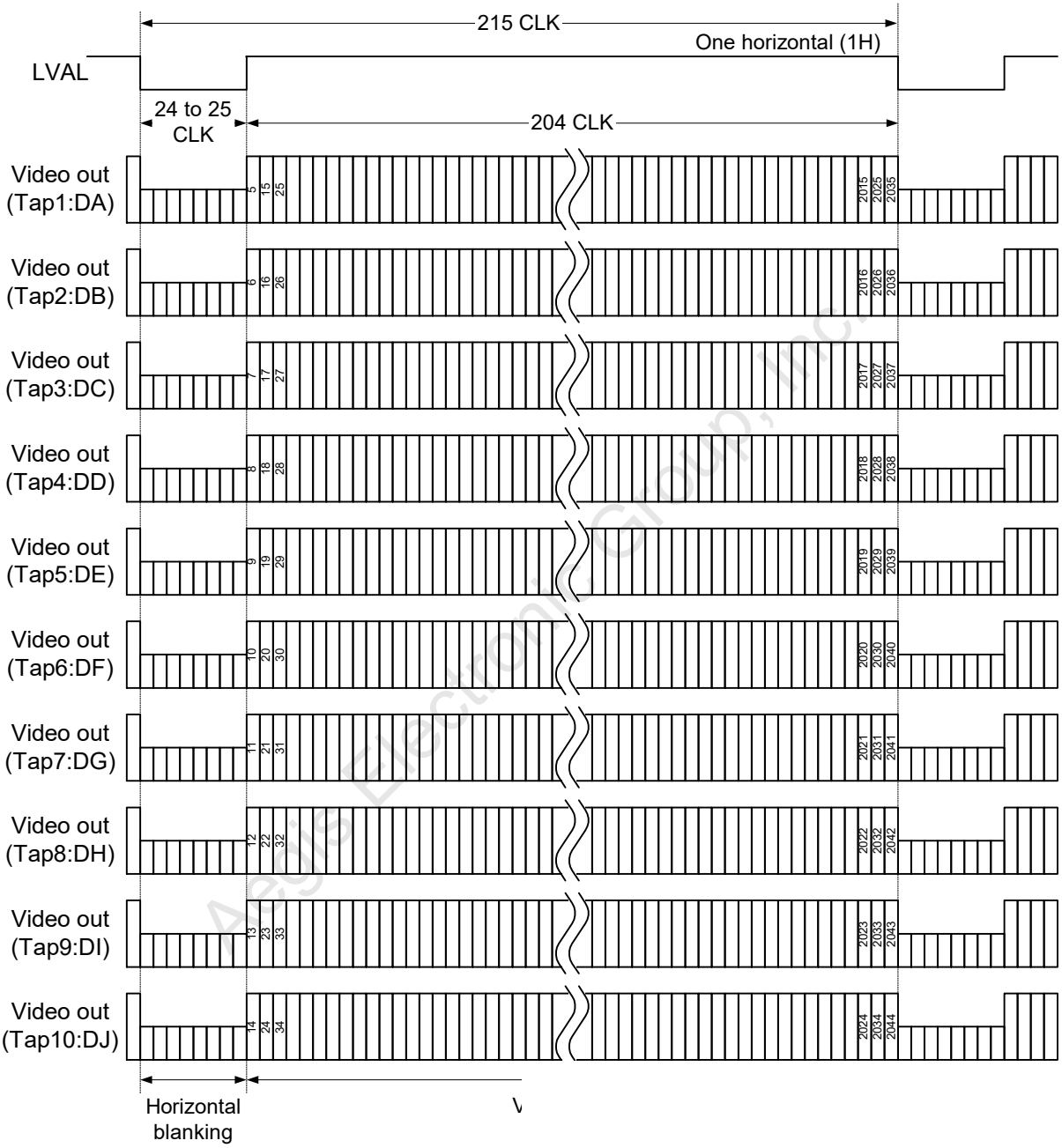
The pixel order for the Image



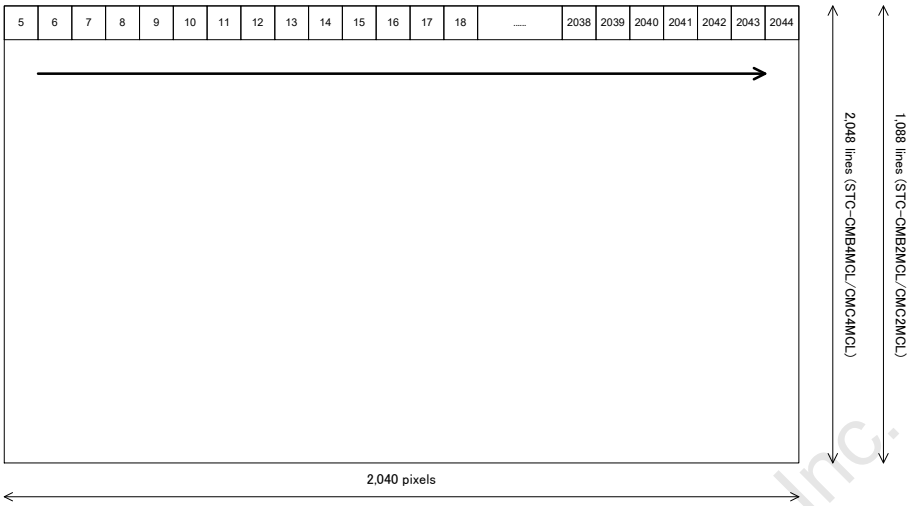
TAP1: DA output pixels	1	9	17	25	33	41	49	.....	1993	2001	2009	2017	2025	2033	2041
TAP2: DB output pixels	2	10	18	26	34	42	50	.....	1994	2002	2010	2018	2026	2034	2042
TAP3: DC output pixels	3	11	19	27	35	43	51	.....	1995	2003	2011	2019	2027	2035	2043
TAP4: DD output pixels	4	12	20	28	36	44	52	.....	1996	2004	2012	2020	2028	2036	2044
TAP5: DE output pixels	5	13	21	29	37	45	53	.....	1997	2005	2013	2021	2029	2037	2045
TAP6: DF output pixels	6	14	22	30	38	46	54	.....	1998	2006	2014	2022	2030	2038	2046
TAP7: DG output pixels	7	15	23	31	39	47	55	.....	1999	2007	2015	2023	2031	2039	2047
TAP8: DH output pixels	8	16	24	32	40	48	56	.....	2000	2008	2016	2024	2032	2040	2048

5.1.4 10 Taps (1X10-1Y) / Horizontal 2,040 pixels

1 CLK = 12.500 nseconds (80MHz)
1 CLK = 25.000 nseconds(40MHz)



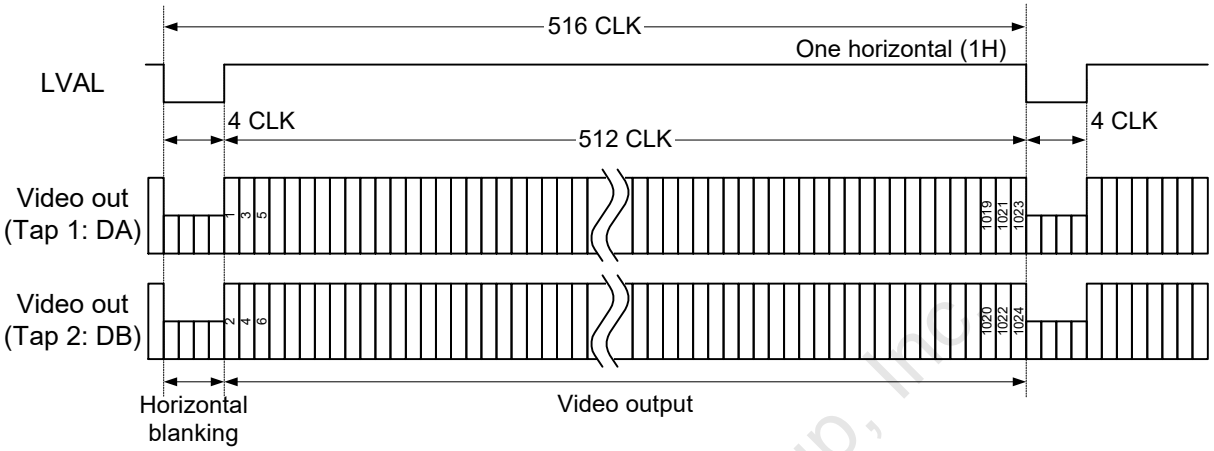
The pixel order for the Image



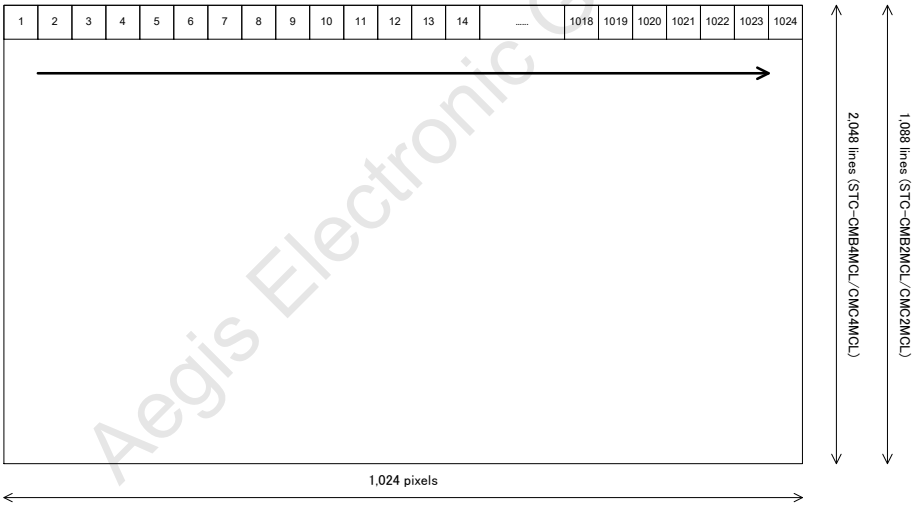
TAP1: DA output pixels	5	15	25	35	45	55	65	.....	1975	1985	1995	2005	2015	2025	2035
TAP2: DB output pixels	6	16	26	36	46	56	66	.....	1976	1986	1996	2006	2016	2026	2036
TAP3: DC output pixels	7	17	27	37	47	57	67	.....	1977	1987	1997	2007	2017	2027	2037
TAP4: DD output pixels	8	18	28	38	48	58	68	.....	1978	1988	1998	2008	2018	2028	2038
TAP5: DE output pixels	9	19	29	39	49	59	69	.....	1979	1989	1999	2009	2019	2029	2039
TAP6: DF output pixels	10	20	30	40	50	60	70	.....	1980	1990	2000	2010	2020	2030	2040
TAP7: DG output pixels	11	21	31	41	51	61	71	.....	1981	1991	2001	2011	2021	2031	2041
TAP8: DH output pixels	12	22	32	42	52	62	72	.....	1982	1992	2002	2012	2022	2032	2042
TAP9: DG output pixels	13	23	33	43	53	63	73	.....	1983	1993	2003	2013	2023	2033	2043
TAP10: DH output pixels	14	24	34	44	54	64	74	.....	1984	1994	2004	2014	2024	2034	2044

5.1.5 2Taps (1X2-1Y) / Horizontal 1,024 pixels

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)

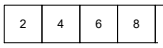


The pixel order for the Image



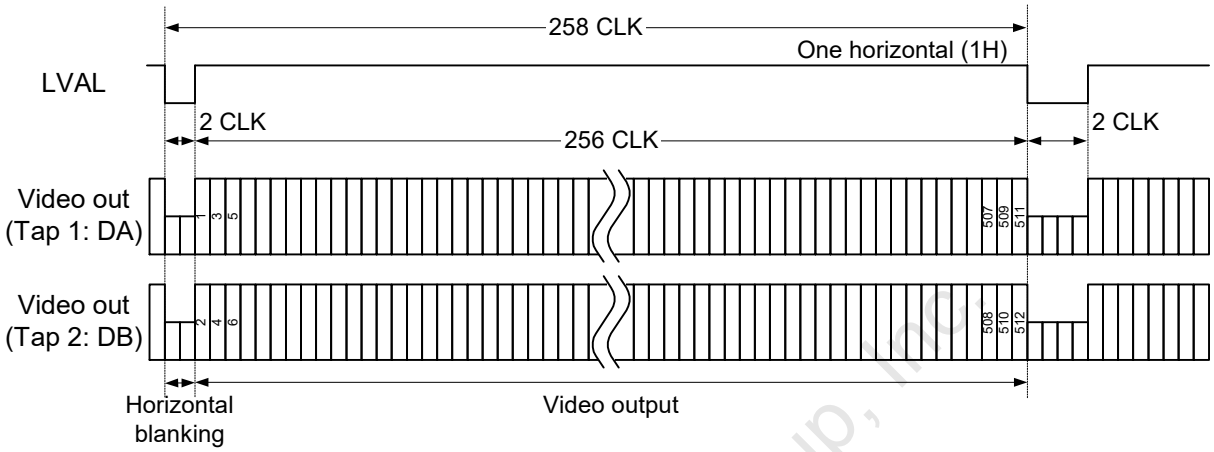
TAP1: DA output pixels

TAP2: DB output pixels

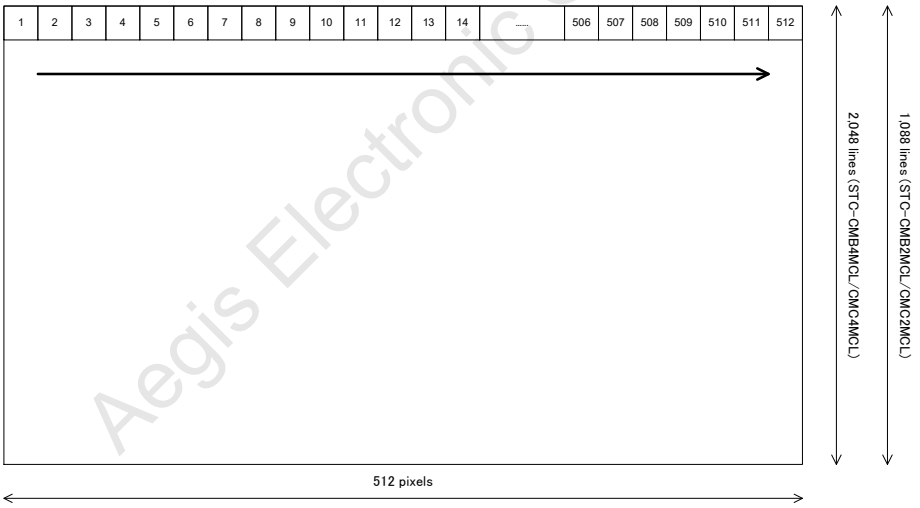


5.1.6 2Taps (1X2-1Y) / Horizontal 512 pixels

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)

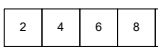


The pixel order for the Image



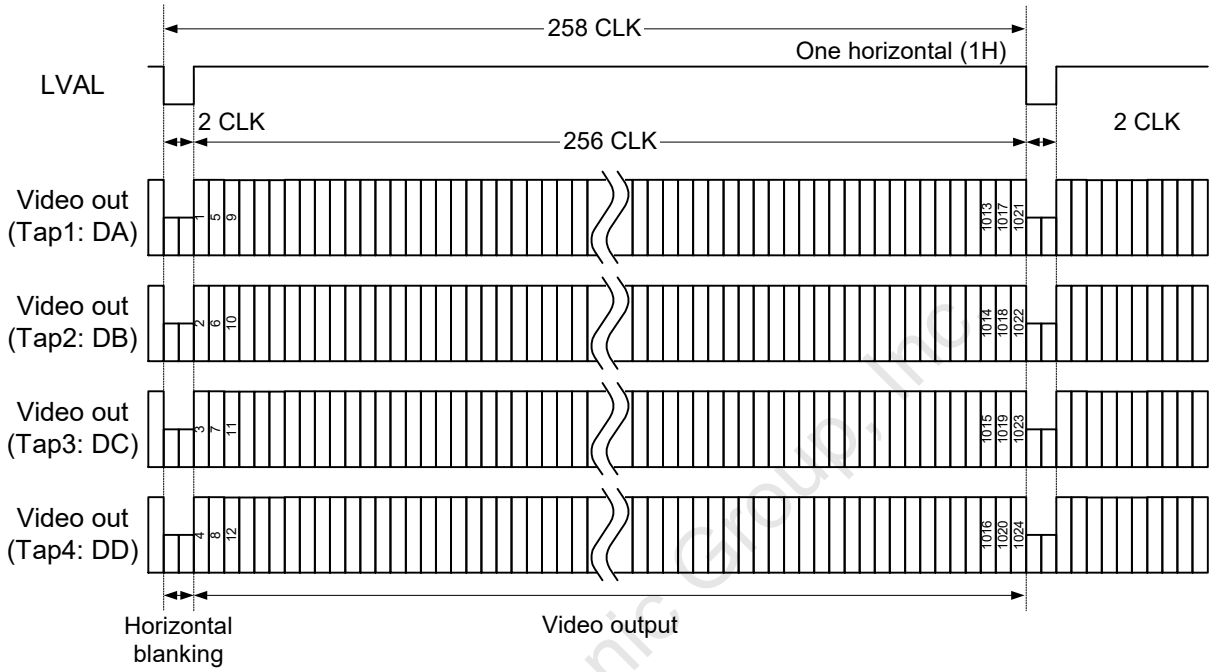
TAP1: DA output pixels

TAP2: DB output pixels

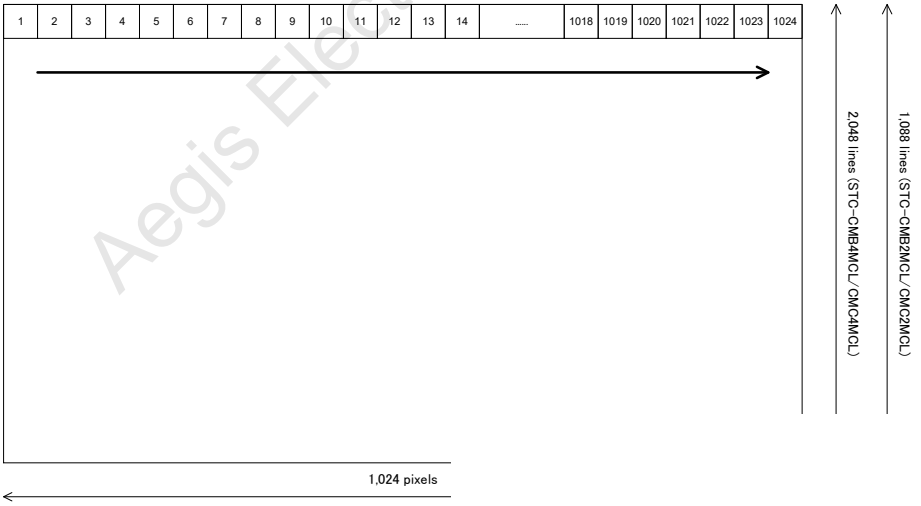


5.1.7 4Taps / Horizontal 1,024 pixels

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels | 1 | 5 | 9 | 13 |

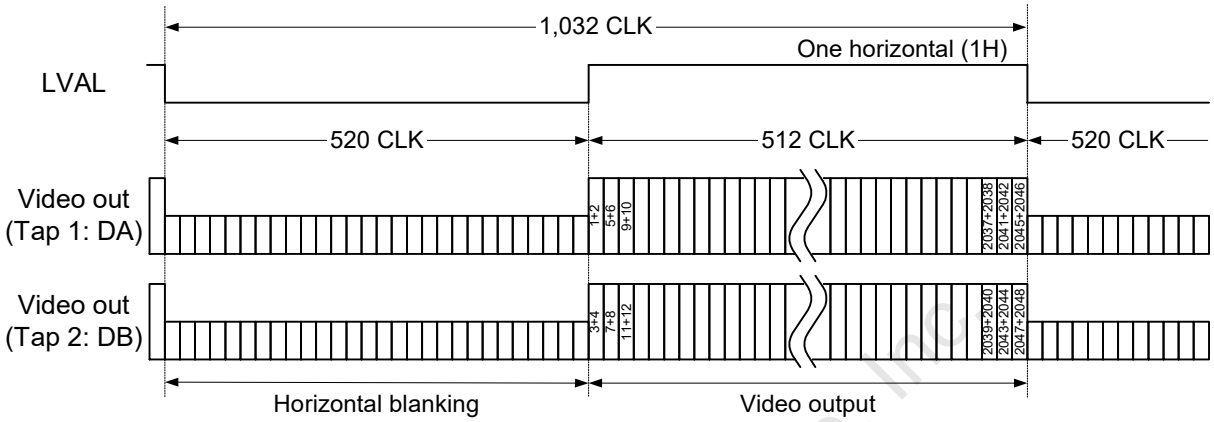
TAP2: DB output pixels | 2 | 6 | 10 | 14 |

TAP3: DC output pixels | 3 | 7 | 11 | 15 |

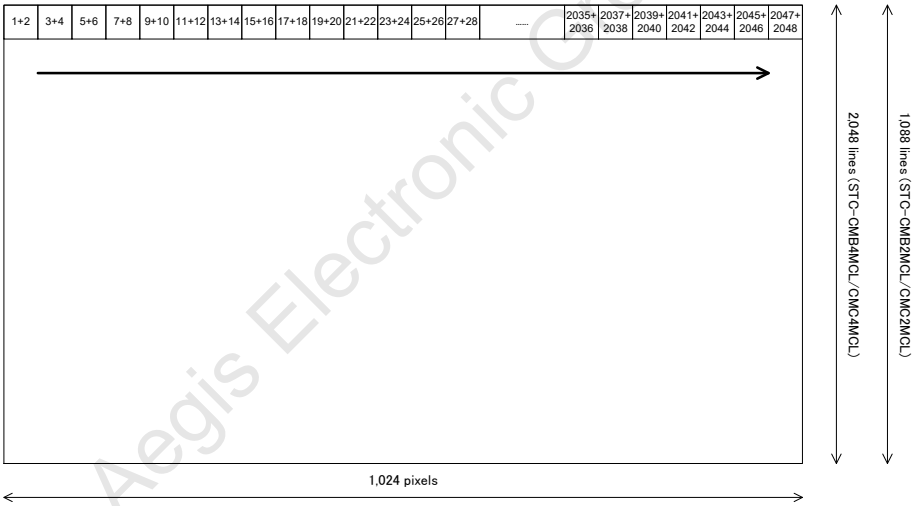
TAP4: DD output pixels | 4 | 8 | 12 | 16 |

5.1.8 2Taps (1X2-1Y) / 2 x 2 Binning

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

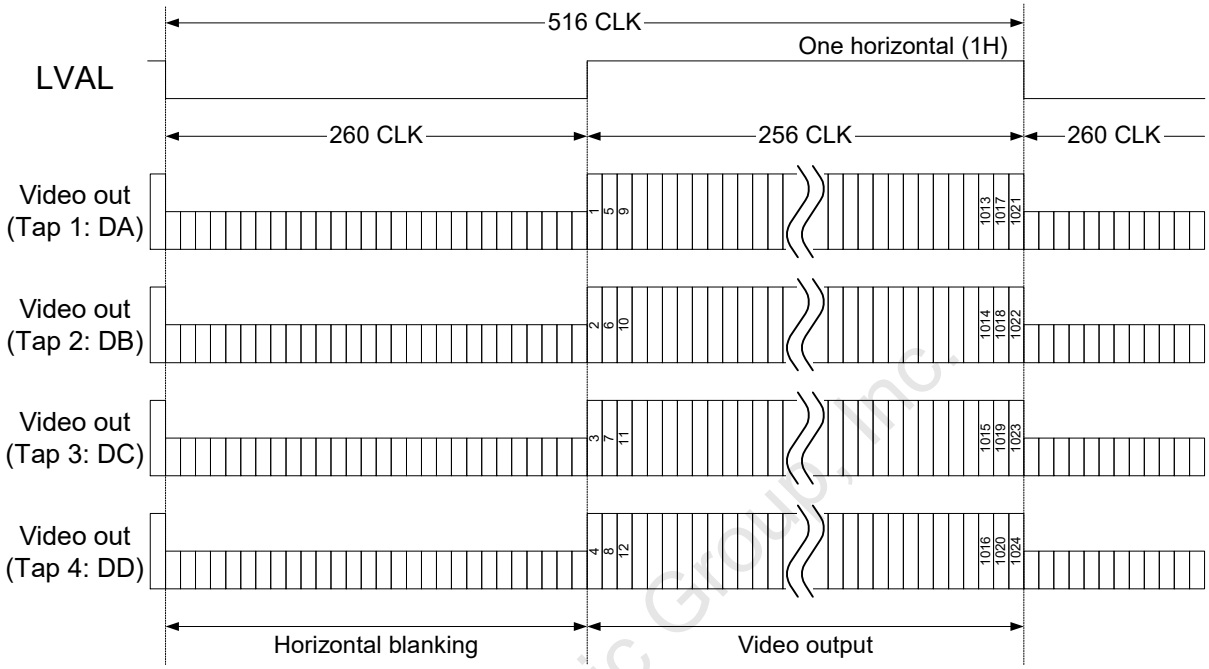
1+2	5+6	9+10	13+14	17+18	21+22	25+26	.....	2021+2022	2025+2026	2029+2030	2033+2034	2037+2038	2041+2042	2045+2046

TAP2: DB output pixels

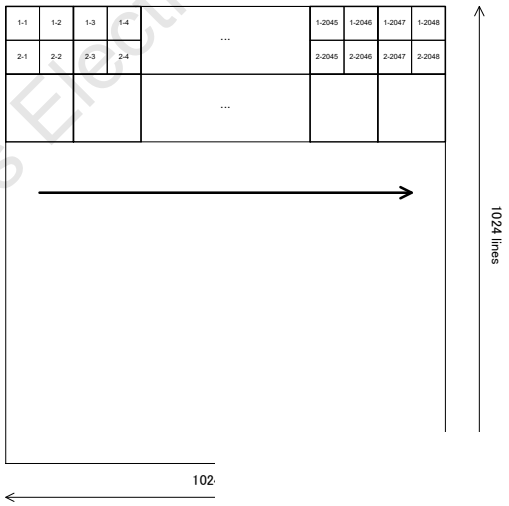
3+4	7+8	11+12	15+16	19+20	23+24	27+28	.....	2023+2024	2027+2028	2031+2032	2035+2036	2039+2040	2043+2044	2047+2048

5.1.9 4Taps (1X4-1Y) / 2 x 2 Binning

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



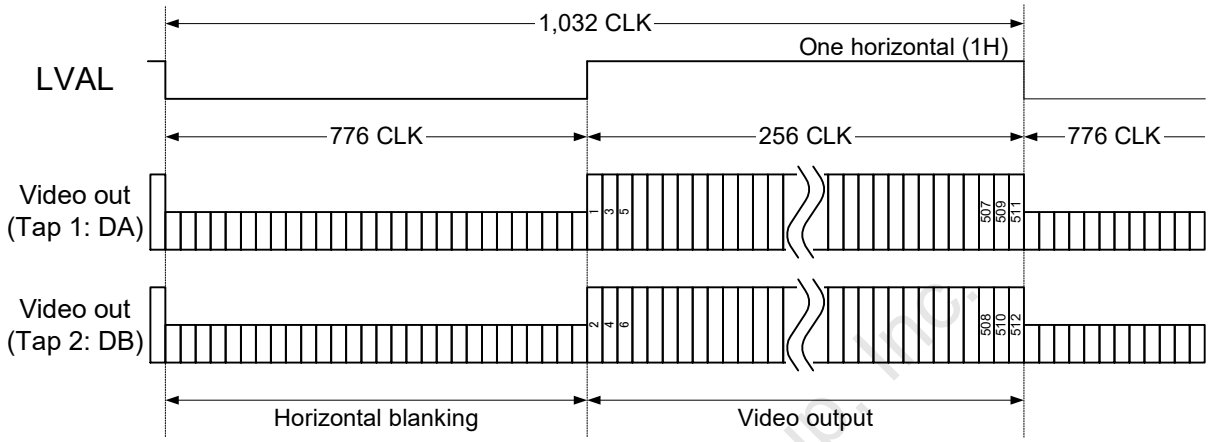
The pixel order for the Image



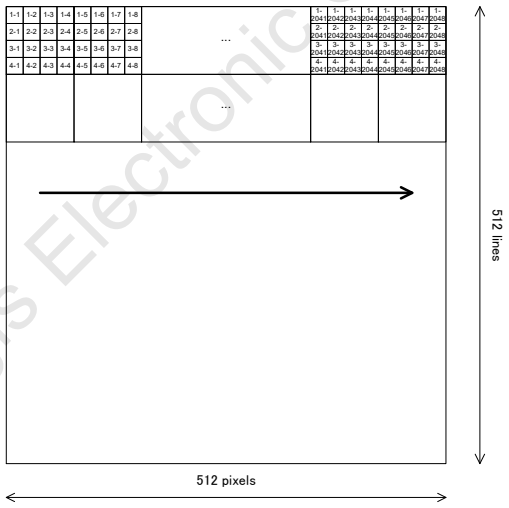
TAP1: DA output pixels	1	5	9	13	17	21
TAP2: DB output pixels	2	6	10	14	18	22
TAP3: DC output pixels	3	7	11	15	19	23
TAP4: DD output pixels	4	8	12	16	20	24

5.1.10 2Taps (1X2-1Y) / 4 x 4 Binning

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

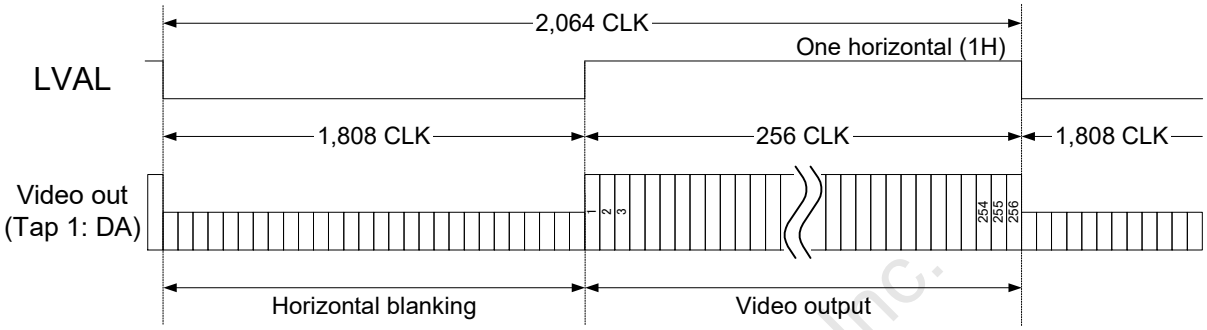
1	3	5	7	9	11	13	.....	499	501	503	505	507	509	511

TAP2: DB output pixels

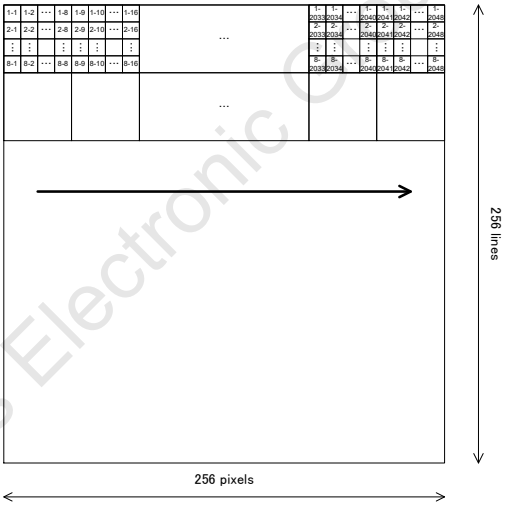
2	4	6	8	10	12

5.1.11 1Taps (1X-1Y) / 8 x 8 Binning

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image

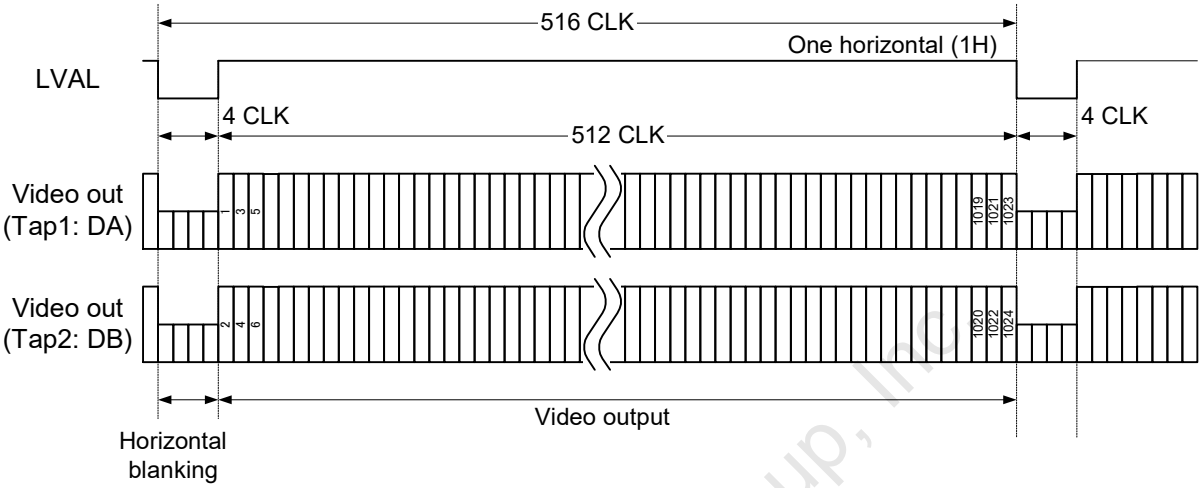


TAP1: DA output pixels

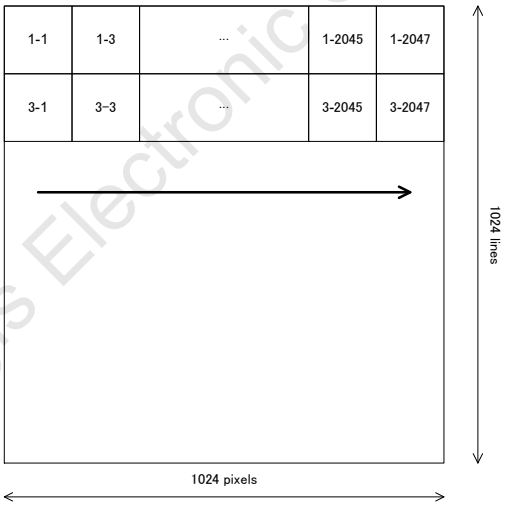
1	2	3	4	5	6	7	.....	250	251	252	253	254	255	256

5.1.12 2 Taps (1X2-1Y)/2 x 2 Subsampling

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

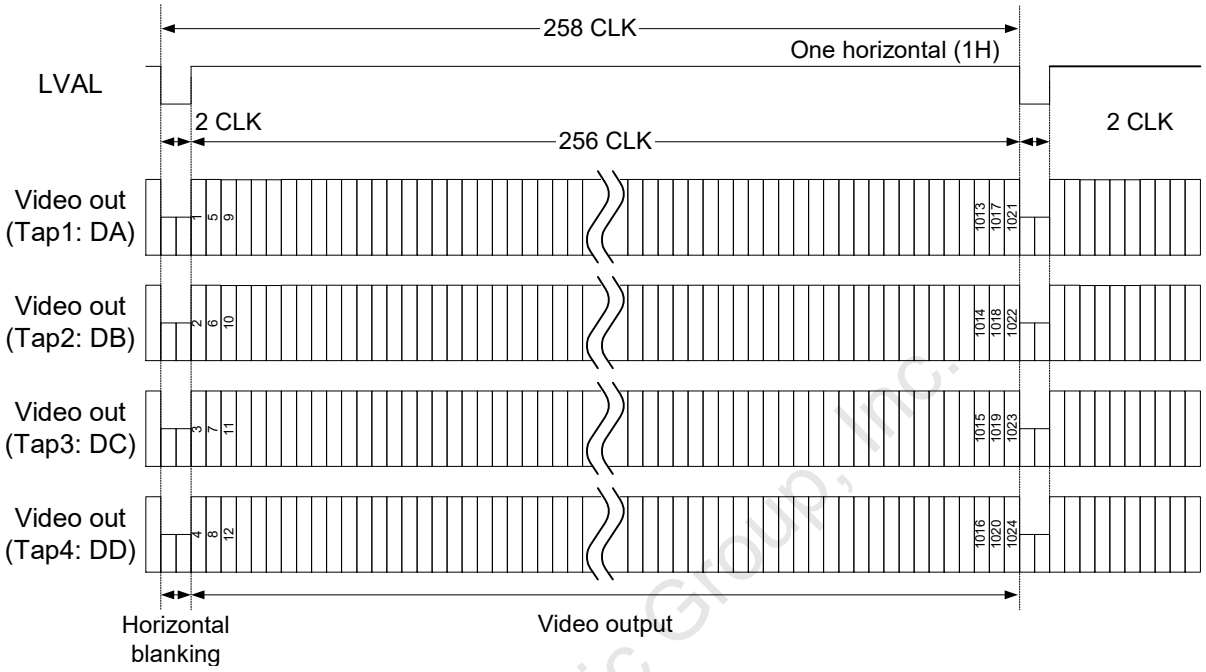
1	3	5	7	9	11	13	.....	1011	1013	1015	1017	1019	1021	1023

TAP2: DB output pixels

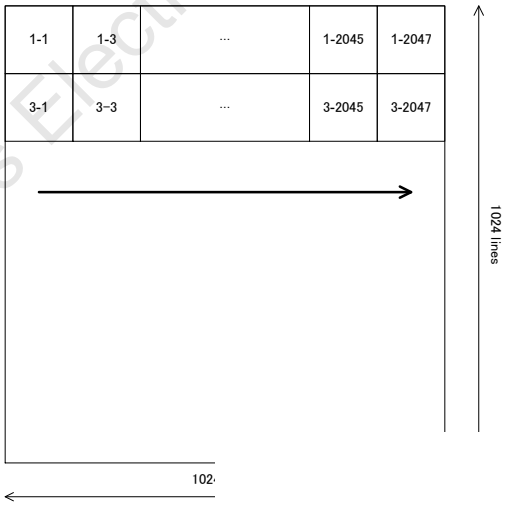
2	4	6	8	10	12

5.1.13 4 Taps (1X4-1Y) / 2 x 2 Subsampling

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



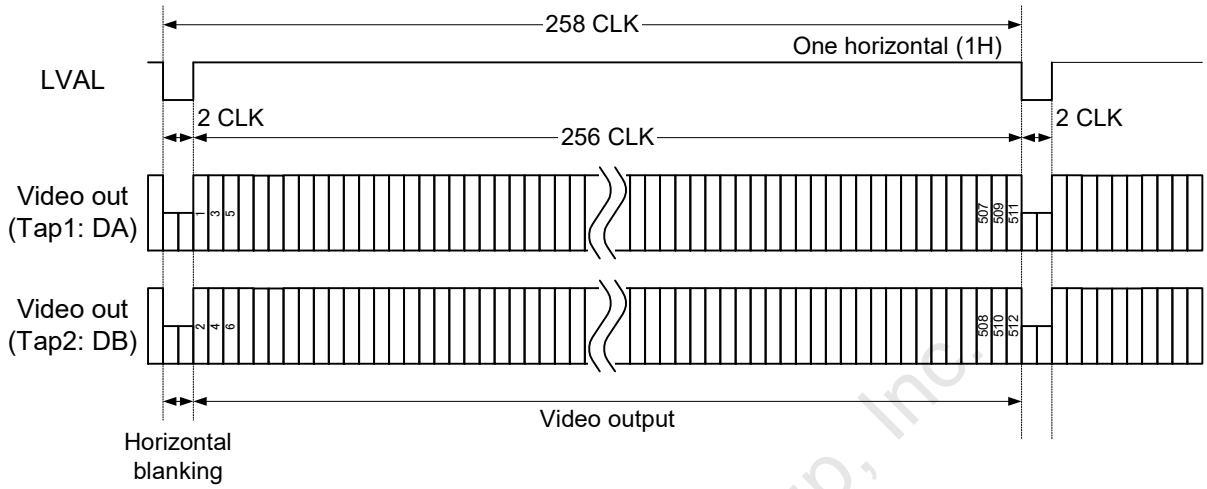
The pixel order for the Image



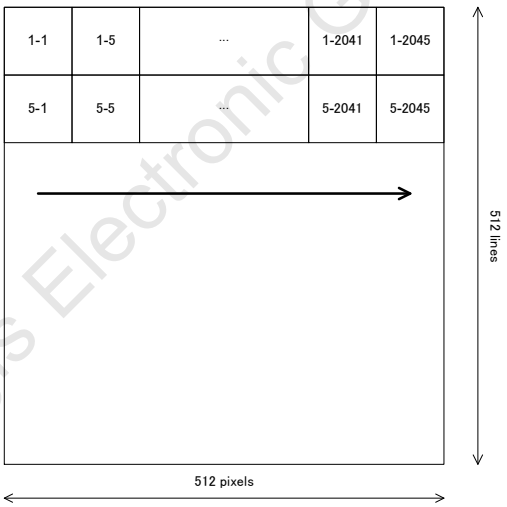
TAP1: DA output pixels	1	5	9	13	17	21
TAP2: DB output pixels	2	6	10	14	18	22
TAP3: DC output pixels	3	7	11	15	19	23
TAP4: DD output pixels	4	8	12	16	20	24

5.1.14 2 Taps (1X2-1Y) / 4 x 4 Subsampling

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

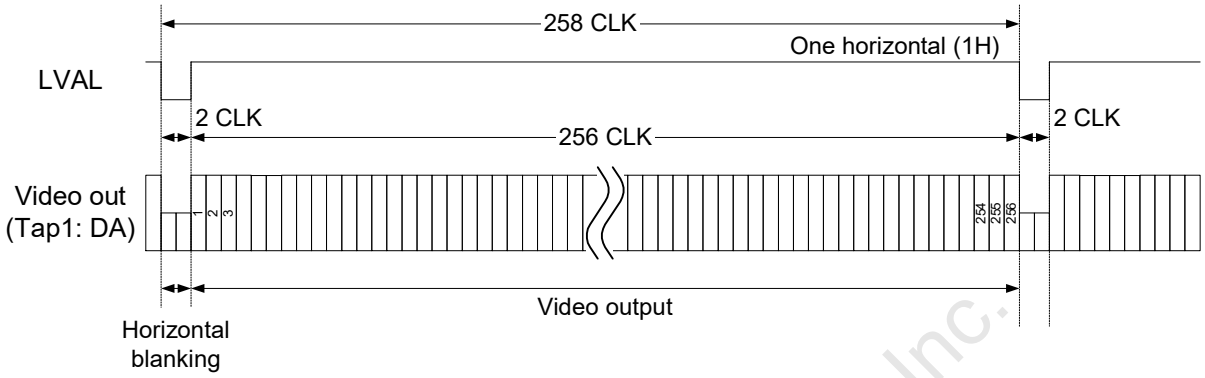
1	3	5	7	9	11	13	.....	499	501	503	505	507	509	511

TAP2: DB output pixels

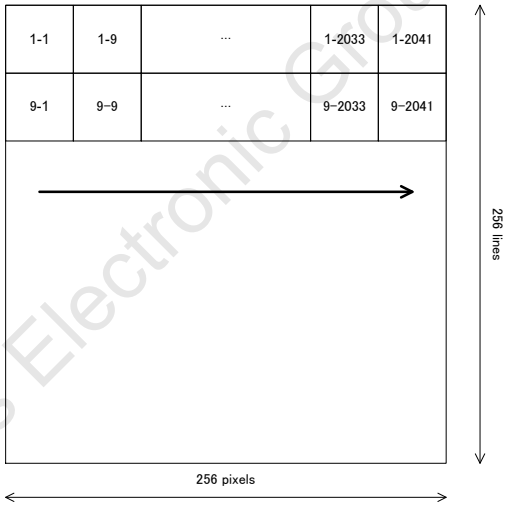
2	4	6	8	10	12

5.1.15 1 Taps (1X-1Y)/8 x 8 Subsampling

1 CLK = 11.764 nseconds(85MHz)
1 CLK = 23.524 nseconds(42.5MHz)



The pixel order for the Image



TAP1: DA output pixels

1	2	3	4	5	6	7	.....	250	251	252	253	254	255	256

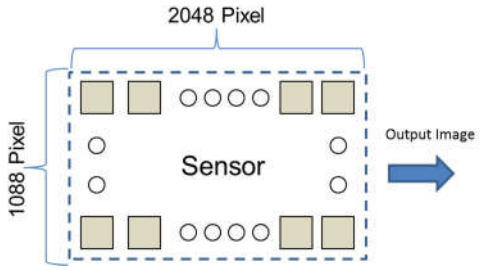
5.2 The Vertical timings

As for Horizontal timing, please refer to the
The horizontal timings (STC-CMB/CMC200PCL, CMB/CMC401PCL)
Three Video scan modes exist. The detail for these three scan modes are described as below.

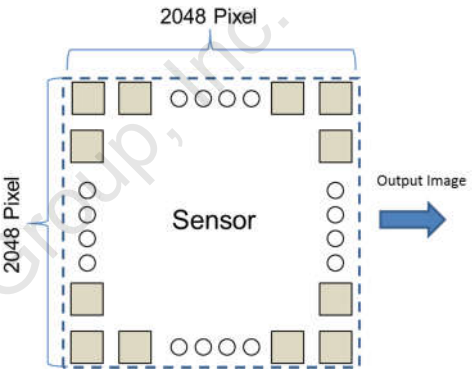
Full scan: All of line and pixel output from the camera
Binning: Averaged pixel value output from the camera
Subsampling: Skipped the lines and pixels output from the camera

Overview of Full scan

All of the lines and pixels are output and the entire image is shown. For transmitting the image, some configurations will not be supported, or can drop the frame rate..



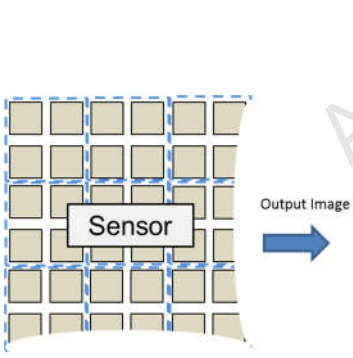
Output image from Sensor on Fullscan (STC-CMB2MCL/CMC2MCL)



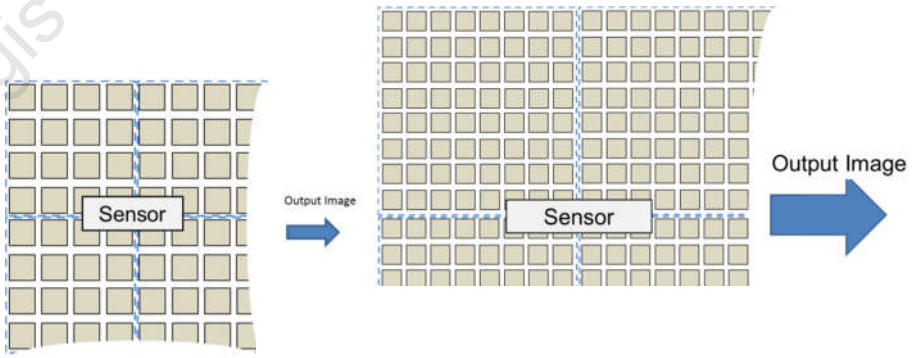
Output image from Sensor on Fullscan (STC-CMB4MCL/CMC4MCL)

Overview of Binning (2M,4M)

The average pixel value is output and shown in the image. For average pixel data, decreasing the noise level. This binning does not add the pixel value, but instead increases the black level (this means narrow dynamic range). For this, the resolution will decrease and frame rate will increase.



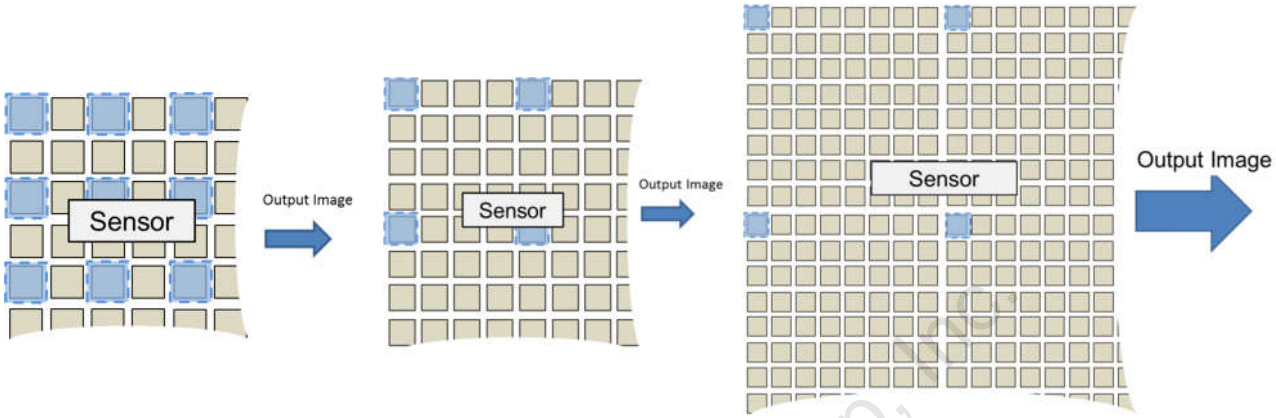
Output image from Sensor on 2 x2 binning



Output image from Sensor

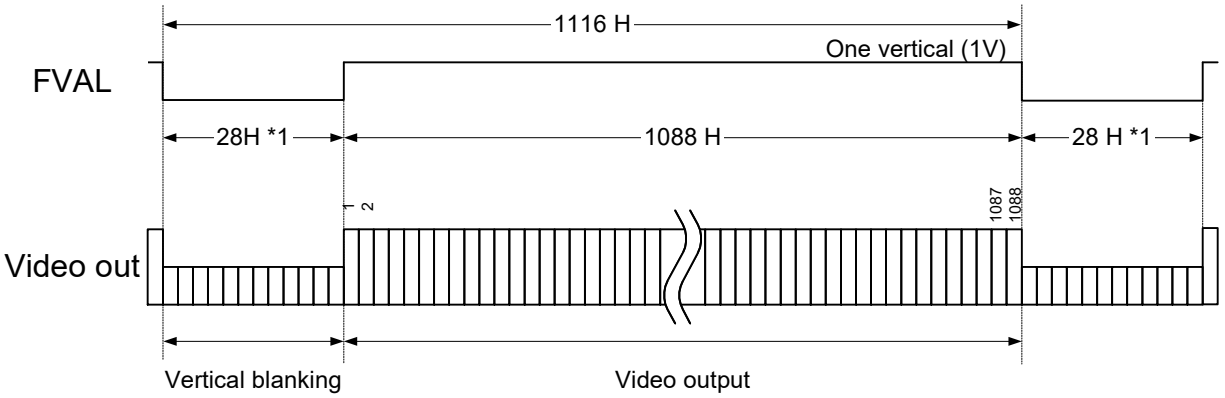
Overview of Subsampling (2M,4M)

In Subsampling mode, lines and pixel values skip, then are output in the shown image. For skipped pixel data, the resolution will decrease while the frame rate increases. Subsampling reduces the output resolution and increases the frame rate without the FOV (Field of View).



Output image from Sensor on 2 x2 subsampling Output image from Sensor on 4 x4subsampling Output image from Sensor on 8 x 8 subsampling

5.2.1 Full Scan (STC-CMB/CMC200PC)

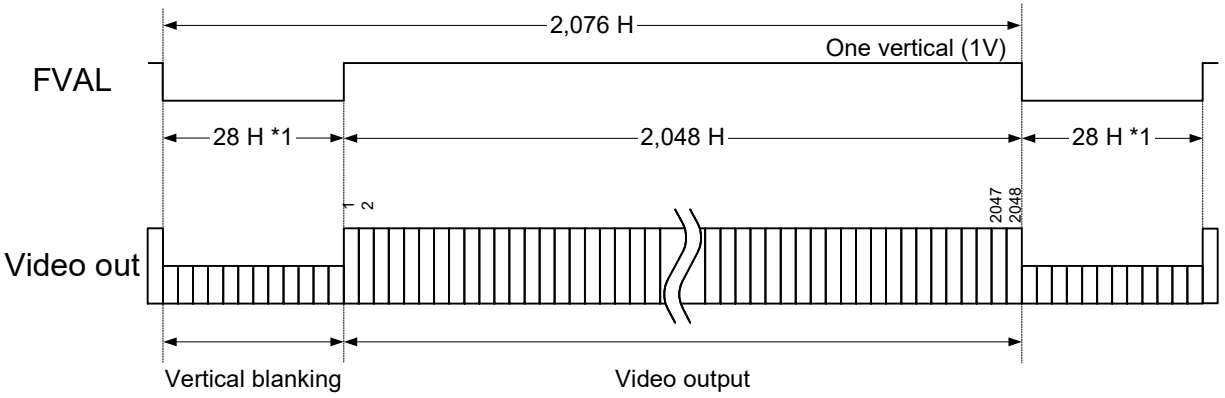


*1: 94H only on 2TAP, 42.5MHz mode

Table of Video Output on Full Scan mode (STC-CMB/CMC200PCL)

Mode (EEH)	Tap Number	Configuration	CameraLink Output PixelClock Frequency(MHz)	Horizontal Pixel (Pixel)	Sensor Output Pixel Clock(MHz)	FPS	Camera Link Output Bit
0	2	Base	85.0	2048	10.625	73.8	8/10
5	2	Base	85.0	1024	21.250	147.6	8/10
6	2	Base	85.0	512	42.500	295.2	8/10
1	4	MEDIUM	85.0	2048	21.250	147.6	8/10
7	4	MEDIUM	85.0	1024	42.500	295.2	8/10
2	8	FULL	85.0	2048	42.500	295.2	8
3	10		80.0	2040	48.000	333.4	8
0	2	Base	42.5	2048	5.313	34.8	8/10
5	2	Base	42.5	1024	10.625	73.8	8/10
6	2	Base	42.5	512	21.250	147.6	8/10
1	4	MEDIUM	42.5	2048	10.625	73.8	8/10
7	4	MEDIUM	42.5	1024	21.250	147.6	8/10
2	8	FULL	42.5	2048	21.250	147.6	8
3	10		40.0	2040	24.000	166.7	8

5.2.2 Full Scan (STC-CMB/CMC401PCL)

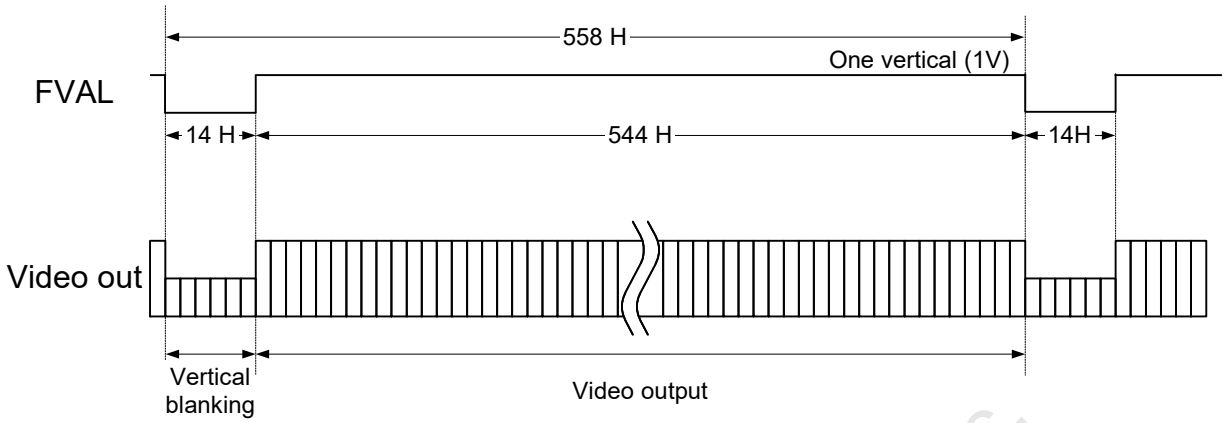


*1: 94H only on 2TAP, 42.5MHz mode

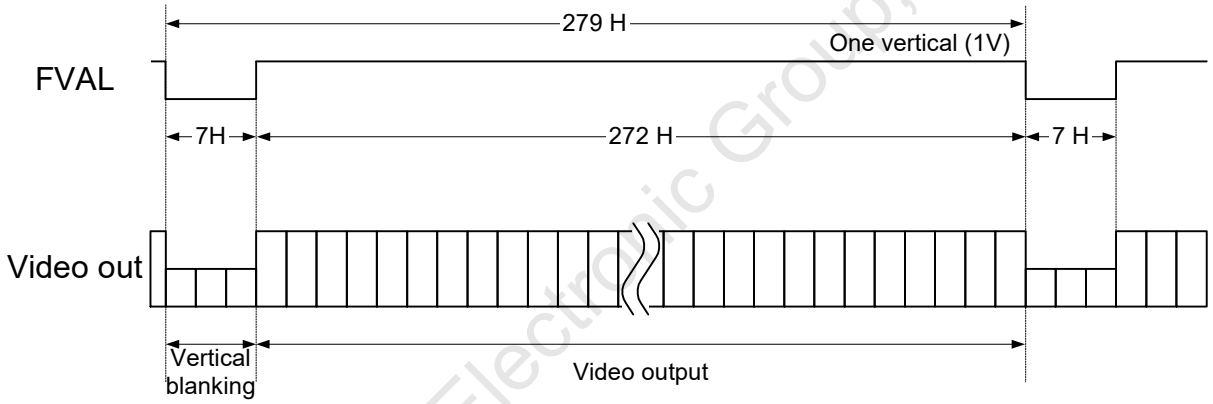
Table of Video Output on Full Scan mode (STC-CMB/CMC401PCL)

Mode (EEH)	Tap Number	Configuration	CameraLink Output PixelClock Frequency(MHz)	Horizontal Pixel (Pixel)	Sensor Output Pixel Clock(MHz)	FPS	Camera Link Output Bit
0	2	Base	85.0	2048	10.625	39.7	8/10
5	2	Base	85.0	1024	21.250	79.3	8/10
6	2	Base	85.0	512	42.500	158.7	8/10
1	4	Medium	85.0	2048	21.250	79.3	8/10
7	4	Medium	85.0	1024	42.500	158.7	8/10
2	8	Full	85.0	2048	42.500	158.7	8
3	10		80.0	2040	48.000	179.2	8
0	2	Base	42.5	2048	5.313	19.2	8/10
5	2	Base	42.5	1024	10.625	39.7	8/10
6	2	Base	42.5	512	21.250	79.3	8/10
1	4	Medium	42.5	2048	10.625	39.7	8/10
7	4	Medium	42.5	1024	21.250	79.3	8/10
2	8	Full	42.5	2048	21.250	79.3	8
3	10		40.0	2040	24.000	89.6	8

5.2.3 2 x 2 Binning (STC-CMB/CMC200PCL)



5.2.4 4 x 4 Binning (STC-CMB/CMC200PCL)



5.2.5 8 x 8 Binning (STC-CMB/CMC200PCL)

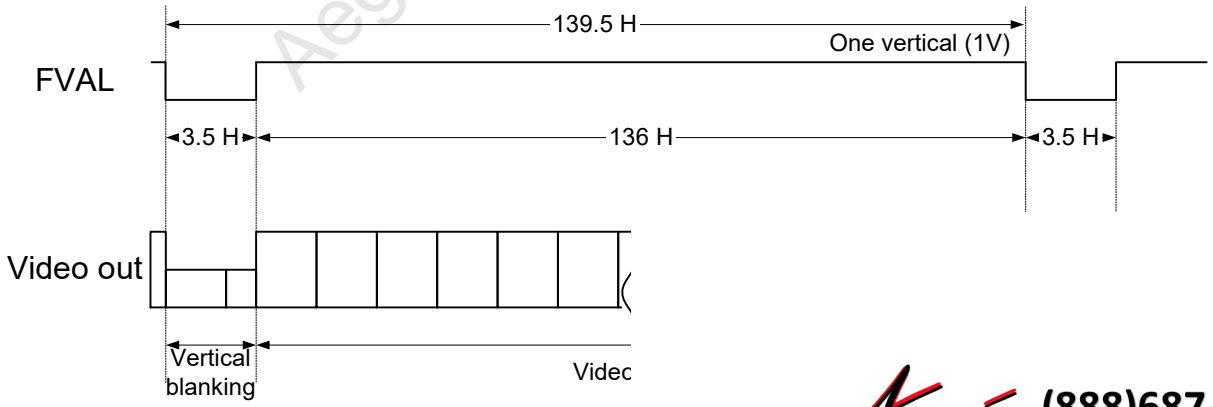
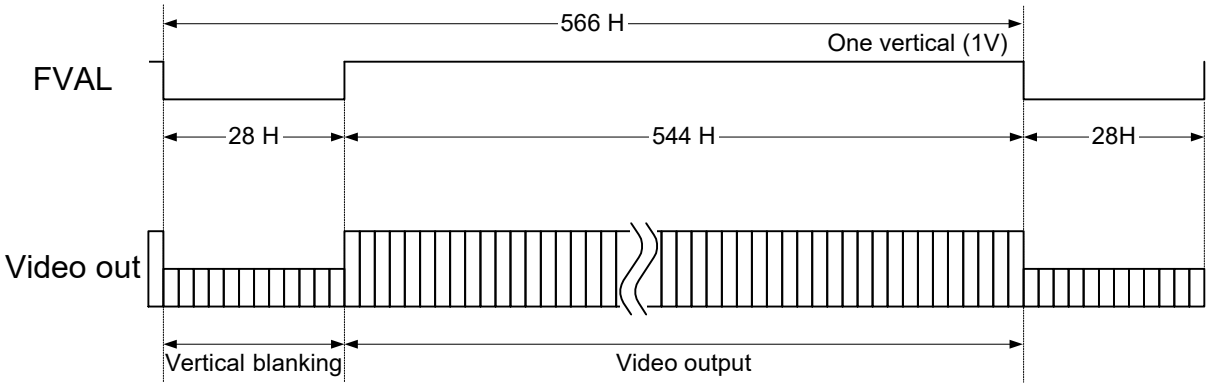


Table of Video Output on Binning mode (STC-CMB/CMC200PCL)

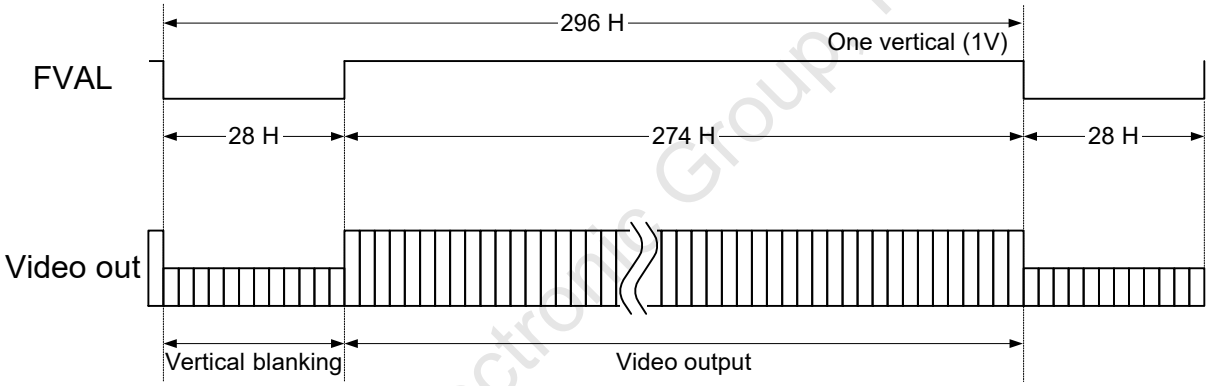
Averaged the pixels data is used for Binning mode. It makes decreasing the noise level and increasing the Signal Noise Ratio. This camera has row and column binning modes. This mode can not increase the frame rate.

Mode (EEH)	Tap Number	Binning	Configuration	CameraLink Output PixelClock Frequency(MHz)	Horizontal Pixel (Pixel)	Sensor Output Pixel Clock(MHz)	FPS	Camera Link Output Bit
8	2	2 x 2	Base	85.0	1024	21.250	147.6	8/10
10	2	4 x 4	Base	85.0	512	42.500	295.2	8/10
9	4	2 x 2	Medium	85.0	1024	42.500	295.2	8/10
11	1	8 x 8	Base	85.0	256	42.500	295.2	8/10
8	2	2 x 2	Base	42.5	1024	10.625	73.8	8/10
10	2	4 x 4	Base	42.5	512	21.250	147.6	8/10
9	4	2 x 2	Medium	42.5	1024	21.250	147.6	8/10
11	1	8 x 8	Base	42.5	256	21.250	147.6	8/10
8	2	2 x 2	Base	85.0	1024	21.250	147.6	8/10

5.2.6 2 x 2 Subsampling (STC-CMB/CMC200PCL)



5.2.7 4 x 4 Subsampling (STC-CMB/CMC200PCL)



5.2.8 8 x 8 Subsampling (STC-CMB/CMC200PCL)

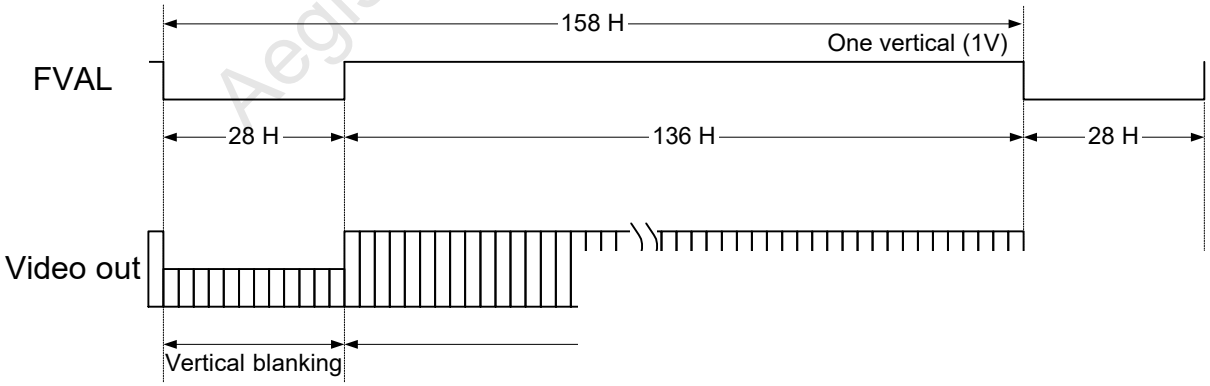
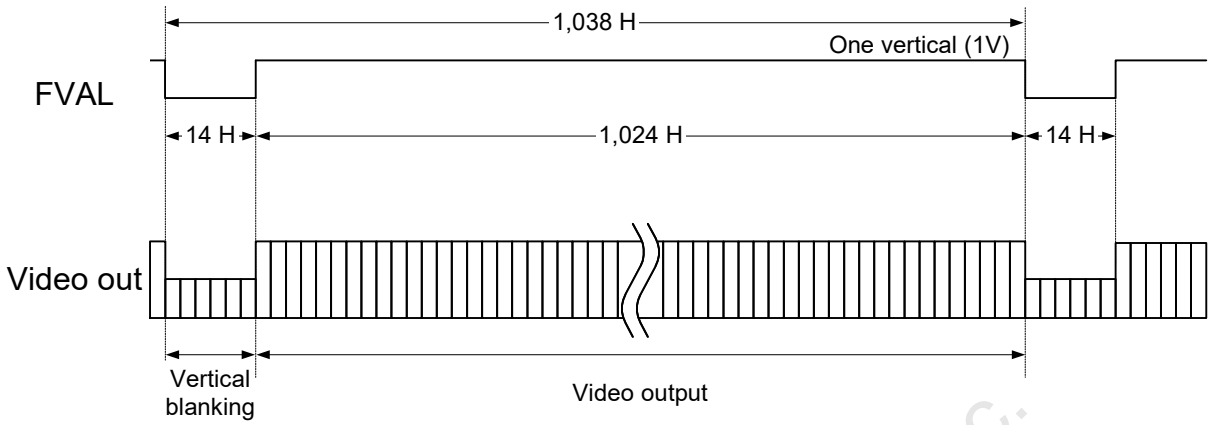


Table of Video Output on Subsampling mode (STC-CMB/CMC200PCL)

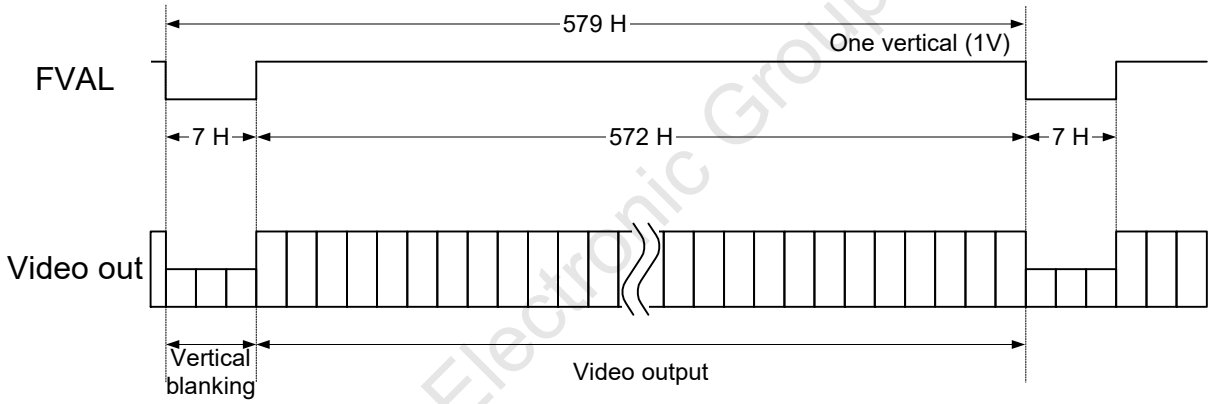
Subsampling reduce the output resolution and increase the frame rate.without FOV(Field of View). This camera has row and column subsampling modes. This mode can not reduce the noise level.

Mode (EEH)	Tap Number	Binning	Configuration	CameraLink Output PixelClock Frequency(MHz)	Horizontal Pixel (Pixel)	Sensor Output Pixel Clock(MHz)	FPS	Camera Link Output Bit
12	2	2 x 2	Base	85.0	1024	21.250	288.0	8/10
14	2	4 x 4	Base	85.0	512	42.500	1098.2	8/10
13	4	2 x 2	Medium	85.0	1024	42.500	576.0	8/10
15	1	8 x 8	Base	85.0	256	42.500	2008.9	8/10
12	2	2 x 2	Base	42.5	1024	10.625	144.0	8/10
14	2	4 x 4	Base	42.5	512	21.250	549.1	8/10
13	4	2 x 2	Medium	42.5	1024	21.250	288.0	8/10
15	1	8 x 8	Base	42.5	256	21.250	1004.4	8/10

5.2.9 2 x 2 Binning (STC-CMB/CMC401PCL)



5.2.10 4 x 4 Binning (STC-CMB/CMC401PCL)



5.2.11 8 x 8 Binning (STC-CMB/CMC401PCL)

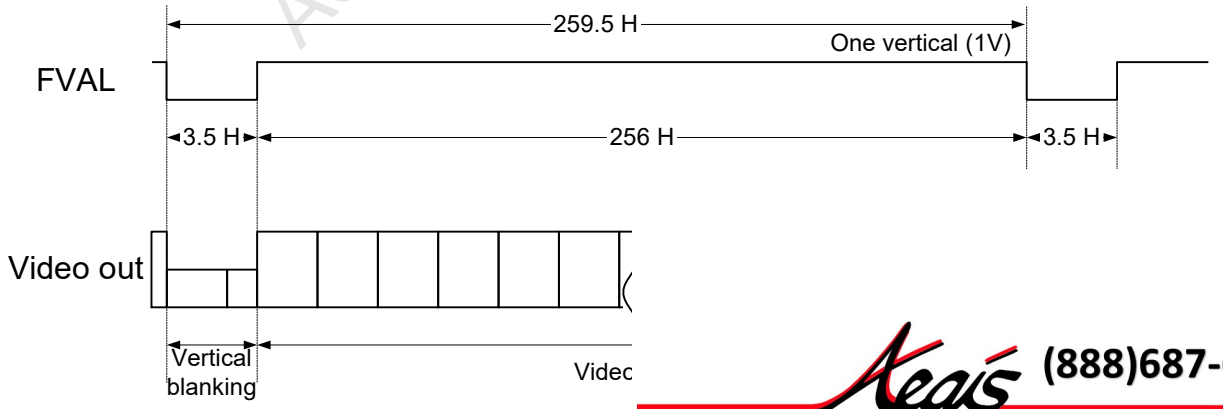
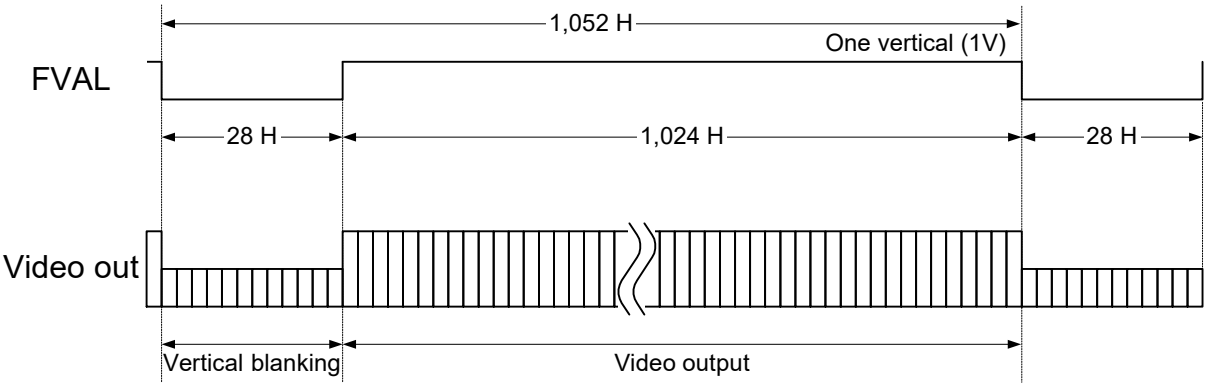


Table of Video Output on Binning mode (STC-CMB/CMC401PCL)

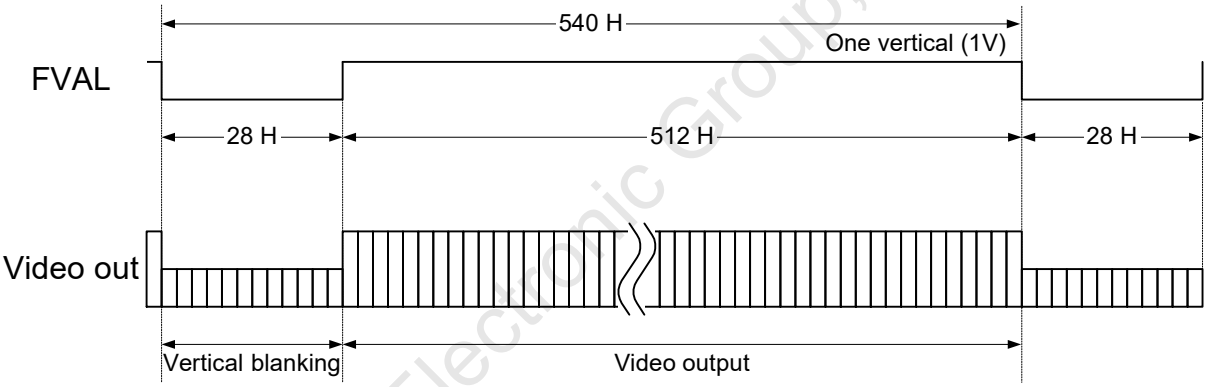
Averaged the pixels data is used for Binning mode. It makes decreasing the noise level and increasing the Signal Noise Ratio. This camera has row and column binning modes. This mode can not increase the frame rate.

Mode (EEH)	Tap Number	Binning	Configuration	CameraLink Output PixelClock Frequency(MHz)	Horizontal Pixel (Pixel)	Sensor Output Pixel Clock(MHz)	FPS	Camera Link Output Bit
8	2	2 x 2	Base	85.0	1024	21.250	79.3	8/10
10	2	4 x 4	Base	85.0	512	42.500	158.7	8/10
9	4	2 x 2	Medium	85.0	1024	42.500	158.7	8/10
11	1	8 x 8	Base	85.0	256	42.500	158.7	8/10
8	2	2 x 2	Base	42.5	1024	10.625	39.7	8/10
10	2	4 x 4	Base	42.5	512	21.250	79.3	8/10
9	4	2 x 2	Medium	42.5	1024	21.250	79.3	8/10
11	1	8 x 8	Base	42.5	256	21.250	79.3	8/10

5.2.12 2 x 2 Subsampling (STC-CMB/CMC401PCL)



5.2.13 4 x 4 Subsampling (STC-CMB/CMC401PCL)



5.2.14 8 x 8 Subsampling (STC-CMB/CMC401PCL)

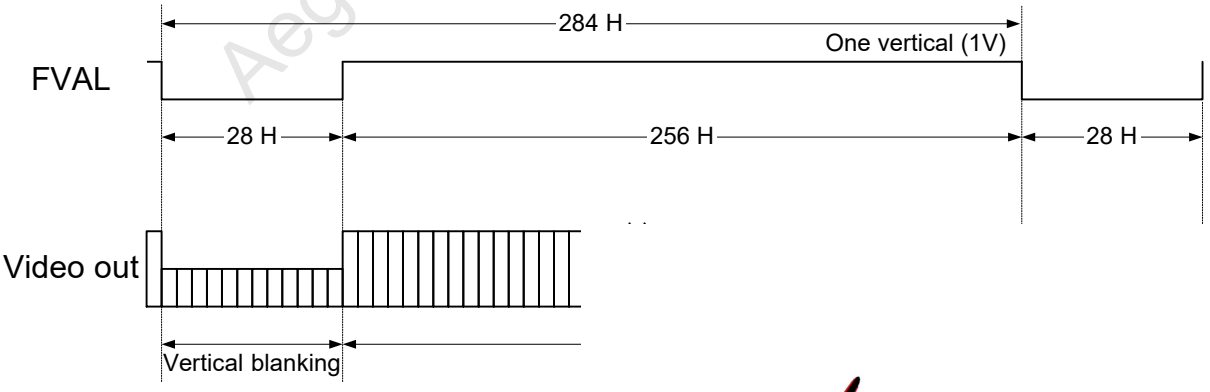


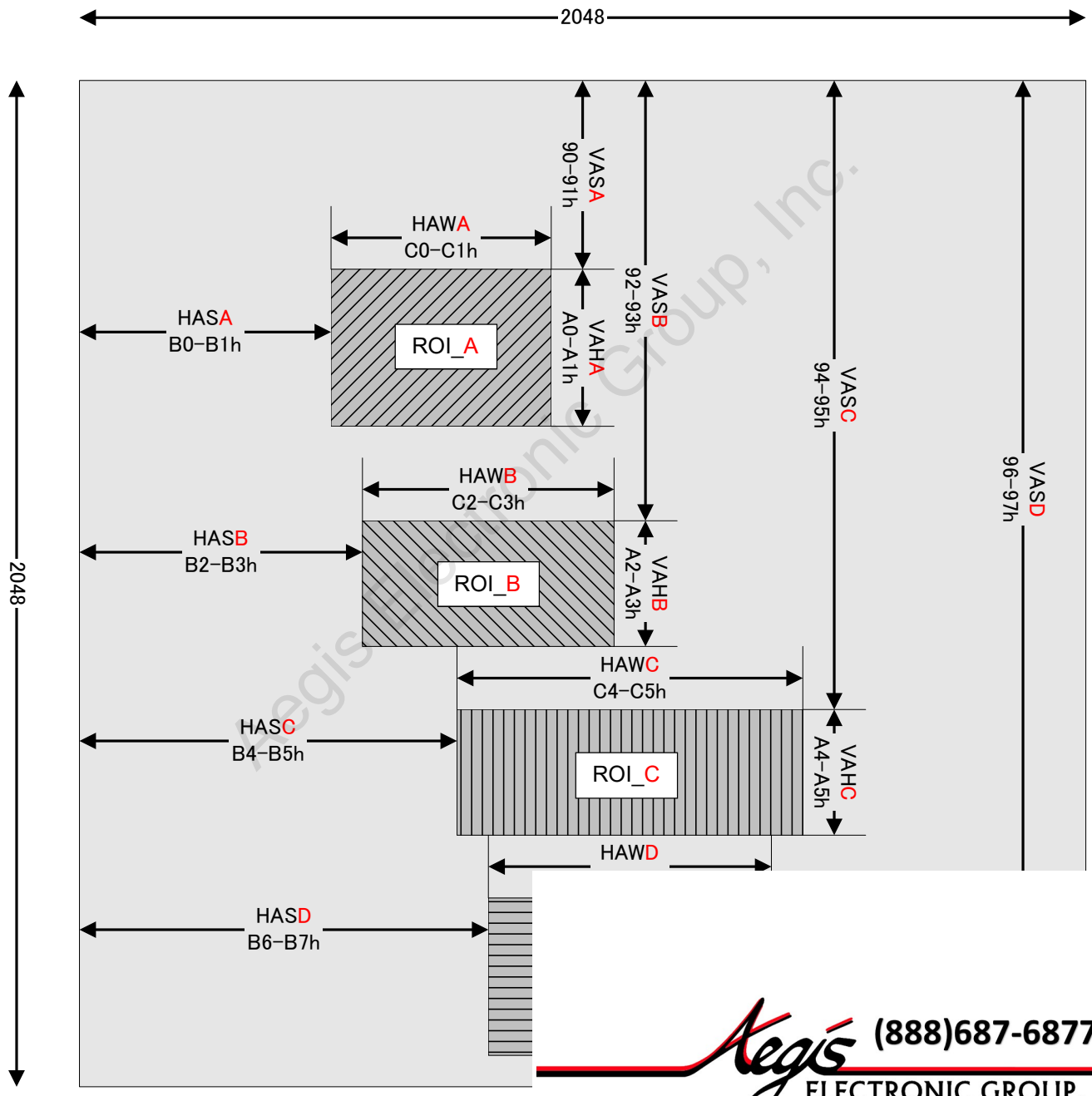
Table of Video Output on Subsampling mode(STC-CMB/CMC401PCL)

Subsampling reduce the output resolution and increase the frame rate.without FOV(Field of View). This camera has row and column subsampling modes. This mode can not reduce the noise level.

Mode (EEH)	Tap Number	Binning	Configuration	CameraLink Output PixelClock Frequency(MHz)	Horizontal Pixel (Pixel)	Sensor Output Pixel Clock(MHz)	FPS	Camera Link Output Bit
12	2	2 x 2	Base	85.0	1024	21.250	156.6	8/10
14	2	4 x 4	Base	85.0	512	42.500	610.1	8/10
13	4	2 x 2	Medium	85.0	1024	42.500	313.2	8/10
15	1	8 x 8	Base	85.0	256	42.500	1160.1	8/10
12	2	2 x 2	Base	42.5	1024	10.625	78.3	8/10
14	2	4 x 4	Base	42.5	512	21.250	305.1	8/10
13	4	2 x 2	Medium	42.5	1024	21.250	156.6	8/10
15	1	8 x 8	Base	42.5	256	21.250	580.0	8/10

5.3 ROI Output Timing

- This camera can be set the ROI up to 8.
- ROI can be set the Binning and Subsampling at the same time.
- Setting of **The horizontal effective pixel** and **the horizontal effective pixels of changeable DVAL** are different form each Cameralink output TAP number.
- The horizontal ROI can be controlled by LVAL and DVAL. The Video signal output directly. Therefore frame rate cannot increase on this mode.



The horizontal effective pixel

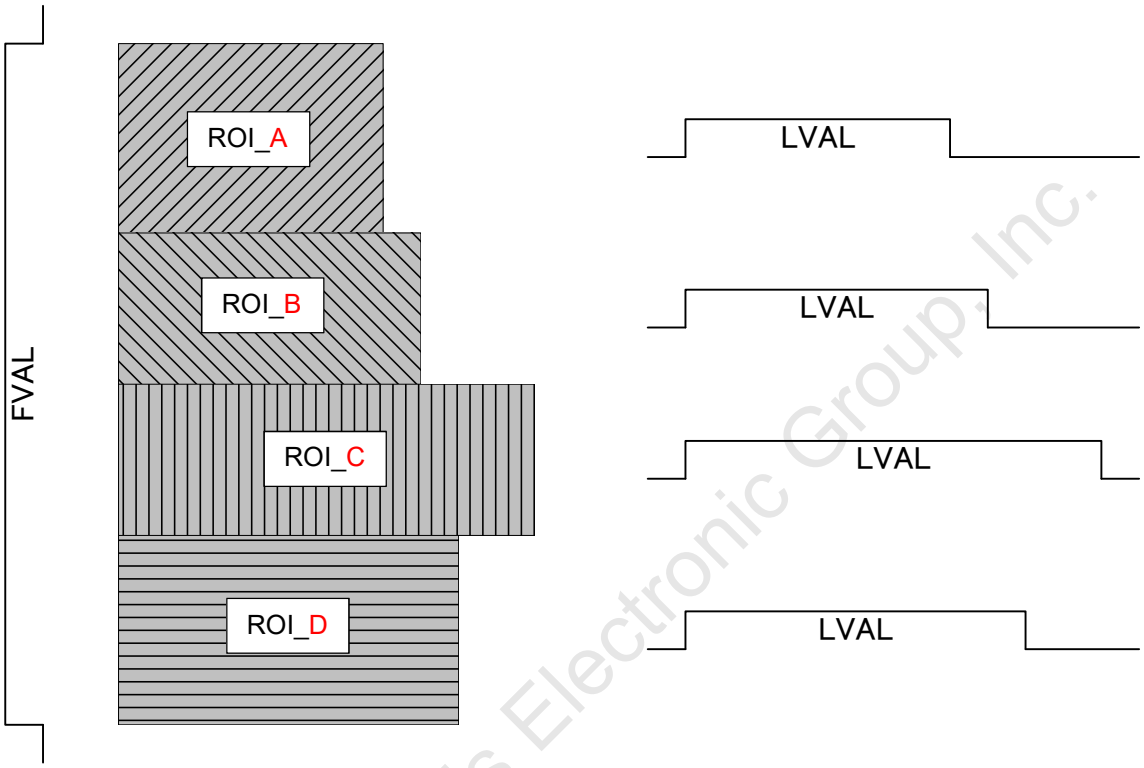
Register[4CH,4DH2-0]＝H_STRAT: Horizontal start position / Output TAP number / Binning or Subsampling number

The horizontal effective pixels of changeable DVAL

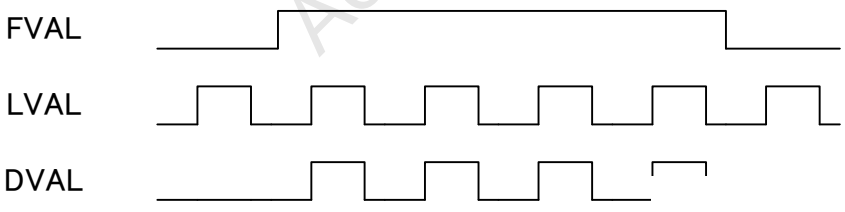
Register[4EH,4FH2-0]＝H_NUMBER: Horizontal available pixel number / Output TAP number / Binning or Subsampling number

When use the 10 TAP, horizontal pixel number is 2,040 pixels. using H_STRAT: Horizontal start position - 4.

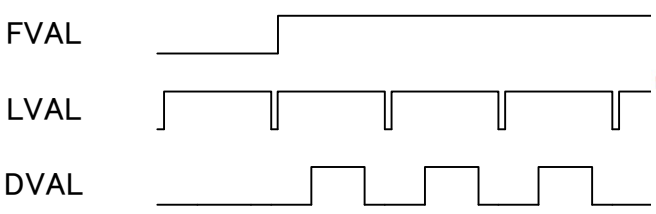
Register[4EH,4FH2-0]＝(H_NUMBER: Horizontal available pixel number -4) / Output TAP number / Binning or Subsampling number



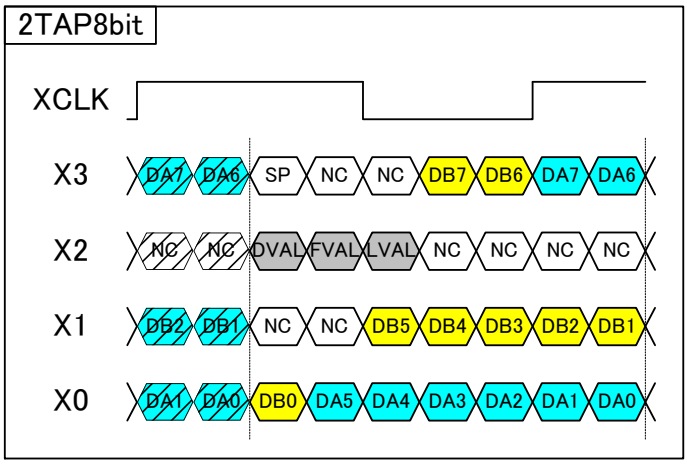
H_STRAT[15]＝0



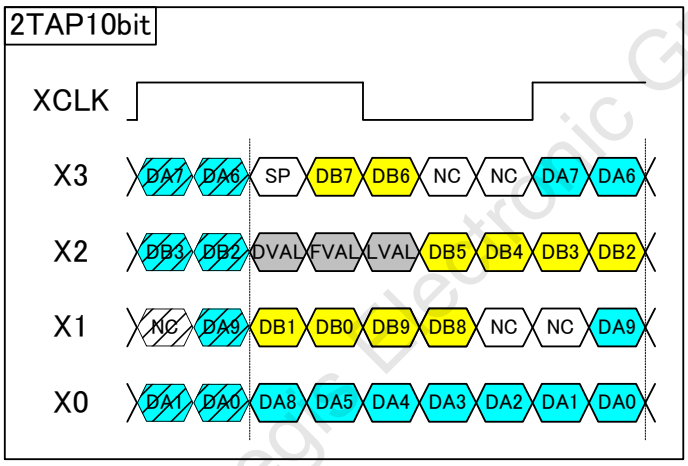
H_STRAT[15]＝1



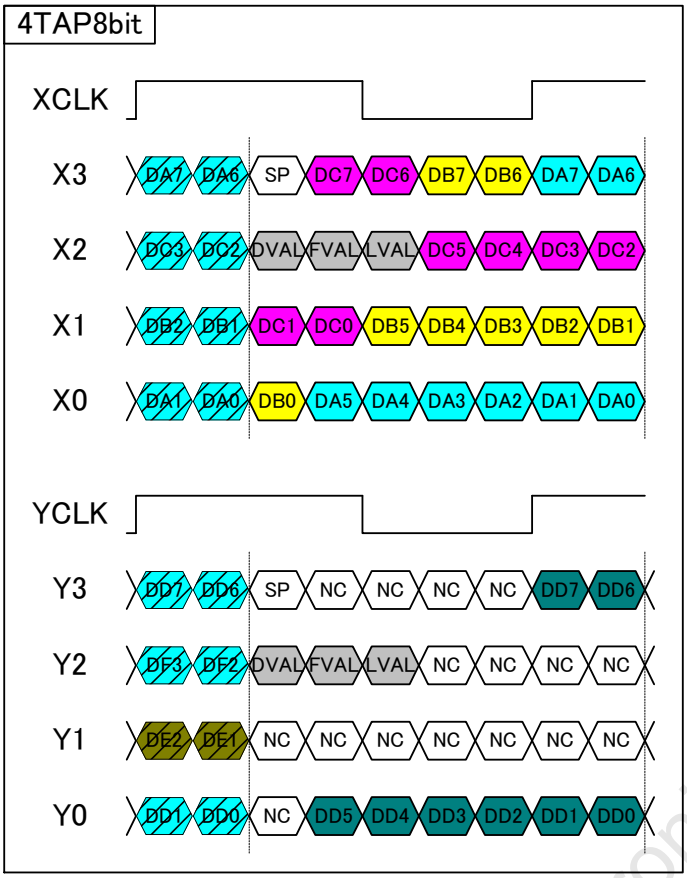
5.4 Camera Link bit assignment



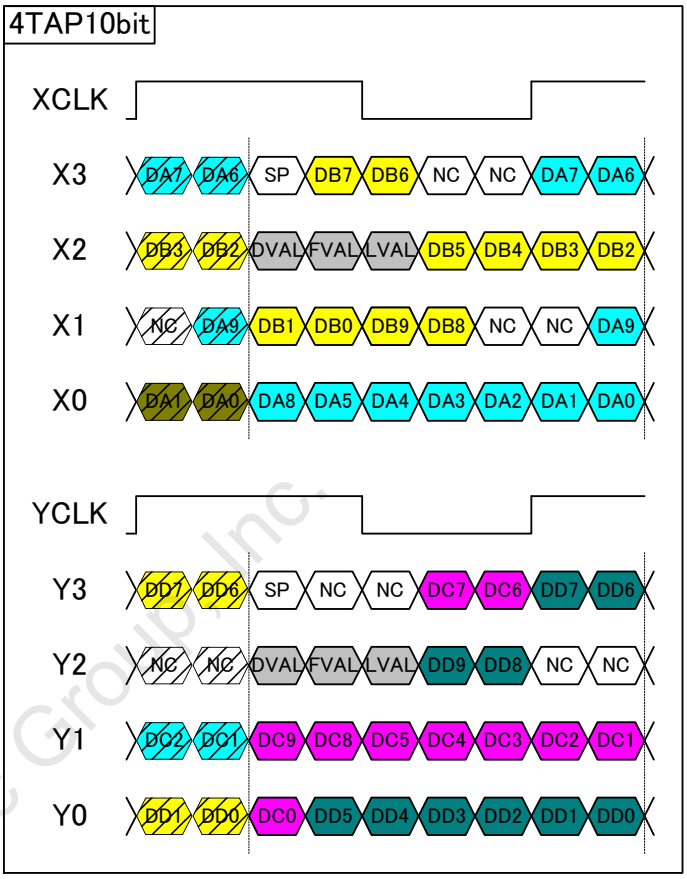
DA0 to DA7: 8bit data for one pixel from TAP1
DB0 to DB7: 8bit data for one pixel from TAP2



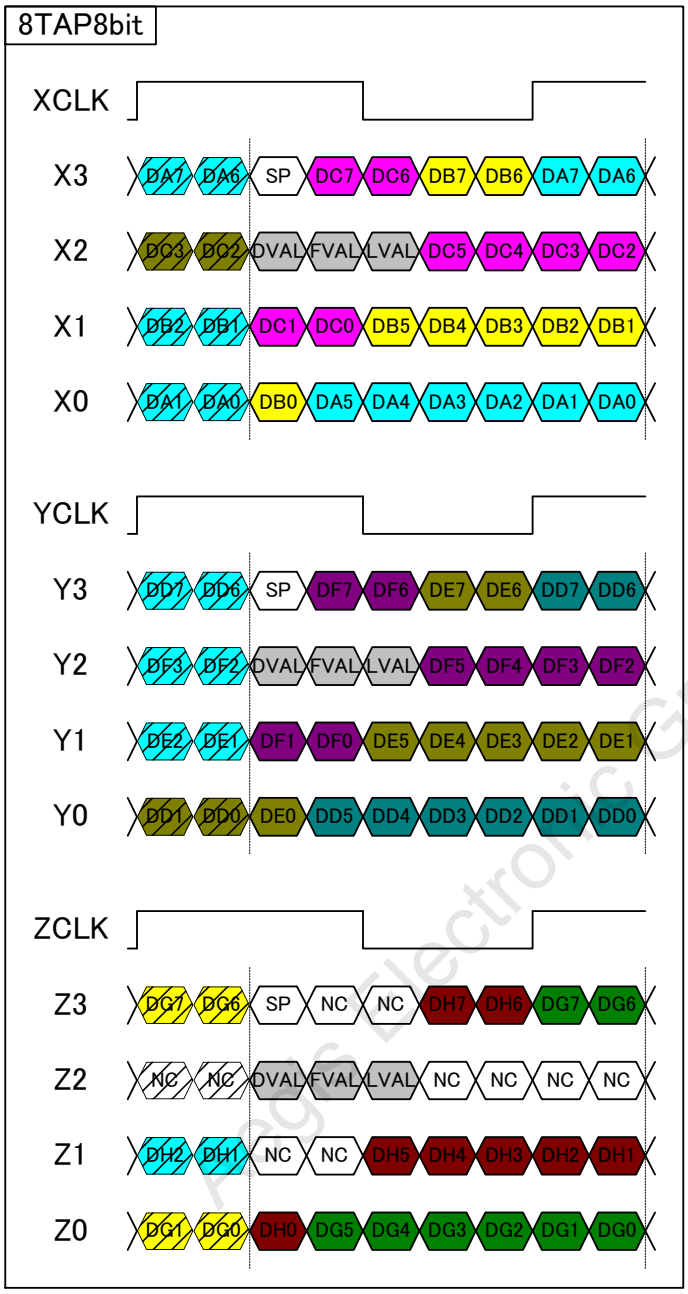
DA0 to DA9: 10bit data for one pixel from TAP1
DB0 to DB9: 10bit data for one pixel from TAP2



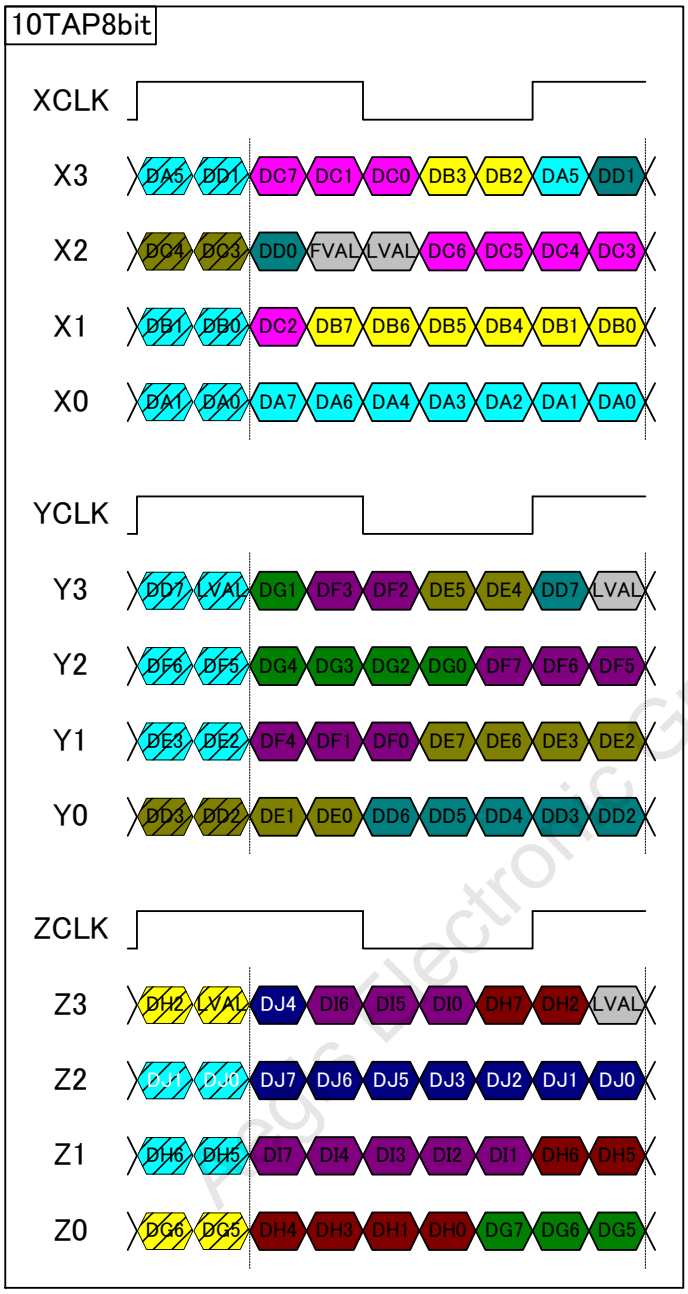
DA0 to DA7: 8bit data for one pixel from TAP1
DB0 to DB7: 8bit data for one pixel from TAP2
DC0 to DC7: 8bit data for one pixel from TAP3
DD0 to DD7: 8bit data for one pixel from TAP4



DA0 to DA9: 10bit data for one pixel from TAP1
DB0 to DB9: 10bit data for one pixel from TAP2
DC0 to DC9: 10bit data for one pixel from TAP3
DD0 to DD9: 10bit data for one pixel from TAP4



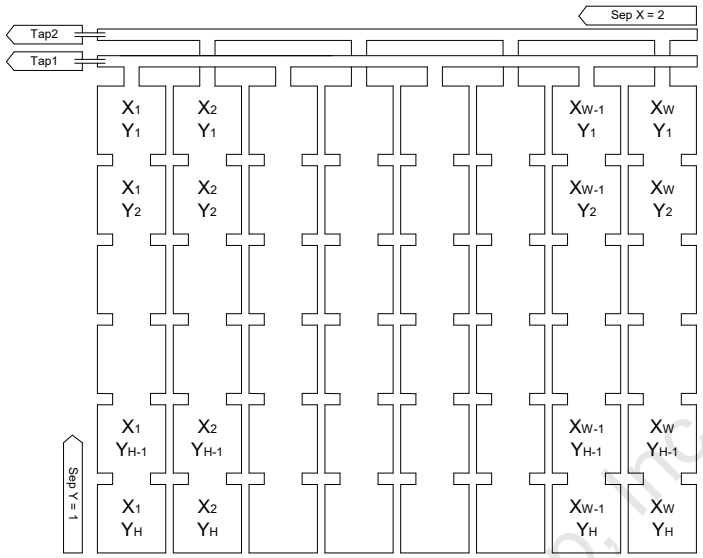
DA0 to DA7: 8bit data for one pixel fr
DB0 to DB7: 8bit data for one pixel fr
DC0 to DC7: 8bit data for one pixel fr
DD0 to DD7: 8bit data for one pixel fr
DE0 to DE7: 8bit data for one pixel fr
DF0 to DF7: 8bit data for one pixel fr
DG0 to DG7: 8bit data for one pixel fr
DH0 to DH7: 8bit data for one pixel fr



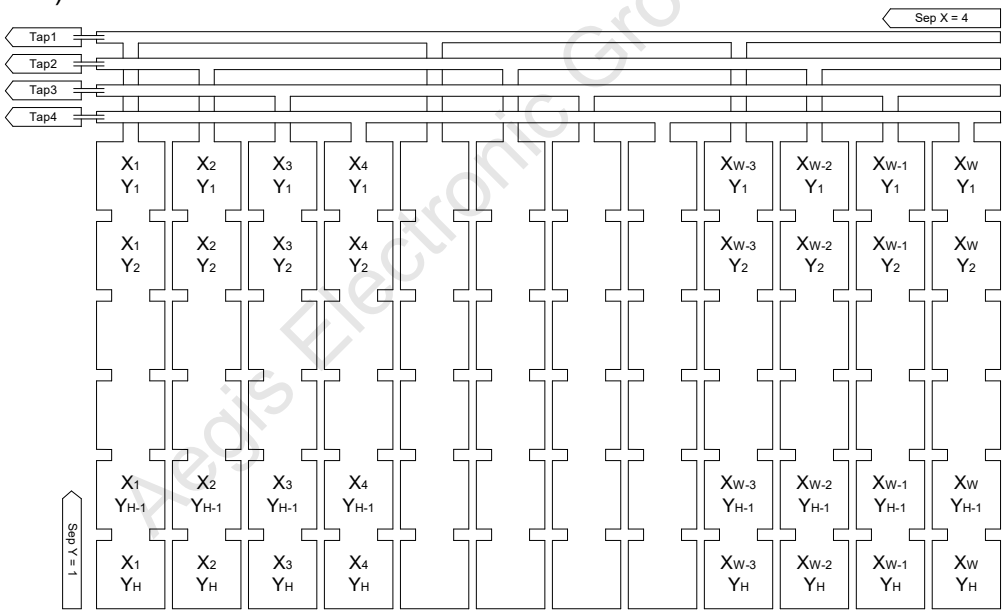
DA0 to DA7:	8bit data for one pixel fr
DB0 to DB7:	8bit data for one pixel fr
DC0 to DC7:	8bit data for one pixel fr
DD0 to DD7:	8bit data for one pixel fr
DE0 to DE7:	8bit data for one pixel fr
DF0 to DF7:	8bit data for one pixel fr
DG0 to DG7:	8bit data for one pixel fr
DH0 to DH7:	8bit data for one pixel fr
DI0 to DI7:	8bit data for one pixel fr
DJ0 to DJ7:	8bit data for one pixel fr

5.5 Camera Link TAP Geometry

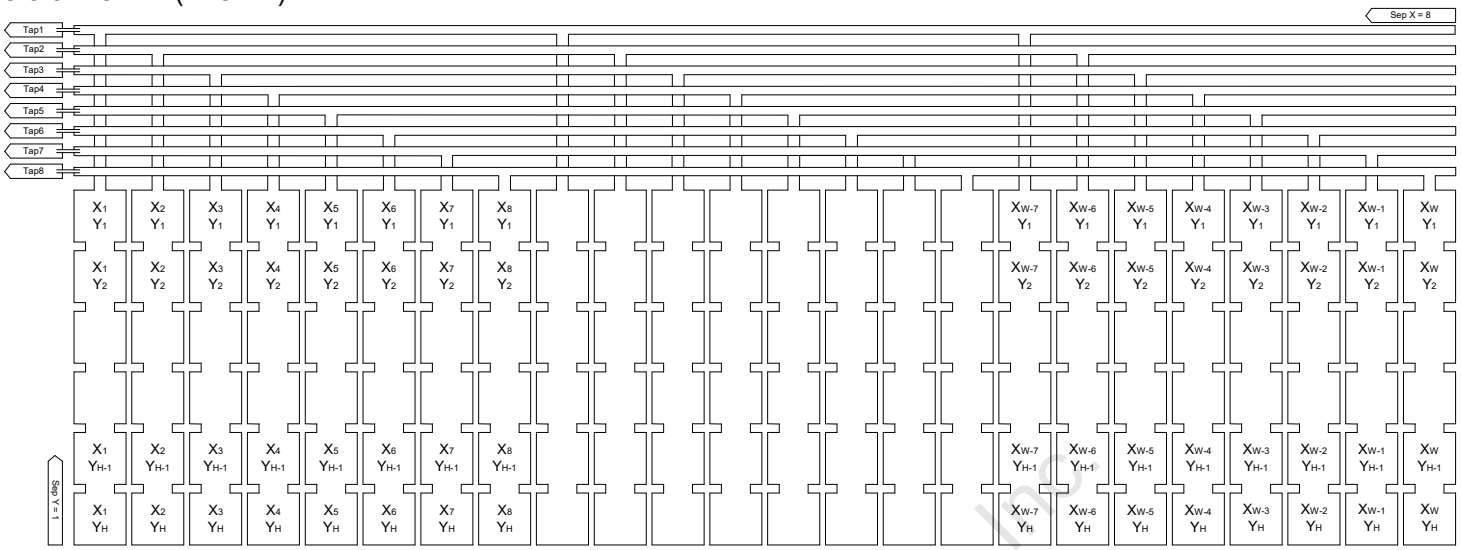
5.5.1 2TAP (1X2-1Y)



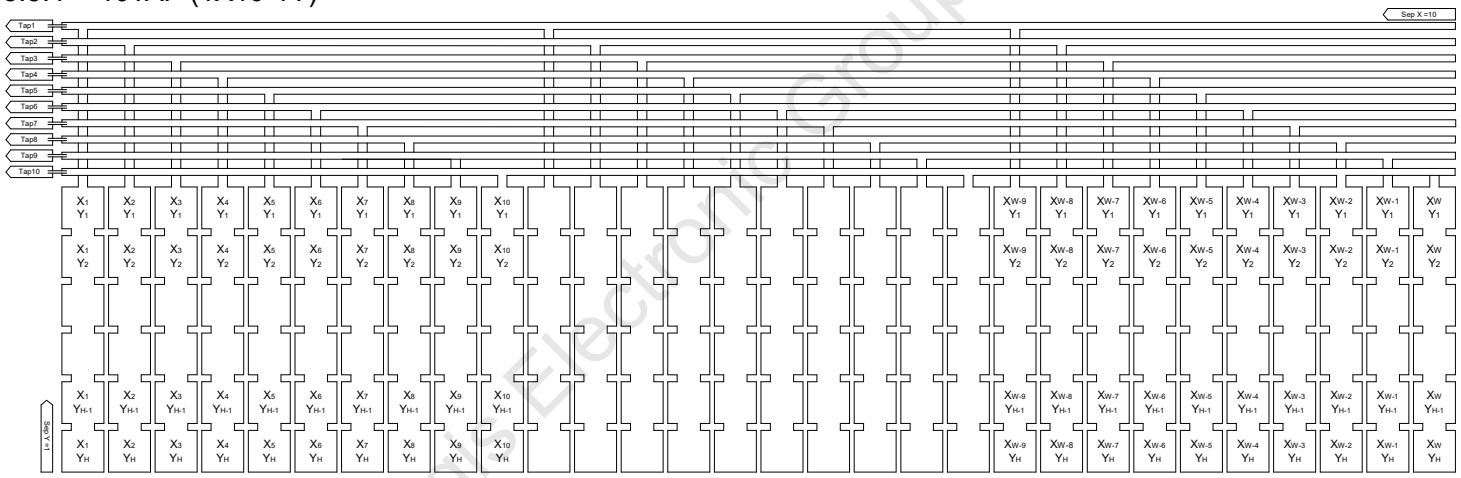
5.5.2 4TAP (1X4-1Y)



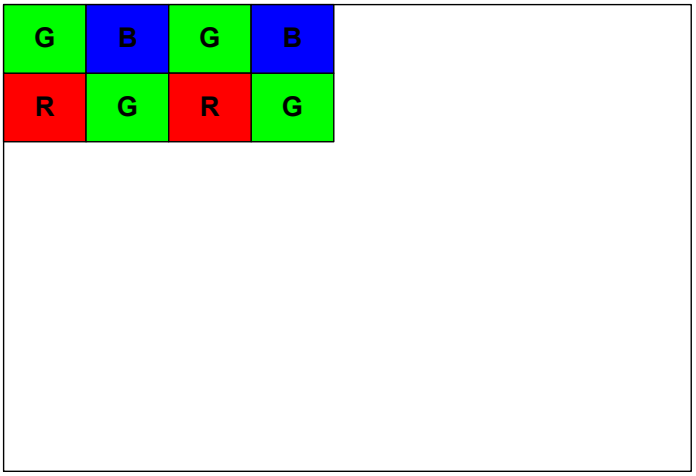
5.5.3 8TAP (1X8-1Y)



5.5.4 10TAP (1X10-1Y)



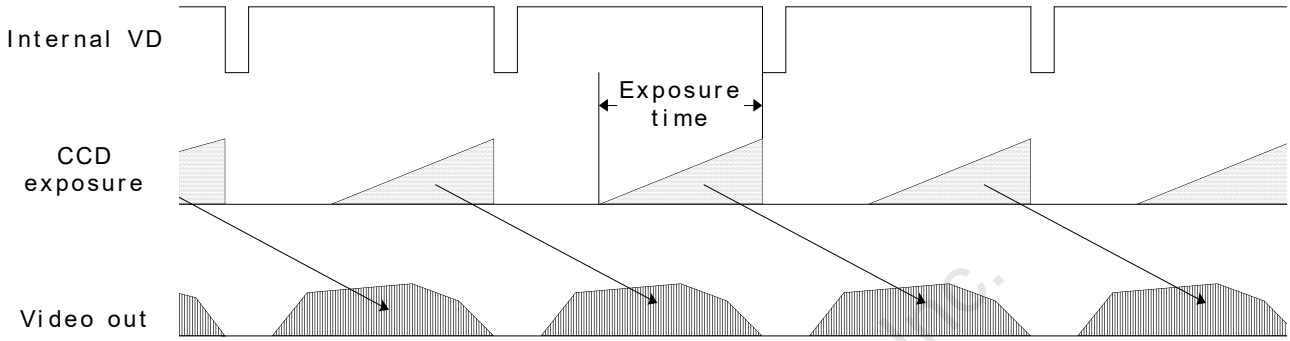
5.6 Bayer pattern for color model (Only STC-CMC200PCL / STC-CMC401PCL)



6. Camera function modes

6.1. Normal mode

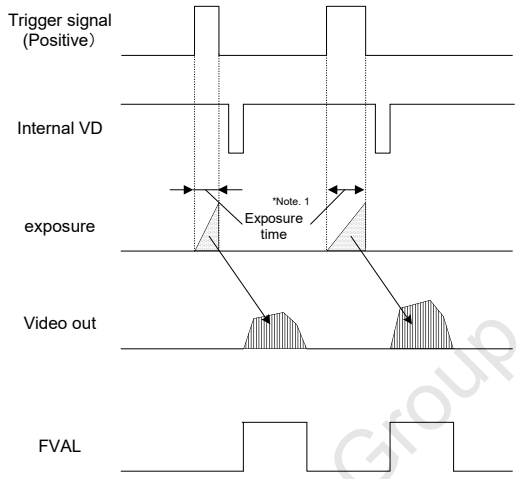
6.1.1. Normal mode (Electronic shutter)



6.2 Pulse width trigger mode

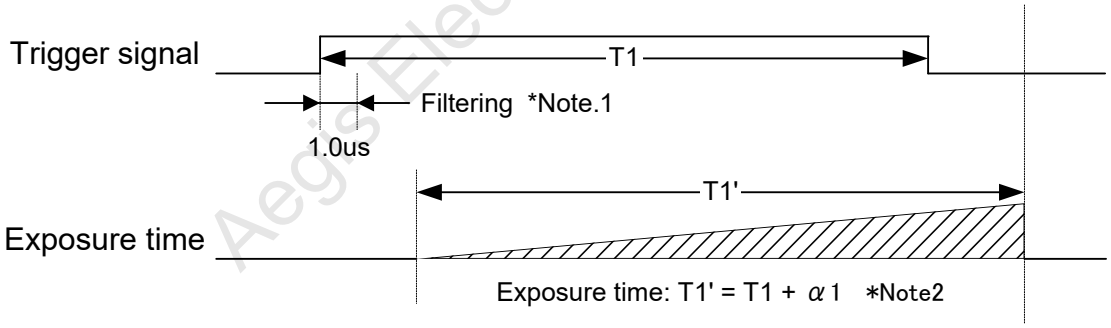
In this trigger mode with positive polarity, the camera exposure starts at the rising edge of the trigger pulse and stops at the falling edge of the trigger pulse. Therefore, In the case of the exposure positive polarity is selected, the exposure periods are the high states of the trigger pulse.

6.2.1 Pulse width trigger mode (V-Reset)



Note.1: The exposure time sets by the pulse width of the trigger signal.

6.2.2 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 15us. Please input the trigger signal has more than 1.0 us pulse width.

Note.2: α1(Exposure time offset) is different from

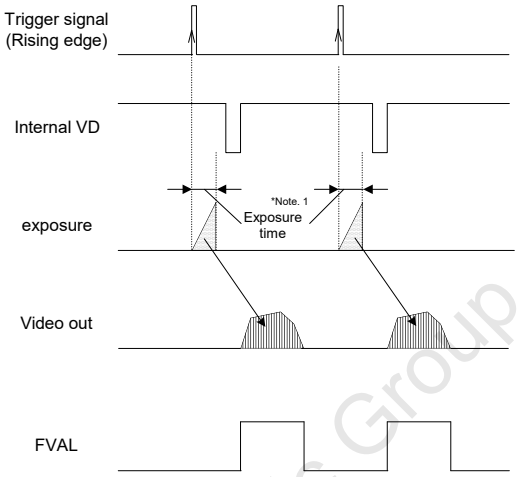
Pulse Width：22[us]
Edge Preset：21[us]

6.3 Edge preset trigger mode

In this trigger mode, the camera exposure starts at the rising edge of the trigger pulse or negative edge when setting is “Trigger Polarity::Negative”, the camera exposure starts at the falling edge of the trigger pulse. Exposure duration time is preset by the “Electrical Shutter” settings.

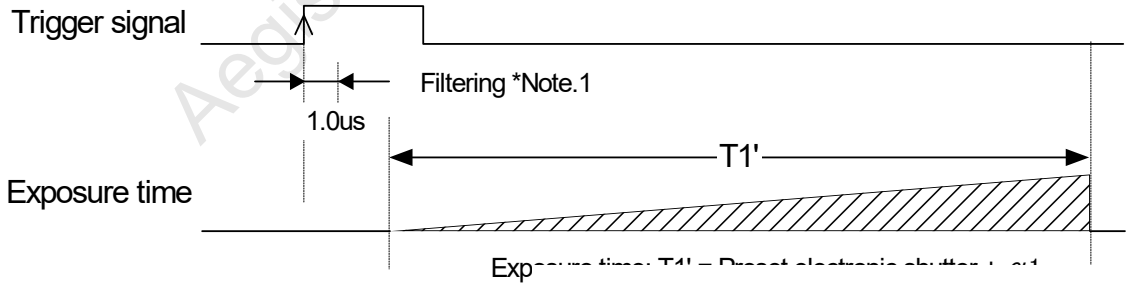
.

6.3.1 Edge preset trigger mode (V-Reset)



Note.1: The exposure time sets by the preset electronic shutter speed.
Note 2. The horizontal two lines noise is appeared on the image when Trigger signal is input while the image output period. In this case, trigger input after video out or set usec unit on exposure time setting unit.

6.3.2 Edge preset trigger mode (Exposure timing)



Note.1: The trigger signal is removed by the filterin
Please input the trigger signal has more tha

Note.2: α1(Exposure time offset) is different from

Pulse Width：22[us]
Edge Preset：21[us]

7. The communication protocol specifications

This camera has the communication function that enables external devises like PC control the camera functions.
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 (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

7.3. The communication format

A. The sending data format from the PC to the camera is as follows:

a. Send the read command

SOF (8bit)	Device code (6bit)	Read (1bit)	Page selection (1bit)	Command code (8bit)	Data length (8bit)	Data (1byte)	EOF (8bit)

b. Send the write command

SOF (8bit)	Device code (6bit)	Write (1bit)	Page selection (1bit)	Command code (8bit)	Data length (8bit)	Data (Data length byte)	EOF (8bit)

B. The receiving data format from the camera is as follows:

a. After sent the read command

SOF (8bit)	Data length (8bit)	Data (Data length byte)	EOF (8bit)

b. After sent the write command

SOF (8bit)	Data length (8bit) "00"	Receiving code (8bit)	EOF (8bit)

C. Descriptions of the format

Name	Descriptions
SOF	**S**tart **o**f the **f**rame Sets (or gets) the value is as “02H” always.
Device code	Sets the device code of the camera is as “000000”.
Read / Write	Sets (or gets) “0” when send read command. Sets (or gets) “1” when send write command.
Page selection	Sets “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.** Sets “1” when access to the EEPROM of the camera The camera works with the data of the EEPROM when the power on the camera. Gets 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 coce as "01H" to the PC after the data of the EEPROM is replaced. The camera rejects other commands while the data of the EEPROM is being replaced (approximately 5 msec. / byte).
Command code	**Please refer from the following page.**
Data length	Data length (Unit: byte) Receiving data The data length is depending on the command after sent read command. The data length is “00H” after sent write command. Sending data The data length is 1 byte when send read command. The data length is depending on the command when send write command.
Data	The value of the data is depending on th
EOF	**E**nd **o**f the **f**rame Sets (or gets) the value is as “03H” alwa
Receiving code	Result of the sending command 01H: OK (ACK), 11H: Communication problem

D. Example command

Send the read command to read the 00H addres
02, 00, 00, 01, 00, 03
SOF, (Device code/Read/Register), Comma

The return command
02, 01, 00, 03

7.4. The camera control commands

7.4.1. The camera commands list(Device Code : 00H)

Note. 1: The data unit of the each command is 1byte (8bits).
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	-	-
10H	R/W	○	The camera function mode1(8bit : D[7..0])	1	
11H	R/W	○	The camera function mode2 (8bit : D[7..0])	00H	
12H	R/W	○	The camera function mode3 (8bit : D[7..0])	50H	
13H			Reserved	-	-
14H	R/W		The communication mode (8bit : D[7..0])	1	
15 - 1FH			Reserved	-	-
20H	R/W	○	The exposure time of the electronic shutter (24bit : D[7..0])	2,048	0 to 16,777,215
21H	R/W	○	The exposure time of the electronic shutter (24bit : D[15..8])		
22H	R/W	○	The exposure time of the electronic shutter (24bit : D[23..16])		
23 - 27H			Reserved	-	-
28H	R/W	○	The delay time for the trigger (8bit : D[7..0])	0	0 to 255
29 - 30H			Reserved	-	-
31H	R/W	○	The digital gain (8bit : D[7..0])	0	-
32 - 37H			Reserved	-	-
38H	R/W	○	The clamp level (8bit : D[7..0])	40	0 to 255
39H			Reserved	-	-
3AH	R/W	○	R gain (8bit : D[7..0])	0	0 to 255
3BH	R/W	○	B gain(8bit : D[7..0])	0	0 to 255
3CH	R/W	○	GR gain(8bit : D[7..0])	0	0 to 255
3DH	R/W	○	GB gain(8bit : D[7..0])	0	0 to 255
3E - 3FH			Reserved	-	-
47H	R/W	○	HDR slope (8bit : D[7..0])	1	
4AH			Reserved	-	-
4BH	R/W	○	PGA	0	-
4CH	R/W	○	Horizontal start point on DVAL (16bit : D[7..0])		
4DH	R/W	○	Horizontal start point on DVAL		
4E - 55H			Reserved		
56H	R/W	○	Knee1parameter (8bit : D[7..0])		
57H	R/W	○	Knee2 parameter (8bit : D[7..0])		
58 - 5AH			Reserved		
5BH	R/W	○	Vlow2voltage (8bit : D[7..0])		
5CH	R/W	○	Vlow3voltage (8bit : D[7..0])		
5D - 5FH			Reserved		
60 - 67H			Reserved		
68H	R/W	○	Reverse mode (8bit : D[7..0])		

Command No.	R/W	EEPROM	Function	Initial Data	Data Range
69H			Reserved	-	-
70 - 77H			Reserved	-	-
80H	R/W		EEPROM control (8bit : D[7..0])	0	0 or 1
81H	R/W		Reload Initial camera setting (8bit : D[7..0])	0	0 or 170
82 - 8FH			Reserved	-	-

2M: STC-CMB200PCL / STC-CMC200PCL
4M: STC-CMB401PCL / STC-CMC401PCL

Command No.	R/W	EEPROM	Function	Initial Data	Data Range
90H	R/W	○	Vertical ROI Start Line ROI_A (16bit : D[7..0])	0	2M:0 to 1,087
91H	R/W	○	Vertical ROI Start Line ROI_A (16bit : D[15..8])		4M:0 to 2,047
92H	R/W	○	Vertical ROI Start Line ROI_B (16bit : D[7..0])	0	2M:0 to 1,087
93H	R/W	○	Vertical ROI Start Line ROI_B (16bit : D[15..8])		4M:0 to 2,047
94H	R/W	○	Vertical ROI Start Line ROI_C (16bit : D[7..0])	0	2M:0 to 1,087
95H	R/W	○	Vertical ROI Start Line ROI_C (16bit : D[15..8])		4M:0 to 2,047
96H	R/W	○	Vertical ROI Start Line ROI_D (16bit : D[7..0])	0	2M:0 to 1,087
97H	R/W	○	Vertical ROI Start Line ROI_D (16bit : D[15..8])		4M:0 to 2,047
98H	R/W	○	Vertical ROI Start Line ROI_E (16bit : D[7..0])	0	2M:0 to 1,087
99H	R/W	○	Vertical ROI Start Line ROI_E (16bit : D[15..8])		4M:0 to 2,047
9AH	R/W	○	Vertical ROI Start Line ROI_F (16bit : D[7..0])	0	2M:0 to 1,087
9BH	R/W	○	Vertical ROI Start Line ROI_F (16bit : D[15..8])		4M:0 to 2,047
9CH	R/W	○	Vertical ROI Start Line ROI_G (16bit : D[7..0])	0	2M:0 to 1,087
9DH	R/W	○	Vertical ROI Start Line ROI_G (16bit : D[15..8])		4M:0 to 2,047
9EH	R/W	○	Vertical ROI Start Line ROI_H (16bit : D[7..0])	0	2M:0 to 1,087
9FH	R/W	○	Vertical ROI Start Line ROI_H (16bit : D[15..8])		4M:0 to 2,047
A0H	R/W	○	Vertical ROI Effective Line ROI_A (16bit : D[7..0])	2M :1,088	2M:0 to 1,088
A1H	R/W	○	Vertical ROI Effective Line ROI_A (16bit : D[15..8])	4M :2,048	4M:0 to 2,048
A2H	R/W	○	Vertical ROI Effective Line ROI_B (16bit : D[7..0])	0	2M:0 to 1,088
A3H	R/W	○	Vertical ROI Effective Line ROI_B (16bit : D[15..8])		4M:0 to 2,048
A4H	R/W	○	Vertical ROI Effective Line ROI_C (16bit : D[7..0])	0	2M:0 to 1,088
A5H	R/W	○	Vertical ROI Effective Line ROI_C (16bit : D[15..8])		4M:0 to 2,048
A6H	R/W	○	Vertical ROI Effective Line ROI_D (16bit : D[7..0])	0	2M:0 to 1,088
A7H	R/W	○	Vertical ROI Effective Line ROI_D (16bit : D[15..8])		4M:0 to 2,048
A8H	R/W	○	Vertical ROI Effective Line ROI_E (16bit : D[7..0])	0	2M:0 to 1,088
A9H	R/W	○	Vertical ROI Effective Line ROI_E (16bit : D[15..8])		4M:0 to 2,048
AAH	R/W	○	Vertical ROI Effective Line ROI_F (16bit : D[7..0])	0	2M:0 to 1,088
ABH	R/W	○	Vertical ROI Effective Line ROI_F (16bit : D[15..8])		4M:0 to 2,048
ACH	R/W	○	Vertical ROI Effective Line ROI_G (16bit : D[7..0])	0	2M:0 to 1,088
ADH	R/W	○	Vertical ROI Effective Line ROI_G (16bit : D[15..8])		4M:0 to 2,048
AEH	R/W	○	Vertical ROI Effective Line ROI_H (16bit : D[7..0])	0	2M:0 to 1,088
AFH	R/W	○	Vertical ROI Effective Line ROI_H (16bit :		

Command No.	R/W	EEPROM	Function	Initial Data	Data Range
B0H	R/W	○	Horizontal ROI Start Pixel ROI_A (16bit : D[7..0])	0	0 to 2,047
B1H	R/W	○	Horizontal ROI Start Pixel ROI_A (16bit : D[15..8])		
B2H	R/W	○	Horizontal ROI Start Pixel ROI_B (16bit : D[7..0])	0	0 to 2,047
B3H	R/W	○	Horizontal ROI Start Pixel ROI_B (16bit : D[15..8])		
B4H	R/W	○	Horizontal ROI Start Pixel ROI_C (16bit : D[7..0])	0	0 to 2,047
B5H	R/W	○	Horizontal ROI Start Pixel ROI_C (16bit : D[15..8])		
B6H	R/W	○	Horizontal ROI Start Pixel ROI_D (16bit : D[7..0])	0	0 to 2,047
B7H	R/W	○	Horizontal ROI Start Pixel ROI_D (16bit : D[15..8])		
B8H	R/W	○	Horizontal ROI Start Pixel ROI_E (16bit : D[7..0])	0	0 to 2,047
B9H	R/W	○	Horizontal ROI Start Pixel ROI_E (16bit : D[15..8])		
BAH	R/W	○	Horizontal ROI Start Pixel ROI_F (16bit : D[7..0])	0	0 to 2,047
BBH	R/W	○	Horizontal ROI Start Pixel ROI_F (16bit : D[15..8])		
BCH	R/W	○	Horizontal ROI Start Pixel ROI_G (16bit : D[7..0])	0	0 to 2,047
BDH	R/W	○	Horizontal ROI Start Pixel ROI_G (16bit : D[15..8])		
BEH	R/W	○	Horizontal ROI Start Pixel ROI_H (16bit : D[7..0])	0	0 to 2,047
BFH	R/W	○	Horizontal ROI Start Pixel ROI_H (16bit : D[15..8])		
C0H	R/W	○	Horizontal ROI Effective Pixel ROI_A (16bit : D[7..0])	2,048	0 to 2,048
C1H	R/W	○	Horizontal ROI Effective Pixel ROI_A (16bit : D[15..8])		
C2H	R/W	○	Horizontal ROI Effective Pixel ROI_B (16bit : D[7..0])	0	0 to 2,048
C3H	R/W	○	Horizontal ROI Effective Pixel ROI_B (16bit : D[15..8])		
C4H	R/W	○	Horizontal ROI Effective Pixel ROI_C (16bit : D[7..0])	0	0 to 2,048
C5H	R/W	○	Horizontal ROI Effective Pixel ROI_C (16bit : D[15..8])		
C6H	R/W	○	Horizontal ROI Effective Pixel ROI_D (16bit : D[7..0])	0	0 to 2,048
C7H	R/W	○	Horizontal ROI Effective Pixel ROI_D (16bit : D[15..8])		
C8H	R/W	○	Horizontal ROI Effective Pixel ROI_E (16bit : D[7..0])	0	0 to 2,048
C9H	R/W	○	Horizontal ROI Effective Pixel ROI_E (16bit : D[15..8])		
CAH	R/W	○	Horizontal ROI Effective Pixel ROI_F (16bit : D[7..0])	0	0 to 2,048
CBH	R/W	○	Horizontal ROI Effective Pixel ROI_F (16bit : D[15..8])		
CCH	R/W	○	Horizontal ROI Effective Pixel ROI_G (16bit : D[7..0])	0	0 to 2,048
CDH	R/W	○	Horizontal ROI Effective Pixel ROI_G (16bit : D[15..8])		
CEH	R/W	○	Horizontal ROI Effective Pixel ROI_H (16bit : D[7..0])	0	0 to 2,048
CFH	R/W	○	Horizontal ROI Effective Pixel ROI_H (16bit : D[15..8])		
D0 - DDH			Reserved		
DEH	R/W	○	Pixel defect correction mode (16bit : D[7		
DFH	R/W	○	Pixel defect correction mode2 (16bit : D[		
E0 - EDH			Reserved		
EEH	R/W	○	The camera function mode6 (8bit : D[7..(		
EFH	R/W	○	The camera function mode6 (8bit : D[15.		
F0 - FFH			Reserved		

7.4.2 Description of the camera control commands

The under line settings are the factory default settings

Command No.	Command Description
10H: MOD1[7..0]	[camera function mode 1] Initial data: MOD1[7..0] = 01H Sets the camera function mode. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 D7: No Function — Always set as “0” D6: Trigger Polarity — 0: Positive — 1: Negative D5: Trigger Mode — 0: Edge Preset — 01:Pluse Width D4 to D1: No Function — Always set as “0000” D0: Exposure time unit — 0: Line unit — 1: u sec unit Note The horizontal line noise is appeared on the image when Trigger signal is input while the image output period
11H: MOD2[7..0]	[Camera function mode 2] Initial data: MOD2[7..0] = 08H Sets the camera function mode. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 D7 : No Function — Always set as “0” D6 to D5: CameraLink Clock — 00:85MHz — 01:42.5MHz Another: No Function D4: No Function — Always set as “0” D3: Trigger Mode — 0:Tigger — 1:FreeRun D2 o D0 No Function — Always set as “000” Note:While the camera is in Trigger Mode, the video will not output without the trigger signal input.
12H: MOD3[7..0]	[Camera function mode 3] Initial data: MOD3[7..0] = 50H Sets the camera function mode. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 D7 to D6 Video out — 00: 10bit — 01: 8bit 10: 12bit *Note 12H, — 11: No function (Prohibited setting. Do not set these values) D5: Trigger signal input connector — 0: Camera Link (CC1) — 1: Power/IO connector (No. 2 pin, SP4) D4: Exposure start mode — 0: Normal — 1: Horizontal Synchronization D3 to D0: No function — Sets always as "000"
14H: UART[7..0]	[The communication mode] Initial data: 1 Sets the communication mode. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 D7 to D2 No function D1 to D0 Communication mode

*Note 12H : Video out bit can be selected by mode. As for tl

Command No.	Command Description
20H: SVR[7..0] 21H: SVR[15..8] 22H: SVR[23..16]	[The exposure time of the electronic shutter] Initial data: SVR[23..0] = 2048, data range: 0 to 16,777,215 Sets the preset shutter speed for electronic shutter. When 10H.0 = 1 (Exposure time unit: usec) Exposure time (shutter speed) = 1 x SVR[23..0] useconds When SVR[23..0] < 22, SVR[23..0] will be set as SVR[23..0] = 22 automatically. When 10H.0 = 0 (Exposure time unit: Line unit) Exposure time (shutter speed) = (SVR[23..0] x 129 / A) + 21 useconds *Note: A should be determined from CameraLink Clock(11H[D6..D5]) and Camera Mode(EEH) Please refer to the table as below. Note The horizontal line noise is appeared on the image when Trigger signal is input while the image output period

EEH	11H[D6..D5]	A
0	0	10.625
1	0	21.25
2	0	42.5
3	0	48
5	0	21.25
6	0	42.5
7	0	42.5
8	0	21.25
9	0	42.5
A	0	42.5
B	0	42.5
C	0	21.25
D	0	42.5
E	0	42.5
F	0	42.5
0	1	5.3125
1	1	10.625
2	1	21.25
3	1	24
5	1	10.625
6	1	21.25
7	1	21.25
8	1	10.625
9	1	21.25
A	1	21.25
B	1	21.25
C	1	10.625
D	1	21.25
E	1	21.25
F	1	21.25

Command No.	Command Description
28H: DLY[7..0]	[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. Delay time = 2 x DLY[7..0] (usecond)
31H: DGB[7..0]	[The digital gain] Initial data: DGB[7..0] = The factory adjusted value (The value of the address 0EH) Video level = (Input video level - CLAMP[7..0]) x (1 + DGB[7..0] / 64) + CLAMP[7..0] CLAMP[7..0]: The clamp level (The value of the address 38H)
38H: CLAMP[7..0]	[The clamp level] Initial data: CLAMP[7..0] = 40, data range: 0 to 255 Sets the clamp level (The clamp level of the black signal). This value is on 10bit video output/ when 8bit output, 1/4 from setting value output as Clamp level.
3AH: WBR[7..0]	[White Blance R Gain] Initial data: WBR[7..0] = 0, data range: 0 to 255 Set the Red gain on Bayer Video level = (Input video level - CLAMP[7..0]) x (1 + WBR[7..0] / 128) + CLAMP[7..0] Only on Color mode
3BH: WBB[7..0]	[White Blance GR Gain] Initial data: WBGR[7..0] = 0, data range: 0 to 255 Set the Green gain on Bayer GR line Video level = (Input video level - CLAMP[7..0]) x (1 + WBGR[7..0] / 128) + CLAMP[7..0] Only on Color mode
3CH: WBGR[7..0]	[White Blance GR Gain] Initial data: WBGR[7..0] = 0, data range: 0 to 255 Set the Green gain on Bayer GR line Video level = (Input video level - CLAMP[7..0]) x (1 + WBGR[7..0] / 128) + CLAMP[7..0] Only on Color mode
3DH: WBGB[7..0]	[White Blance GB Gain] Initial data: WBGR[7..0] = 0, data range: 0 to 255 Set the Green gain on Bayer GB line Video level = (Input video level - CLAMP[7..0]) x (1 + WBGR[7..0] / 128) + CLAMP[7..0] Only on Color mode
47H: HDR[7..0]	[HDR slope] Initial data: HDR[7..0] = 0 Sets the slope mode (HDR mode) and number of the slope. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 D7 to D6 HDR mode — 00: Normal; 01: Enable; Another: No Function D5 to D2: No function — Sets always as "0000" D1 to D0: Number of the slope — 0: No Function; 1: No Function; 2: Two Slopes; 3: Three Slopes
4BH: PGA [7..0]	[PGA] Initial data: PGA[7..0] = 0 Sets the gain for adjust the brightness. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 D7: No Function — Always set as "0" D6 to D5: PGA gain — 00: 1.0x gain; 01: 1.2x gain; 10: 1.4x gain; 11: 1.6x gain D4 to D0: No Function

Command No.	Command Description
4CH: H_START [7..0] 4DH: H_START [15..8]	[The horizontal effective pixels of changeable DVAL] Sets the horizontal start position of the changeable DVAL. When the horizontal effective pixels is larger than full horizontal pixel number, The horizontal start position sets as 0 automatically. 4DH.D7 LVAL selection 0: Continuous (Horizontal equals DVAL), 1: Continuous (Full horizontal)
56H: KN1P[7..0]	[Knee1 prameter] Initial data: KN1P[7..0] = 1 Sets the exposure time for the electronic shutter for the knee1 point, as for the exposure time. Knee1 exposure = EXPTA[23..0] x 129 x (1 CLK cycle) x KN1P[7..0] / 100
57H: KN2P[7..0]	[Knee2 prameter] Initial data: KN2P[7..0] = 1 Sets the exposure time for the electronic shutter for the knee2 point, as for the exposure time. Knee1 exposure = EXPTA[23..0] x 129 x (1 CLK cycle) x KN2P[7..0] / 100
5BH: Vlow2[7..0]	[Vlow2 voltage] Initial data: 96, data range: 0 to 255 Sets the Vlow2 voltage for the HDR saturation level voltage.
5FH: Vlow3[7..0]	[Vlow3 voltage] Initial data: 96, data range: 0 to 255 Sets the Vlow3 voltage for the HDR saturation level voltage.
68H: [7..0]	[Reverse mode] Initial data: 0 Sets the image output direction. D[7..0] D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 D7 to D6: No Function Always set as “00” D5: Vertical mirror image 0: Normal image 1: Vertical mirror image D4: Horizontal mirror image 0: Normal image 1:Horizontal mirror image D3 to D0: No Function Always set as “0000”

Command No.	Command Description
78H: TESTP[7..0]	[Test Pattern] Initial data: TESTP [7..0] = 00H Sets the test pattern video output. D[7..0] D7 D6 D5 D4 D3 D2 D1 D0 0: Normal Video Image — 1: Gray Scale 2: Ramp — 3: 100% White 4: White Clip — 6: Color Bar Others: Black
79H: EFFCT[7..0]	[Image effect selection] Initial data: EFFCT[7..0] = 00H Sets the image effect. D[7..0] D7 D6 D5 D4 D3 D2 D1 D0 D7: Negative / Positive video selection — 0: Positive image; 1: Negative image D6 to D0: Image effect — 00H: No effect (Original); 01H: 9bit gradation; 02H: 9bit gradation; 03H: 7bit gradation; 04H: 6bit gradation; 05H: 5bit gradation; 06H: 4bit gradation; 07H: 3bit gradation; 08H: 2bit gradation; 09H: 1bit gradation 0A to 7FH: No Function (Prohibited settings. Do not set these values)
80H: E2P[7..0]	[EEPROM control] Initial data: E2P[7..0] = 00H D[7..0] D7 D6 D5 D4 D3 D2 D1 D0 D7 to D1: No function — Always set as “0000000” D6 to D0: Write control to the EEPROM — 0: Prohibited; 1: Accept Note: This bit is cleared to “0” automatically by the internal processes after the execution of the command.
81H: INI[7..0]	[Reload camera default setting] Initial data: INI [7..0] = 00H Sets the factory setting. D[7..0] D7 D6 D5 D4 D3 D2 D1 D0 D7 to D0: Factory Setting — 0: No Function; 170: Reload factory setting Note: Once reloaded the camera setting, this register may set “0” automatically

Command No.	Command Description
90H: VASA[7..0] 91H: VASA[15..8]	[Vertical ROI Start Line ROI_A] STC-CMB200PCL/CMC200PCL: Initial data: ROI_A[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_A[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_A. Actual start line of the partial scanning ROI_A = this value + 1
92H: VASB[7..0] 93H: VASB [15..8]	[Vertical ROI Start Line ROI_B] STC-CMB200PCL/CMC200PCL: Initial data: ROI_B[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_B[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_B. Actual start line of the partial scanning ROI_B = this value + 1
94H: VASC[7..0] 95H: VASC [15..8]	[Vertical ROI Start Line ROI_C] STC-CMB200PCL/CMC200PCL: Initial data: ROI_C[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_C[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_C. Actual start line of the partial scanning ROI_C = this value + 1
96H: VASD[7..0] 97H: VASD [15..8]	[Vertical ROI Start Line ROI_D] STC-CMB200PCL/CMC200PCL: Initial data: ROI_D[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_D[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_D. Actual start line of the partial scanning ROI_D = this value + 1
98H: VASE[7..0] 99H: VASE [15..8]	[Vertical ROI Start Line ROI_E] STC-CMB200PCL/CMC200PCL: Initial data: ROI_E[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_E[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_E. Actual start line of the partial scanning ROI_E = this value + 1
9AH: VASF[7..0] 9BH: VASF [15..8]	[Vertical ROI Start Line ROI_F] STC-CMB200PCL/CMC200PCL: Initial data: ROI_F[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_F[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_F. Actual start line of the partial scanning ROI_F = this value + 1
9CH: VASG[7..0] 9DH: VASG [15..8]	[Vertical ROI Start Line ROI_G] STC-CMB200PCL/CMC200PCL: Initial data: ROI_G[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_G[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_G. Actual start line of the partial scanning ROI_G = this value + 1
9EH: VASH[7..0] 9FH: VASH [15..8]	[Vertical ROI Start Line ROI_H] STC-CMB200PCL/CMC200PCL: Initial data: ROI_H[15..0] = 0, data range: 0 to 1,087 STC-CMB401PCL/CMC4401PCL: Initial data: ROI_H[15..0] = 0, data range: 0 to 2,047 Sets Vertical ROI Start Line ROI_H. Actual start line of the partial scanning ROI_H = this value + 1

Command No.	Command Description
A0H: VAHA[7..0] A1H: VAHA[15..8]	[Vertical ROI Effective Line ROI_A] STC-CMB200PCL/CMC200PCL: Initial data: VAHA [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHA [15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048
A2H: VAHB[7..0] A3H: VAHB[15..8]	[Vertical ROI Effective Line ROI_B] STC-CMB200PCL/CMC200PCL: Initial data: VAHB [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHB[15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048
A4H: VAHC[7..0] A5H: VAHC[15..8]	[Vertical ROI Effective Line ROI_C] STC-CMB200PCL/CMC200PCL: Initial data: VAHC [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHC[15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048
A6H: VAHD[7..0] A7H: VAHD[15..8]	[Vertical ROI Effective Line ROI_D] STC-CMB200PCL/CMC200PCL: Initial data: VAHD [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHD[15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048
A8H: VAHE[7..0] A9H: VAHE[15..8]	[Vertical ROI Effective Line ROI_E] STC-CMB200PCL/CMC200PCL: Initial data: VAHE [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHE[15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048
AAH: VAHF[7..0] ABH: VAHF[15..8]	[Vertical ROI Effective Line ROI_F] STC-CMB200PCL/CMC200PCL: Initial data: VAHF [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHF[15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088

Command No.	Command Description
ACH: VAHG[7..0] ADH: VAHG[15..8]	[Vertical ROI Effective Line ROI_G] STC-CMB200PCL/CMC200PCL: Initial data: VAHG [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHG [15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048
AEH: VAHH[7..0] AFH: VAHG[15..8]	[Vertical ROI Effective Line ROI_H] STC-CMB200PCL/CMC200PCL: Initial data: VAHH [15..0] = 1,088, data range: 0 to 1,088 STC-CMB401PCL/CMC4401PCL: Initial data: VAHH[15..0] = 2,048, data range: 0 to 2,048 Sets the number of the effective lines (image height) of the variable partial scanning. The camera works with full scanning, when the total effective lines of the eight partial. (VAHA [] + VAHB[] + VAHC[] + VAHD[] + VAHE[] + VAHF[] + VAHG[] + VAHH[]) is grater than below value: STC-CMB200PCL/CMC200PCL: 1,088, STC-CMB401PCL/CMC4401PCL: 2,048

Command No.	Command Description
B0H: HASA[7..0] B1H: HASA[15..8]	[Horizontal ROI Start Pixel ROI_A] Initial data: HASA [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_A. Actual start pixel of the partial scanning ROI_A = this value + 1
B2H: HASB[7..0] B3H: HASB [15..8]	[Horizontal ROI Start Pixel ROI_B] Initial data: HASB [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_B. Actual start pixel of the partial scanning ROI_B = this value + 1
B4H: HASC[7..0] B5H: HASC [15..8]	[Horizontal ROI Start Pixel ROI_C] Initial data: HASC [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_C. Actual start pixel of the partial scanning ROI_C = this value + 1
B6H: HASD[7..0] B7H: HASD [15..8]	[Horizontal ROI Start Pixel ROI_D] Initial data: HASD [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_D Actual start pixel of the partial scanning ROI_D = this value + 1
B8H: HASE[7..0] B9H: HASE [15..8]	[Horizontal ROI Start Pixel ROI_E] Initial data: HASE [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_E. Actual start pixel of the partial scanning ROI_E = this value + 1
BAH: HASF[7..0] BBH: HASF [15..8]	[Horizontal ROI Start Pixel ROI_F] Initial data: HASF [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_F. Actual start pixel of the partial scanning ROI_F = this value + 1
BCH: HASG[7..0] BDH: HASG [15..8]	[Horizontal ROI Start Pixel ROI_G] Initial data: HASG [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_G. Actual start pixel of the partial scanning ROI_G = this value + 1
BEH: HASH[7..0] BFH: HASH [15..8]	[Horizontal ROI Start Pixel ROI_F] Initial data: HASF [15..0] = 0, data range: 0 to 2,047 Sets Horizontal ROI Start Pixel ROI_F. Actual start pixel of the partial scanning ROI_F = this value + 1

Command No.	Command Description
C0H: HAWA[7..0] C1H: HAWA[15..8]	[Horizontal ROI Effective Pixel ROI_A] Initial data: HAWA [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
C2H: HAWB[7..0] C3H: HAWB[15..8]	[Horizontal ROI Effective Pixel ROI_B] Initial data: HAWB [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
C4H: HAWC[7..0] C5H: HAWC[15..8]	[Horizontal ROI Effective Pixel ROI_C] Initial data: HAWC [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
C6H: HAWD[7..0] C7H: HAWD[15..8]	[Horizontal ROI Effective Pixel ROI_D] Initial data: HAWD [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
C8H: HAWE[7..0] C9H: HAWE[15..8]	[Horizontal ROI Effective Pixel ROI_E] Initial data: HAWE [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
CAH: HAWF[7..0] CBH: HAWF[15..8]	[Horizontal ROI Effective Pixel ROI_F] Initial data: HAWF [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
CCH: VAWG[7..0] CDH: VAWG[15..8]	[Horizontal ROI Effective Pixel ROI_G] Initial data: HAWG [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels, Effective pixels (image width) = Horizontal pixels
CEH: VAWH[7..0] CFH: VAWG[15..8]	[Horizontal ROI Effective Pixel ROI_H] Initial data: HAWH [15..0] = 2,048, data range: 0 to 2,048 Sets the number of effective pixels (image width). The effective pixels is same as DVAL. Variable value depends on Tap number of CameraLink. When effective pixels (image width) is 0 or larger than horizontal pixels Effective pixels (image width) = Horizontal pix

Command No.	Command Description
DEH: DEF_M[7..0]	[Pixel defect correction mode 1] Initial data: DEF_M [7..0] = 01H Sets the pixel defect correction. As for the x-y coordinate of defect pixel, please refer to the Device Code:3AH D[7..0] D7 D6 D5 D4 D3 D2 D1 D0 When Highlight the corrected pixel is Enable, corrected pixel appeared with highlight. Highlight does not work with subsampling. D7 to D2: No Function — Always set as "0000000" D1: Highlight the corrected pixel — 0: Disable (default) — 1: Enable D0: Pixel Defect Correction — 0: Disable — 1: Enable (default)
DFH: DEF_M2[7..0]	[Pixel defect correction mode 2] Initial data: DEF_M2 [7..0] = 70H Sets the artificial effect with pixel defect correction. D[7..0] D7 D6 D5 D4 D3 D2 D1 D0 D7: No Function — Always set as "0" D6: ROI — 0: Disable (default) — 1: Enable D5: Vertical Flip — 0: Disable (default) — 1: Enable D4: Horizontal Flip — 0: Disable (default) — 1: Enable D3 to D0 No Function — Always set as "0000"
EEH: MOD6[7..0] EFH MOD6[15..8]	[The camera function mode 6] Initial data: MOD6 [7..0] = 02H, data range: 0 to 15 Sets the camera TAP number for each setting. D[15..0] D15 to D0: 0: 2TAP (Horizontal: 2,048 pixels), 1: 4 TAP (Horizontal: 2,048 pixels), 2: 8 TAP (Horizontal: 2,048 pixels), (default) 3: 10 TAP (Horizontal: 2,040 pixels), 4: No function 5: 2 TAP (Horizontal: 1,024 pixels), 6: 2 TAP (Horizontal: 512 pixels), 7: 4 TAP (Horizontal: 1,024 pixels) 8: 2 TAP (2 × 2 Binning), 9: 4 TAP (2 × 2 Binning), 10: 2 TAP (4 × 4 Binning), 11: 1 TAP (8 × 8 Binning), 12: 2 TAP (2 × 2 Subsampling), 13: 4 TAP (2 × 2 Subsampling), 14: 2 TAP (4 × 4 Subsampling), 15: 1 TAP (8 × 8 Subsampling) More than16: No function Note: Binning and Subsampling are available on Monochrome camera.

7.4.3 The camera commands list (Device Code : 3AH)

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.

Pixel Defect Correction(PDC)

Maximum 64points can be corrected.
When defect pixels were found in the factory, these defect pixels were corrected before shipping.

This function can be control through Pixel defect correction mode(DEH,DFH).

2M: STC-CMB200PCL,STC-CMC200PCL
4M: STC-CMB401PCL,STC-CMC401PCL

Command No.	R/W	EEPROM	Function	Initial Data	Data Range
00H	R/W	O	PDC Horizontal coordinate 1 (16bit : D[7..0])	FFFFh	0 to 2,047
01H	R/W	O	PDC Horizontal coordinate 1 (16bit : D[15..8])	(PDC OFF)	
02H	R/W	O	PDC Horizontal coordinate 1 (16bit : D[7..0])	FFFFh	2M:0 to 1,087
03H	R/W	O	PDC Horizontal coordinate 1 (16bit : D[15..8])	(PDC OFF)	4M:0 to 2,047
04H	R/W	O	PDC Horizontal coordinate 2 (16bit : D[7..0])	FFFFh	0 to 2,047
05H	R/W	O	PDC Horizontal coordinate 2 (16bit : D[15..8])	(PDC OFF)	
06H	R/W	O	PDC Horizontal coordinate 2 (16bit : D[7..0])	FFFFh	2M:0 to 1,087
07H	R/W	O	PDC Horizontal coordinate 2 (16bit : D[15..8])	(PDC OFF)	4M:0 to 2,047
●					●
●					●
FCH	R/W	O	PDC Horizontal coordinate 64 (16bit : D[7..0])	FFFFh	0 to 2,047
FDH	R/W	O	PDC Horizontal coordinate 64(16bit : D[15..8])	(PDC OFF)	
FEH	R/W	O	PDC Horizontal coordinate 64 (16bit : D[7..0])	FFFFh	2M:0 to 1,087
FFH	R/W	O	PDC Horizontal coordinate 64 (16bit : D[15..8])	(PDC OFF)	4M:0 to 2,047

7.4.4 Sequence for the command saves to the EEPROM

Please use below sequence for the command saves to the EEPROM

1) Set “1” to the 80H.0 for the accept “write control to the EEPROM”.

2) Send the command and the save data with the EEPROM access command, which is set “1” for the page selection.

3) The camera send back the one of the below receiving code after write EEPROM.
   01H: OK
   10H: EEPROM write error

4) 80H.0 is changed to “0” automatically after write EEPROM.

Note.1) DO NOT saves to the EEPROM when 80H.0 is “0”.

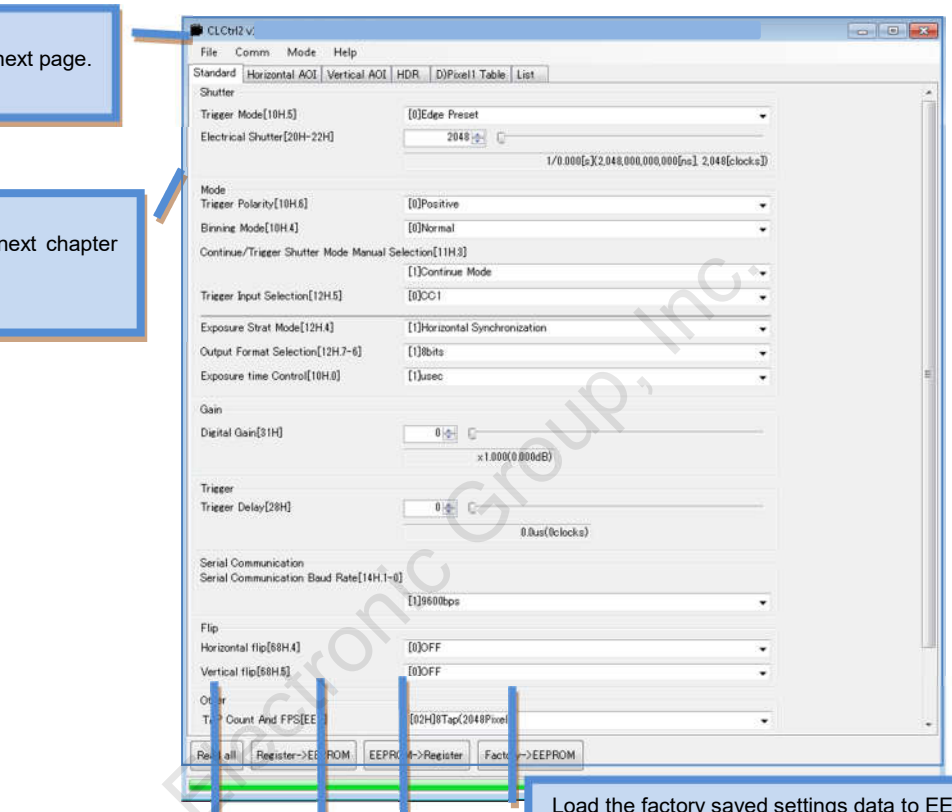
Note.2) When save the multiple sequence command to the EEPROM, all data save to the EEPROM by one operation from 1) to 4).
Example of the multiple sequence command: “10H, 11H, 12H and 13H” or “22H, 23H and 24H”.

Note.3) When save the multiple command data, which is not sequence command, to the EEPROM, it is necessary to operate the number of times from 1) to 4).
Example of the multiple command: “10H, 13H, 19H and 1BH” or “20H, 23H and 25H”.

8. Control Software

8.1. Summary

After installing the control software and launch the CLCtrl2.exe, main window appears as below.



Menu
As for the detail, please refer to the next page.

Camera Setting Parameters
As for the detail, please refer to the next chapter **Software Function(Standard)**.

Load the factory saved settings data to EERPOM .
As for the detail, please refer to the next chapter **Comm**.

Load the previously saved settings data from EERPOM to Register.
As for the detail, please refer to the next chapter **Comm**.

Read the ca
As for the d

File

Open[From File to Register]
Open the camera setting file (.i2c).

Save as[From Register to File]
Save the current camera setting data on the register to the PC as i2c file.

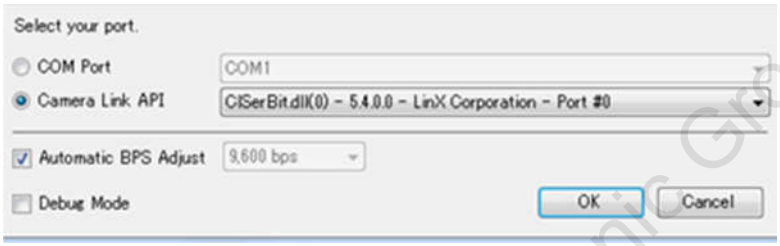
Open[From File to EEPROM]
Open the camera setting file (.i2c) that is read at power on.

Save as[From EEPROM to File]
Save the camera setting data on EEPROM to the PC as i2c file.

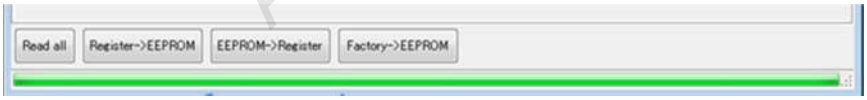
Quit
Exit the control software.

Comm

Port Setting



[Select your port]
COM port When the Graber Board supprot COM port, Please select this comand.
Camera Link API When the Graber Board supprots Camera Link API, Please select this comand.
[Automatic BPS Adjust]
Select the serial comunication speed automatically. When un-checked the box, comunication speed can be selected.
[Debug Mode]
Basically un-checked the box, when checked the box, transfer data can be monitored through 3rd party software.



Read all
Read the setting of all data from camera r
saved without saving the EEPROM(**Registe**

Register -> EEPROM
Save the register data into the EEPROM on the c

EEPROM -> Register
Read the EEPROM data into the register. When

Factory -> EEPROM
Restore the factory setting data from EEPROM t

Mode

Language

Select the language from English, Japanese.

Help

Advanced Operation

When password(sentechcamera) is input, additional functions appear for power user. SP Pin tab can be used.

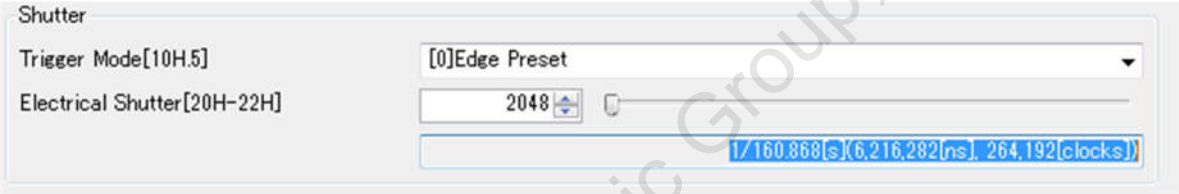
Version Information

Software information window appear.

Software Function(Standard)

This tab has basic camera function. the number(like [10H.5]) beside of the function is register address. When direct register access is needed. Please refer to the **7.The communication protocol specifications.**

Shutter



Trigger

Mode

Edge Preset The camera exposure starts at the rising (or falling) edge of the trigger pulse. Exposure duration time is preset.

Pulse Width The camera exposure starts at the rising (or falling)edge of the trigger pulse and stops at the falling(or rising) edge of the trigger pulse.

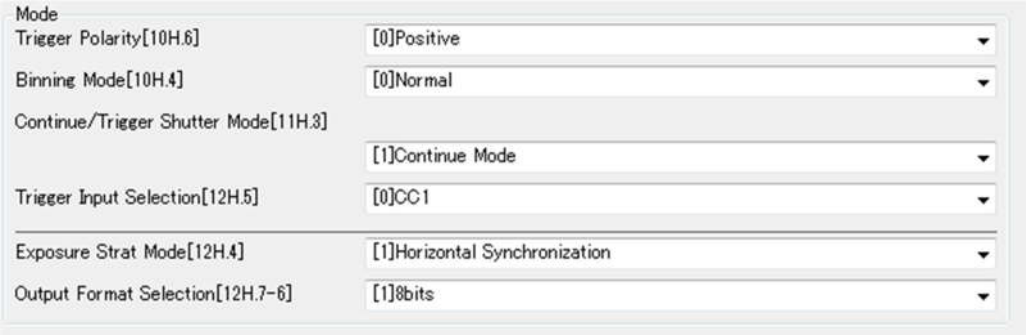
As for the detail of Trigger Mode, please refer to the **6.Camera function modes**.

Electrical Shutter

Effectrical shutter setting can be set through the slide ba or set through the actrual register value. Actual exposure time appears on the bottom of the slide bar.

As for the detail of exposure time setting, please refer to the**7.The communication protocol specifications.**

Mode



Trigger Polarity
Positive Positive signal is availabe as Trigger
Negative Negative signal is availabe as Trigger

Binning Mode
Normal Disable the binning
Binning Enable the binning. As for the actural procedure,please refer to the **Binning[2AH.5-4],Sub[2AH.1-0].** Averaged pixel data make decreasing the noise level. As for the detail of setting, please refer to the **0.Other**.

Contiune/Trigger Shutter Mode
Continue Mode Obtaing the image from the camera automatically.The trigger is gerated inside of the camera continuously.
Trigger Shutter Mode Obtaing the image from the external trigger timing. When this mode is selected.Edge Preset, Pulse Width on the [Trigger Mode] are available.
As for the detail of Continue Mode, Trigger Shutter Mode, please refer to the **6.Camera function modes**.

Trigger Input Selection
CC1: Trigger signal input from camera link conector on pin CC1.
SP4: Trigger singnal input from I/Oport. As for the detail, please refer to the **0.Using the Trigger Signal through 6pin.**

Exposure Start Mode
Normal : Exposure is going to start after trigger input. The exposure can start during the video out from the camera with horizontal noises.

Horizontal Synchronization The exposure can start during the video out from the camera without horizontal noises. The maximum delay to start exposure from the trigger inputs in 1H.

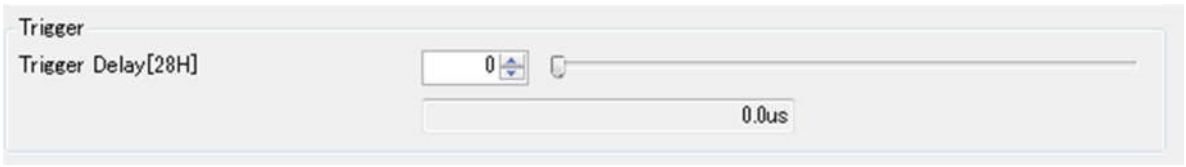
Output Format Selection. Video output bit can be selected from 8/10/12 bit. Video output bit is different for each mode. As for the relation of mode to video output, please refer to the **5.2.**

Gain

Digital Gain

The value of digital gain.As for the detail of gain calucuration, please refer to the 31H.

Trigger



Trigger

Delay

The delay time for the trigger.. As for the detail of delay time calculation, please refer to the 28H.

Serial Communication

Serial Communication Baud Rate

Baud rate can be selected.

Flip

Horizontal flip

OFF Normal image
ON Horizontal Mirror image

Vertical flip

OFF Normal image
ON Vertical Mirror image

Other

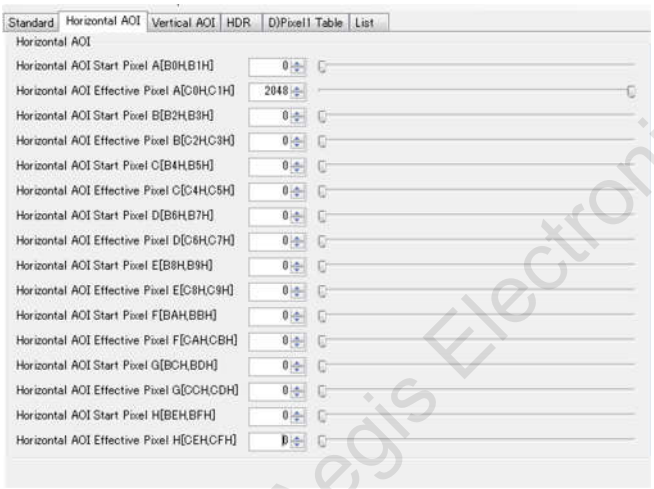
TAP Count And FPS

TAP number can be selected by frame rate, Camera Link Output Bit, Video mode. As for the detail, please refer to the **5.2.**

CL Clock

CameraLink Output PixelClock Frequency(MHz) support High speed mode and Low speed mode. Clock speed can be selected by frame rate, Camera Link Output Bit and Video mode. As for the detail, please refer to the **5.2.**

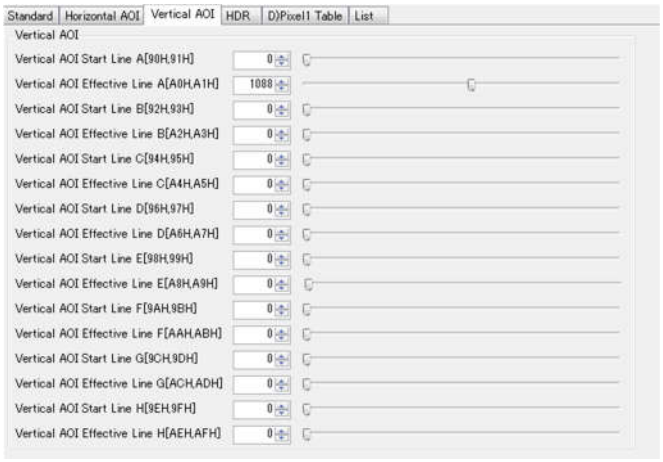
Software Function (Horizontal ROI)



Horizontal ROI

Horizontal scan can be set. As for the detail please refer to 5.3ROI Output Timing and register around B0H.

Software Function (Vertical ROI)



VerticalROI

Vertical scan can be set. As for the detail please refer to 5.3ROI Output Timing and register around 90H.

Software Function (HDR)

This tab uses for the power user to control the Gamma deeply. Do not use the color model.

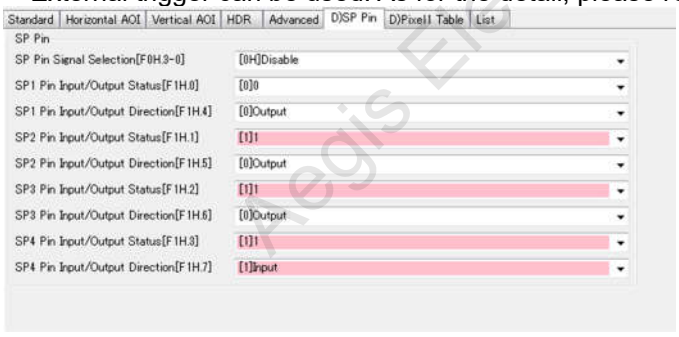
After entered the"sentechcamera" on Advanced Operation on Help Menu. Use can control these function as below.

Software Function Advanced)

This tab is used for factory setting. Please do not use this tab.

Software Function (SP Pin)

External trigger can be used. As for the detail, please refer to the **0. Using the Trigger Signal through 6pin.**

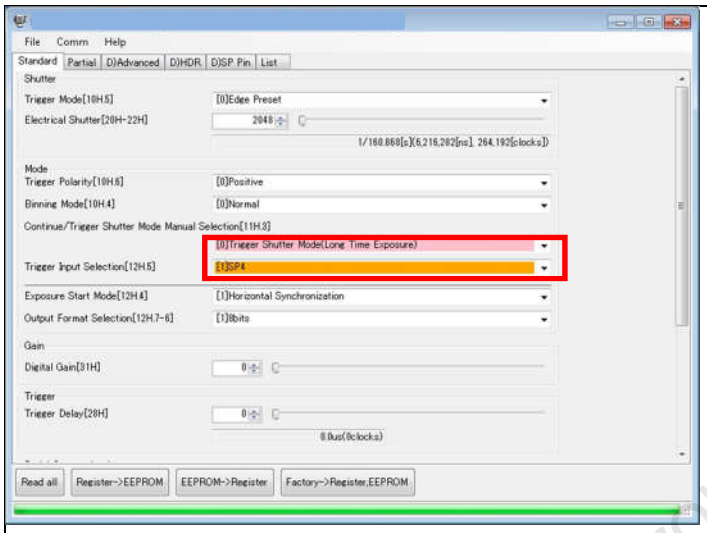


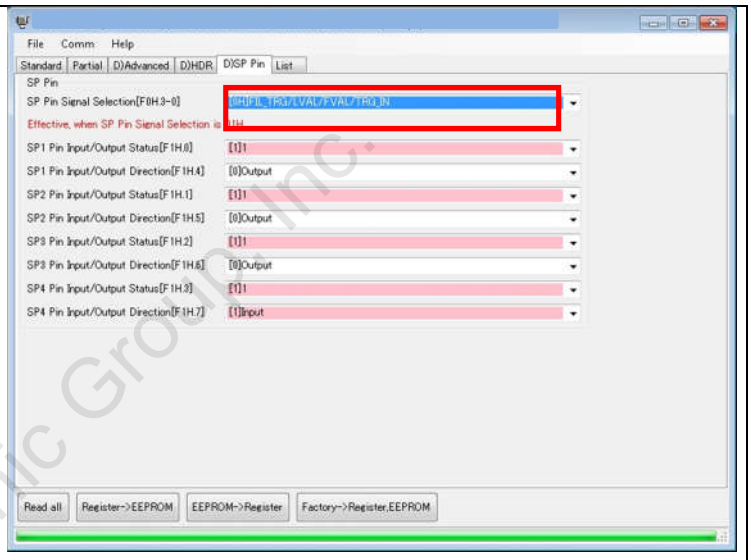
9. Actual Camera Setting & Technical Notes

Using the Trigger Signal through 6pin

1.Select the “[0]Trigger Shutter Mode(Long Exposure)” on Contiue/Trigger Shutter Mode Selection at Standard tab through the control software(CLCtrl2).
2. Select the ”[0H] FIL_TRG/LVAL/FVAL_TRG_IN” on SP Pin Signal Selection at SP_Pin tab.
3. Input the trigger signal through Pin2. As for using the software, please refer to the **0.**

Control Software.





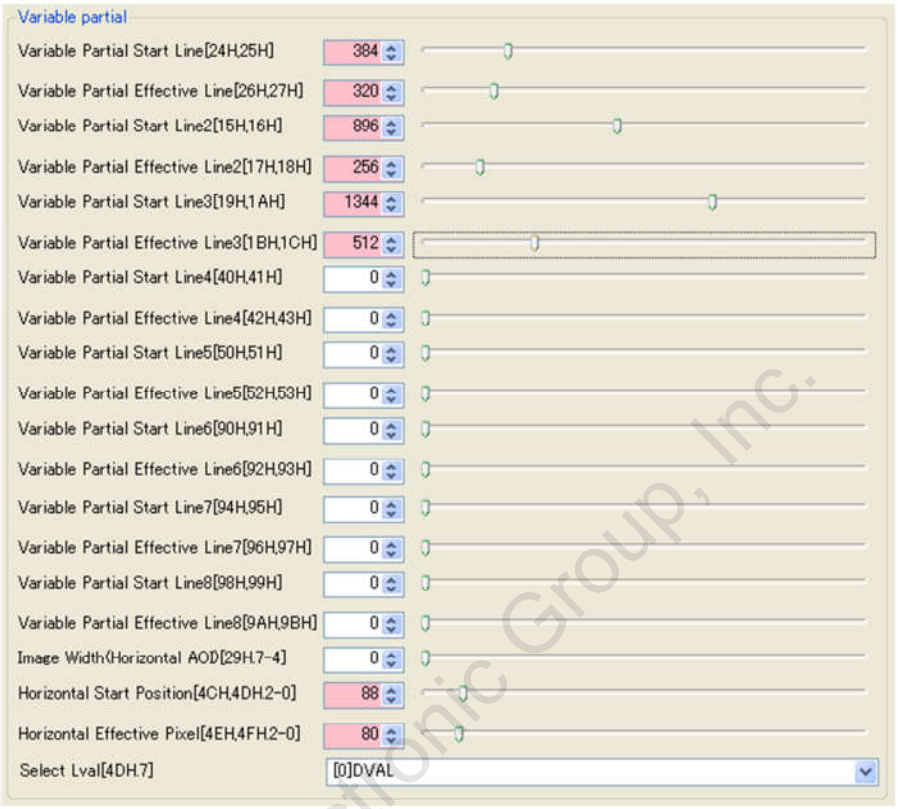
SP Pin Signal Selection Table

Pin No	5	4	3	2
Addr=F0	SP1	SP2	SP3	SP4
0	AfterTrigger FILTER	LVAL	FVAL	**Trigger Input**
1	F1h.0	F1h.1	F1h.2	F1h.3
2	CC1	T_EXP1	FRAME_REQ	HIGH in Exposure
3	CC1	T_EXP1	FRAME_REQ	FVAL
4 ～15	Reserved			

Example setting of ROI

e.g.

Setting on 8 TAP (2048 Pixel)



e.g.

The value of The horizontal effective pixel, The horizontal effective pixels of changeable DVAL for each setting

TAP Number = 8
H_STRAT: Horizontal start position = 704
H_NUMBER: Horizontal available pixel number = 640

The horizontal effective pixel

Register[4CH,4DH2-0] ＝704 ÷ TAP Number ÷ Binning or Subsampling number = 704 ÷ 8 ÷ 1 = 88

The horizontal effective pixels of changeable DVAL

Register[4EH,4FH2-0] ＝640 ÷ TAP Number ÷ Binning or Subsampling number = 640 ÷ 8 ÷ 1 = 80

Mode(EEH)	The horizontal effective pixel	The horizontal effective pixels of changeable DVAL	TAP Number	Binning or Subsampling number	Horizontal Pixel	
0	352	320	2	1	2048	Progressive
1	176	160	4	1	2048	Progressive
2	88	80	8	1	2048	Progressive
3 *	70	64	10	1	2040	Progressive
4						
5	352	320	2	1	1024	Progressive
6	352	320	2	1	512	Progressive
7	176	160	4	1	1024	Progressive
8	176	160	2	2	1024	2 x 2 Binning
9	88	80	4	2	1024	2 x 2 Binning
10	88	80	2	4	512	4 x 4 Binning
11	88	80	1	8	256	8 x 8 Binning
12	176	160	2	2	1024	2 x 2 Subsampling
13	88	80	4	2	1024	2 x 2 Subsampling
14	88	80	2	4	512	4 x 4 Subsampling
15	88	80	1	8	256	8 x 8 Subsampling

*Note :Horizontal pixel is 2040 on 10 TAP mode, then formula of “The horizontal effective pixel” is different.

The horizontal effective pixel

Register[4CH,4DH2-0] ＝(Horizontal start position -4) ÷ 10 TAP ÷ 1

Revisions

Rev	Date	Changes	Note
00	2014/01/17	New document	
01	2014/01/21	Revised resister information on page 90.	
02	2014/12/26	Revised Minimum scene illumination Added notification of Line unit on Exposure time unit	
03	2015/01/22	Revised Company name, Weight	
04	2015/02/05	Revised Dimensions on specifications	
05	2015/11/19	Revised Standard compliancy	
06	2016/02/05	Revised: Formula of Exposure time on 20H-22H	
07	2016/02/29	Revised: FPS on 2TAP 42.5MHz	
08	2016/11/04	Revised: Input Signal Circuit Examples	
09	2016/11/14	Revised: H Blank clk number on 10TAP	
10	2017/07/03	Revised: Change the name of company	