5Mega CMOS Camera

ID5MB-CL (B/W)
ID5MC-CL (COLOR)

Technical Manual

iDule Corporation

Table of Contents

1. **Product Outline**

ID5MB-CL/ID5MC-CL is a Camera Link interfaced and 5Mega resolution camera module.
5Mega pixels CMOS sensor with diagonal length 11.1mm is utilized. Entire pixels can be read out within 1/35.6s at 3Tap Base Configuration output.

Features

- ☐ Global Shutter CMOS sensor is utilized.
- ☐ Camera Link Base Configuration is supported.
- ☐ Fixed trigger shutter mode, pulse width trigger shutter mode are operable.
- ☐ Full frame rates are as follows.

2Tap Base Configuration	85MHz	32.8fps	8bit/10bit/12bit
2Tap Base Configuration	66MHz	25.5fps	8bit/10bit/12bit
3Tap Base Configuration	66MHz	35.6fps	8bit

2. **Handling Precautions**

The camera must not be used for any nuclear equipment or aerospace equipment with which mechanical failure or malfunction could result in serious bodily injury or loss of human life. Our warranty does not apply to dameges or defects caused by irregular and /or abnormal use of the product.
Please observe all warnings and cautions stated below.
Our warranty does not apply to damages or malfunctions caused by neglecting these precautions.

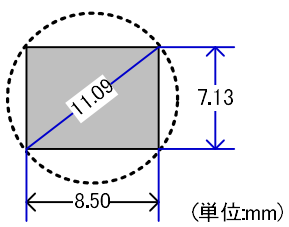
Do not use or store the camera in the following extreme conditions :

- Extremely dusty or humid places.
- Extremely hot or cold places (operating temperature -5℃ to +45℃).
- Close to generators of powerful electromagnetic radiation such as radio or TV transmitters.
- Places subject to fluorescent light reflections.
- Places subject to unstable (flickering, etc.) lighting conditions.
- Places subject to strong vibration.

· Remove dust or dirt on the surface of the lens with a blower.
· Do not apply excessive force or static electricity that could damage the camera.
· Do not shoot direct images that are extremely bright (e.g., light source, sun, etc.), and when camera is not in use, put the lens cap on.
· Confirm the mutual ground potential carefully and then connect the camera to monitors or computers. AC leaks from the connected devices may cause damages or destroy the camera.
· Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera.
· The voltage ripple of camera power DC +12V±10% shall be within ±50mV. Improper power supply voltage may cause noises on the video signals.
· The rising time of camera power supply voltage shall be less than +10V, Max 60ms. Please avoid noises like chattering when rising.

3. **Specification**

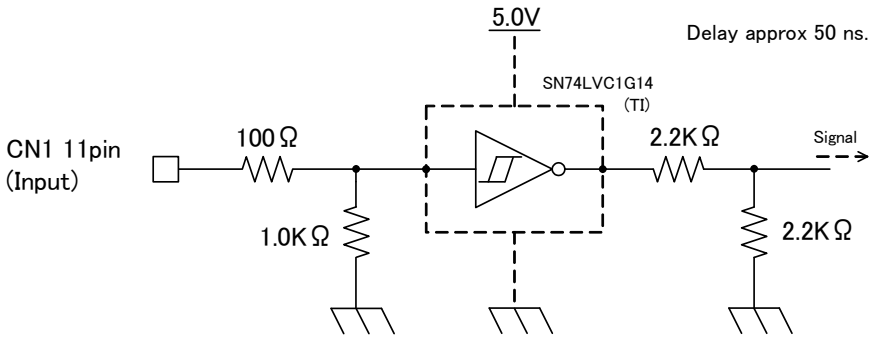
3.1.General Specification

(1) Image Sensor	Type	Diagonal length 11.1mm Global Shutter (SONY IMX264)		
	Effective Pixel Number	2464(H) x 2066(V)		
	Cell Size	3.45μm(H) x 3.45μm(V)		
	Image Circle	Φ11.09mm		
(2) Video Output Frequency	Pixel CLK	85MHz (2Tap) / 66MHz (2Tap/3Tap)		
	Output effective pixel number	2464(H) x 2056(V)		
	2Tap Base Configuration	32.8fps : 85MHz 25.5fps : 66MHz	1238(H) x 2089(V) : with Blanking	
	3Tap Base Configuration	35.6fps	886(H) x 2089(V) : with Blanking	
(3) Video Output	2Tap Base Configuration 3Tap Base Configuration			
(4) Output Format	Sensor AD	12bit		
	Camera Link	8bit / 10bit / 12bit (3Tap Base Configuration : 8bit fixed)		
(5) Sensitivity	B/W	F8	2000lx	
	Color	F5.6	2000lx	
	(at shutter speed 1/32.8s(OFF), Gain 0dB)			
(6) Minimum Illumination	B/W	F1.4	4lx	
	Color	F1.4	8lx	
	(at shutter speed 1/32.8s(OFF), Gain +12dB)			
(7) Power Requirements	DC+12V±10% (12pin / PoCL)			
(8) Power Consumption	typ 1.5 W max 1.8 W			
(9) Dimensions	H:29.0mm W:29.0mm D:29.0mm excluding projection			
(10) Weights	Approx. 50g			
(11) Lens Mount	C Mount			
(12) Gain	0dB ～ +12dB			
(13) Shutter Speed	OFF(1/32.8s) ～ 1/35000s (2Tap:85MHz) OFF(1/25.5s) ～ 1/30000s (2Tap:66MHz) OFF(1/35.6s) ～ 1/37000s (3Tap:66MHz)			
(14) Slow Shutter	OFF(1/32.8s) ～ 7.80s(2Tap:85MHz) OFF(1/25.5s) ～ 10.02s(2Tap:66MHz) OFF(1/35.6s) ～ 7.17s (3Tap:66MHz)			
(15) Trigger Mode	Fixed Trigger Shutter Mode, Pulse Width Shutter Trigger Mode			
(16) Partial Scan	Full Frame ～ 4 Line（4Line/Step） Partial Area : 1area			
(17) Safety/ Quality Standards	CE	To be applied for EN61000-6-4:2007+A1:2011 for Emission To be applied for EN61000-6-2:2005 for Immunity		
	RoHS: Conform to RoHS			
(18) Durability	Vibration	20～200 Hz, 98m/s^2 (10G), X,Y and Z directions (120 min for each direction)		
	Shock	No malfunction shall be occurred with 980m/s^2 (100G) for ±X,±Y,±Z, 6 directions. (without package)		
(19) Environment	Operation	-5℃ ～ +50℃ Humidity 0 ～ 90%RH		
	Storage	-25℃ ～ +65℃ Humidity 0 ～ 90%RH		

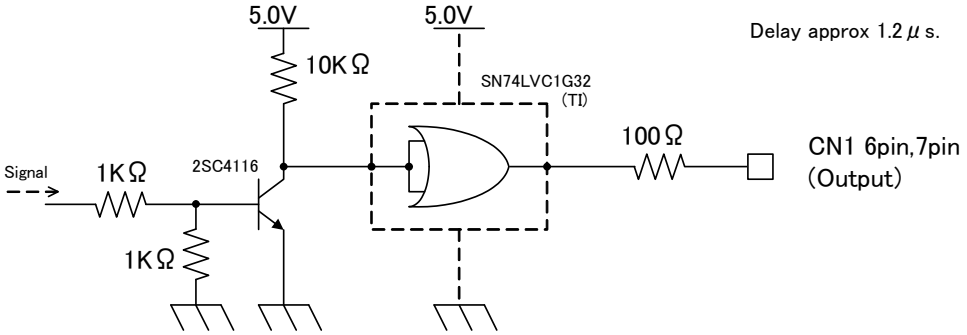
3.2.Camera Output Signal Specification

(1)Video Output Data	Effective Video Output	2464(H) × 2056(V)	(at Full Frame Scan Mode)
(2)Sync Signal Output	LVAL FVAL DVA SP(Exposure Signal)	Camera Link (LVDS)	
(3)Camera Control Signal Input	CC2･CC3･CC4	Camera Link Input(LVDS)	
(4)Trigger Input	Polarity	Positive/Negative Selectable	(Address 05)
	Pulse Width	1HD(Min:18.747us) ～Approx 2 frames	
	CC1	Camera Link Input (LVDS)	(Address 06: ⇔CN1)
(5)Serial Communication	SerTC SerTFG	Camera Link (LVDS)	(Serial to Camera) (Serial to Frame Grabber)
(6)Video Signals	White Clip Level	FFEh	(at Gain 0dB, 12bit)
	Setup Level	under 060h	
	Dark Shading	Both horizontal and vertical should be under 00Fh	
(7)Trigger in CN1	CN1 : 11 pin	Low1.4V(max),High3.3V~5.0V	
(8)Exposure out CN1	CN1 : 6 pin	Low0.55V(max),High3.8V(min)	
(9)FVAL out CN1	CN1 : 7 pin	Low0.55V(max),High3.8V(min)	

Trigger in CN1

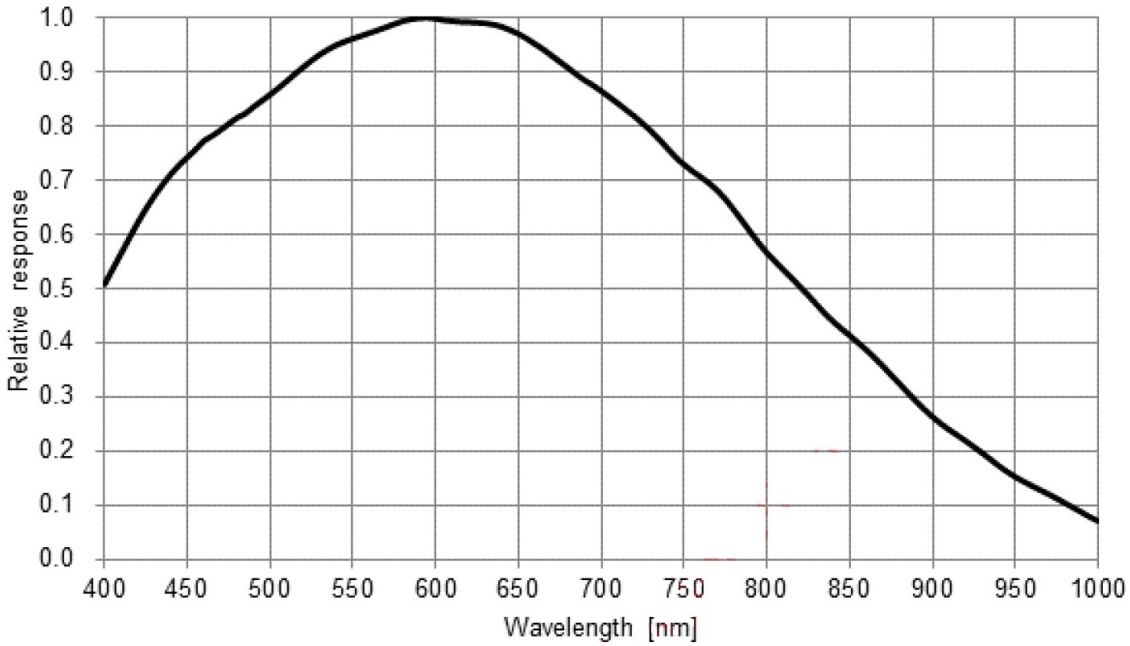


Exposure / FVAL out CN1

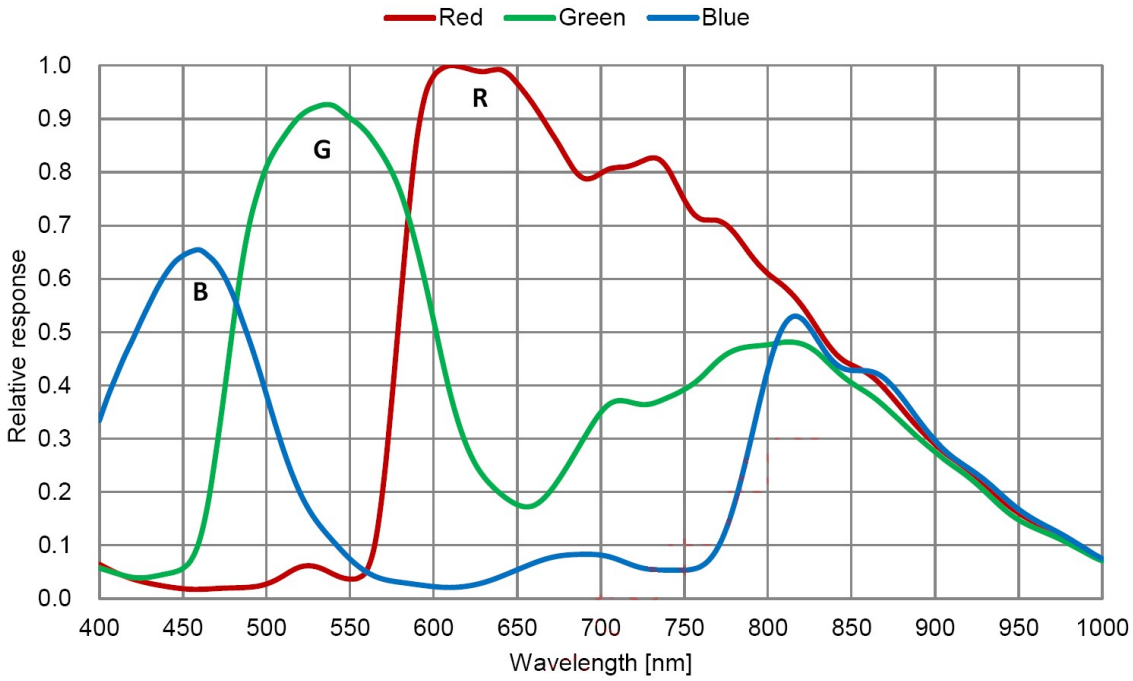


3.3.Spectral Response (Representative Value)

ID5MB-CL (B/W)

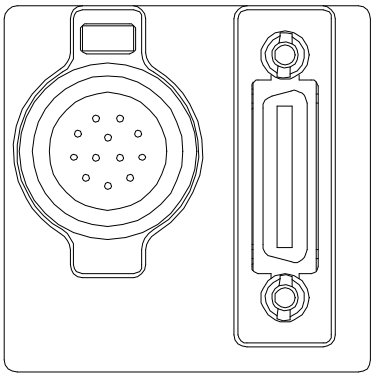


ID5MC-CL (Color)



4. **Connector**

4.1.Camera Link 12226-1100-00PL(3M)



Connector (P1)

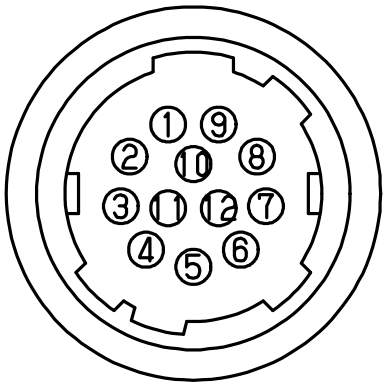
PIN NO		PIN NO	
1	**+12V(PoCL)**	14	**GND**
2	X0-	15	X0+
3	X1-	16	X1+
4	X2-	17	X2+
5	Xclk-	18	Xclk+
6	X3-	19	X3+
7	SerTC+	20	SerTC-
8	SerTFG-	21	SerTFG+
9	CC1- (Trigger IN -)	22	CC1+ (Trigger IN +)
10	CC2+	23	CC2-
11	CC3-	24	CC3+
12	CC4+	25	CC4-
13	**GND**	26	**+12V(PoCL)**

4.2.Power LED

Camera turns on LED light, when it is supplied electricity from the frame Grabber board.

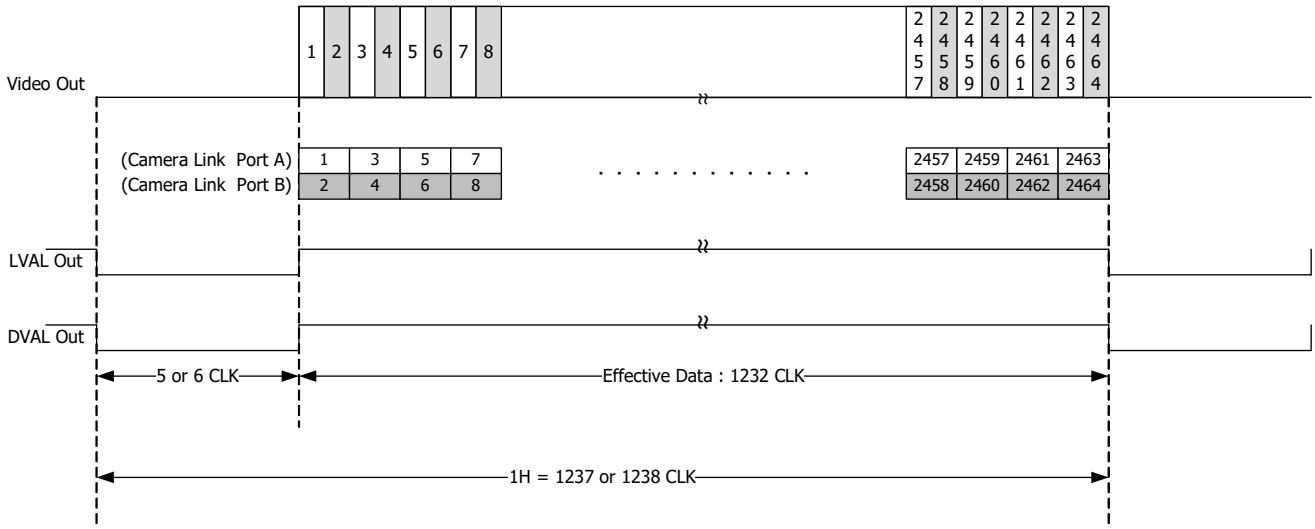
4.3.12pin Connector HR10A-10R-12PB(72) HIROSE

PIN NO	
1	GND
2	Power Input (DC+12V)
3	GND
4	NC
5	GND
6	FVAL out
7	Exposure out
8	GND
9	NC
10	NC
11	Trigger in
12	GND



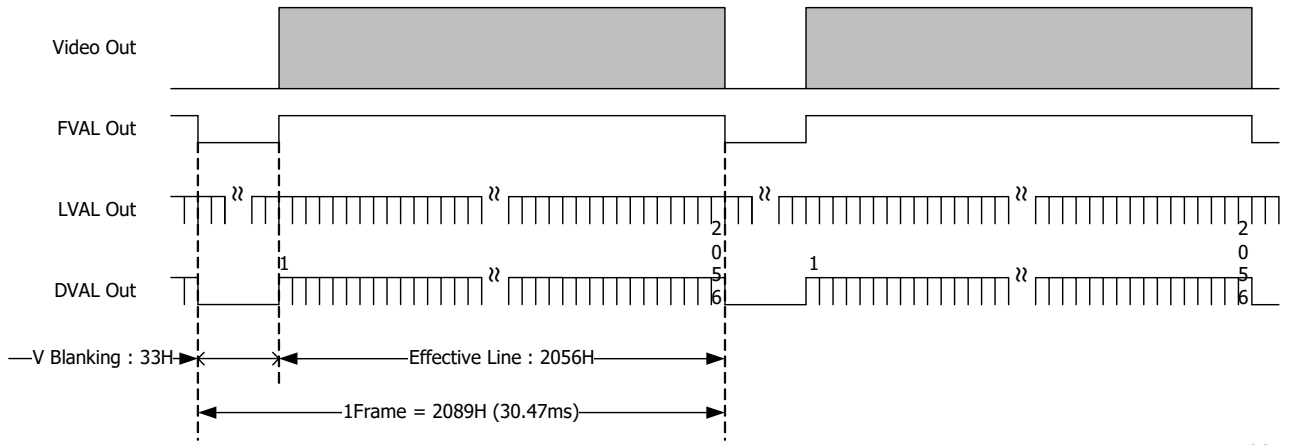
5. **Timing Chart**

5.1.Horizontal Synchronous Signals Timing (2Tap Base Configuration:85MHz)



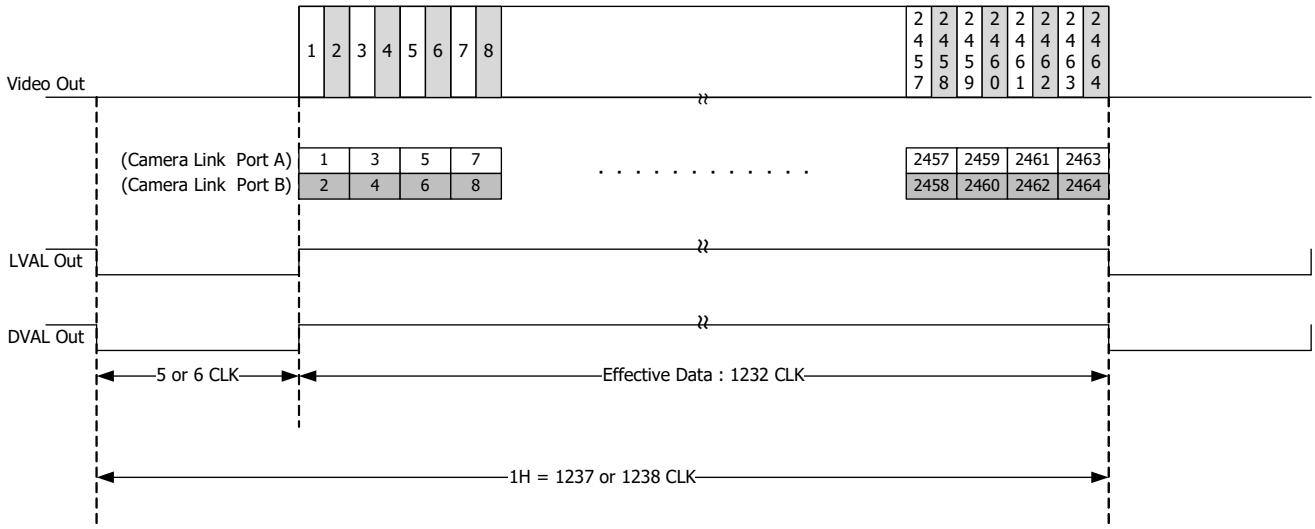
Camera Link CLK : 84.857143MHz
(Clock count per 1frame : 2585585)

5.2.Vertical Synchronous Signals Timing (2Tap Base Configuration:85MHz)



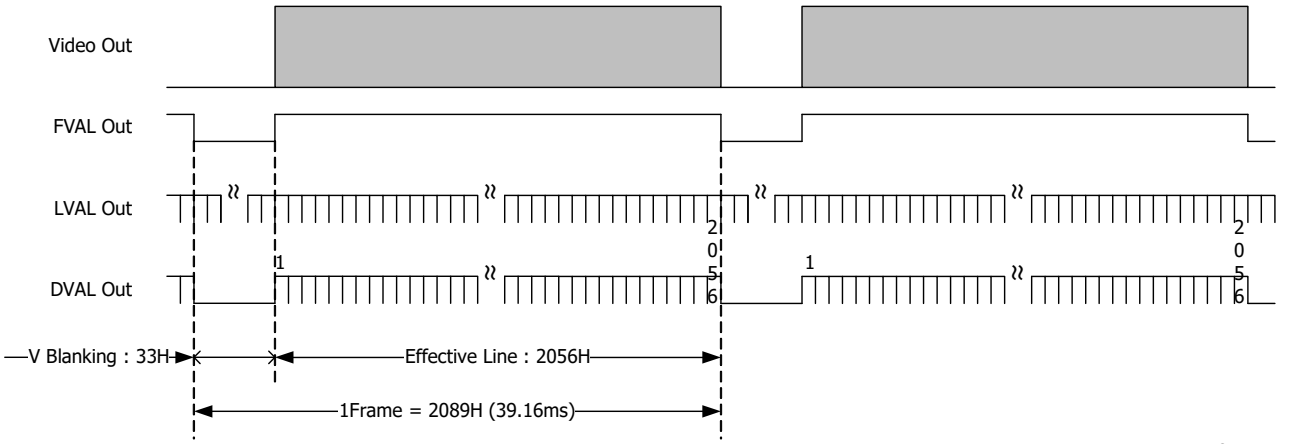
1H = 14.586 us

5.3.Horizontal Synchronous Signals Timing (2Tap Base Configuration:66MHz)



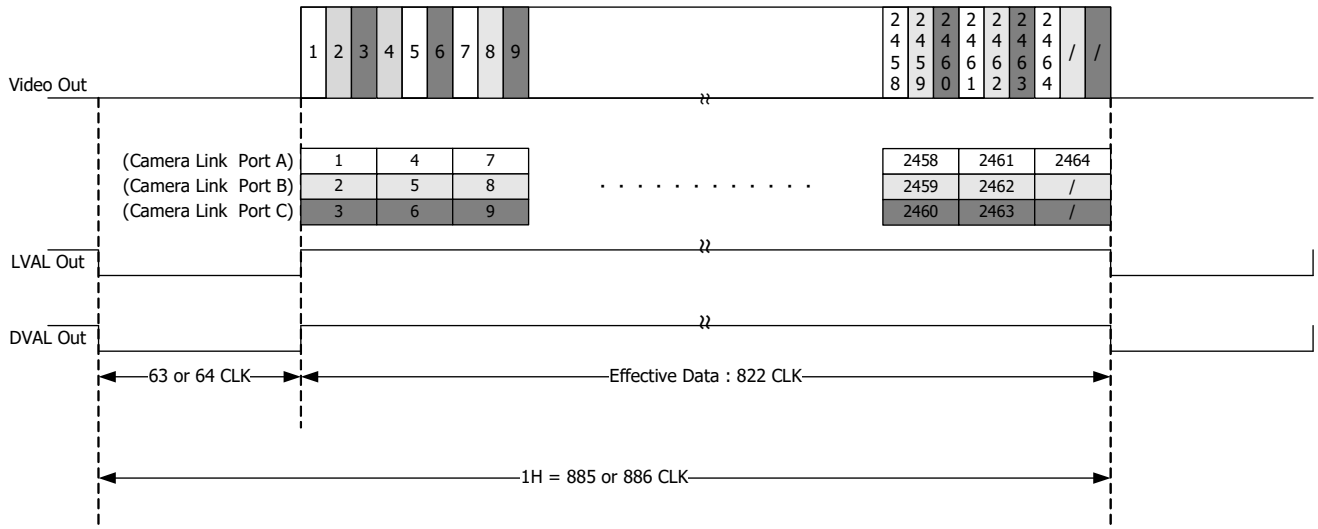
Camera Link CLK : 66.00MHz
(Clock count per 1frame : 2584789)

5.4.Vertical Synchronous Signals Timing (2Tap Base Configuration:66MHz)



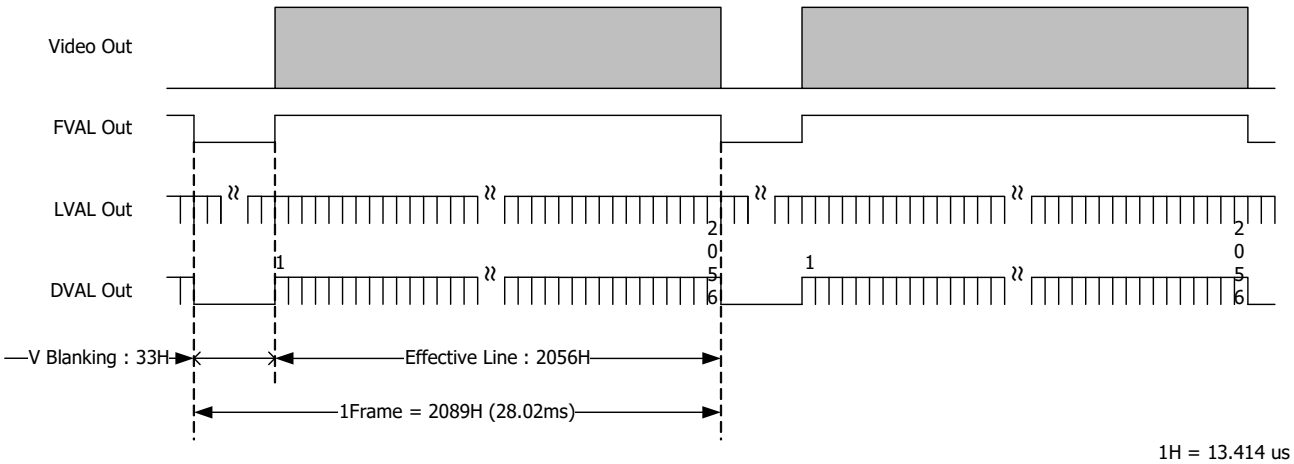
1H = 18.747 us

5.5.Horizontal Synchronous Signals Timing (3Tap Base Configuration:66MHz)



Camera Link CLK : 66.00MHz
(Clock count per 1frame : 1849461)

5.6.Vertical Synchronous Signals Timing (3Tap Base Configuration:66MHz)

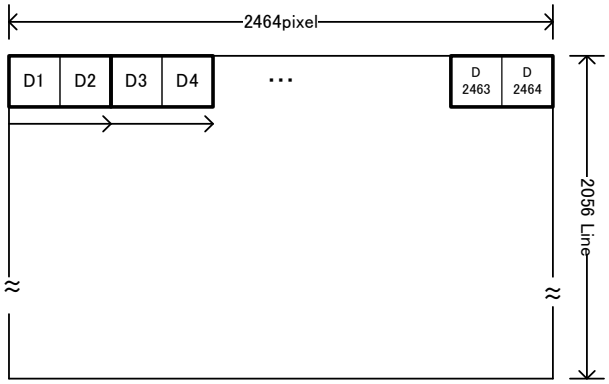


1H = 13.414 us

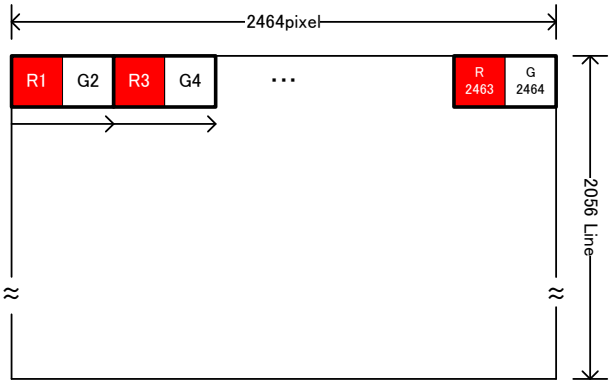
5.7.Output Format

2Tap Base Configuration

ID5MB-CL

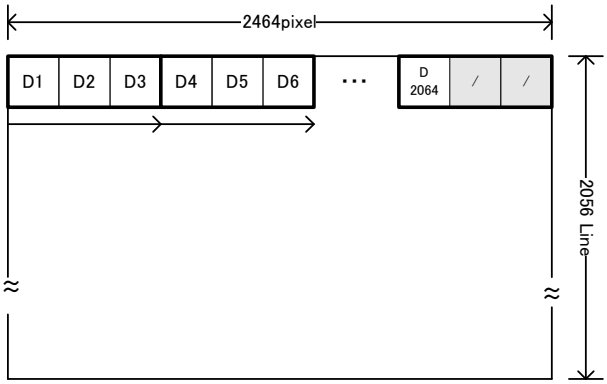


ID5MC-CL

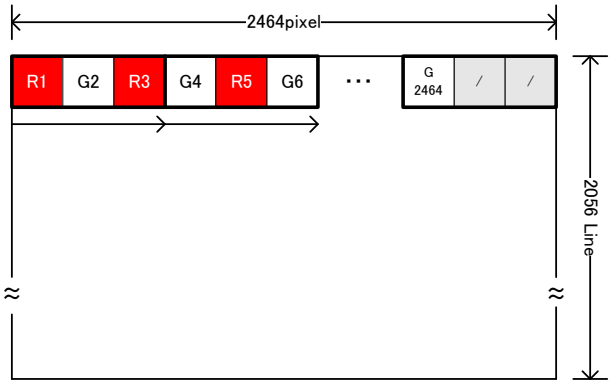


3Tap Base Configuration

ID5MB-CL



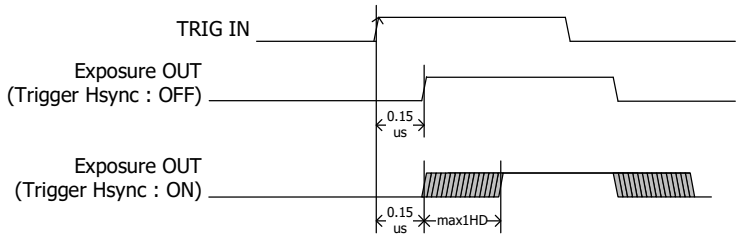
ID5MC-CL



5.8.Fixed Trigger Shutter Mode

☐ This is the mode to start exposure with external input trigger signals, and set the exposure time with serial commands.

☐ Delay time (Exposure Time Delay) from detecting trigger edge in the camera to starting exposure is as below.



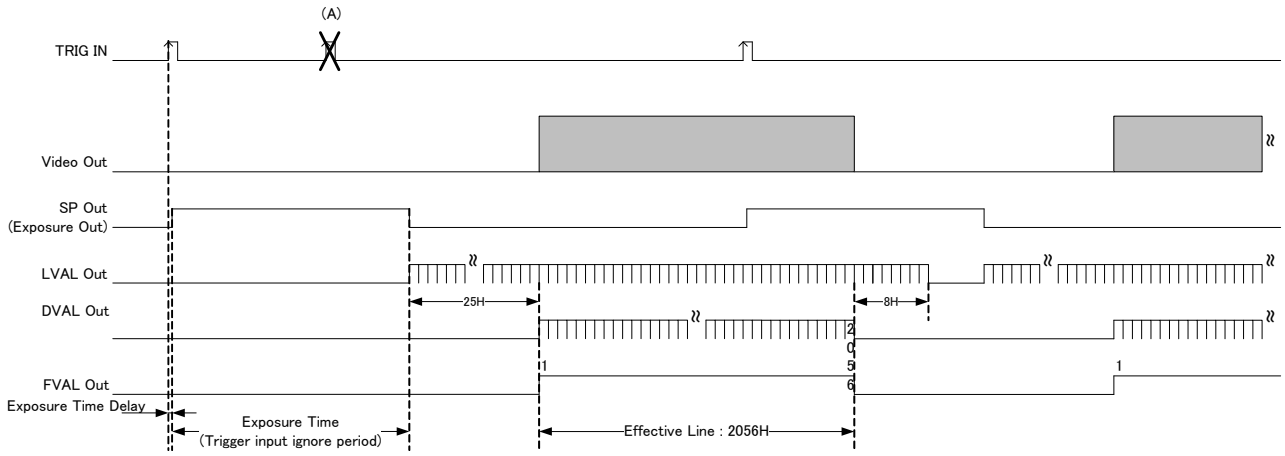
(1) Trigger Hsync Mode OFF : 0.15 us fixed

(2) Trigeer Hsync Mode ON : 0.15 us + max1HD

・2Tap Base Configuration 85Mz	0.15us +	max 1HD (14.586us)
・2Tap Base Configuration 66Mz		max 1HD (18.747us)
・3Tap Base Configuration		max 1HD (13.414us)

☐ Triggers can be accepted even when outputting video signals.
However, trigger signals for exposure to start the next video output prior to the completion of video transmission for the prior video output signals can not be accepted.

☐ Trigger input during exposure time should be ignored. (Refer to the below A)

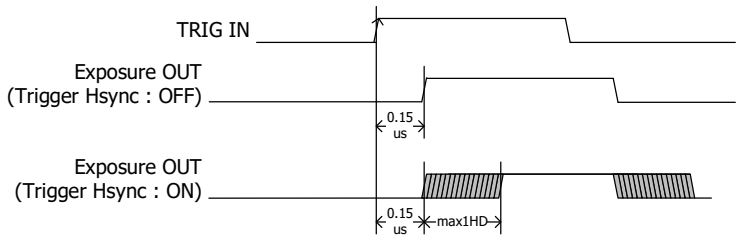


（Caution）Trigger Hsync Mode is available : Change the function ->SAVE->Camera restart

5.9.Pulse Width Trigger Shutter Mode

☐ This is the mode to start exposure with external input trigger signals, and set the exposure time with pulse width of the trigger signals.

☐ Delay time (Exposure Time Delay) from detecting trigger edge in the camera to starting exposure, and from detecting trigger end edge to completing exposure is as below.



(1) Trigger Hsync Mode OFF : 0.15 us fixed

(2) Trigeer Hsync Mode ON : 0.15 us + max1HD

・2Tap Base Configuration 85Mz — 0.15us + max 1HD (14.586us)

・2Tap Base Configuration 66Mz — max 1HD (18.747us)

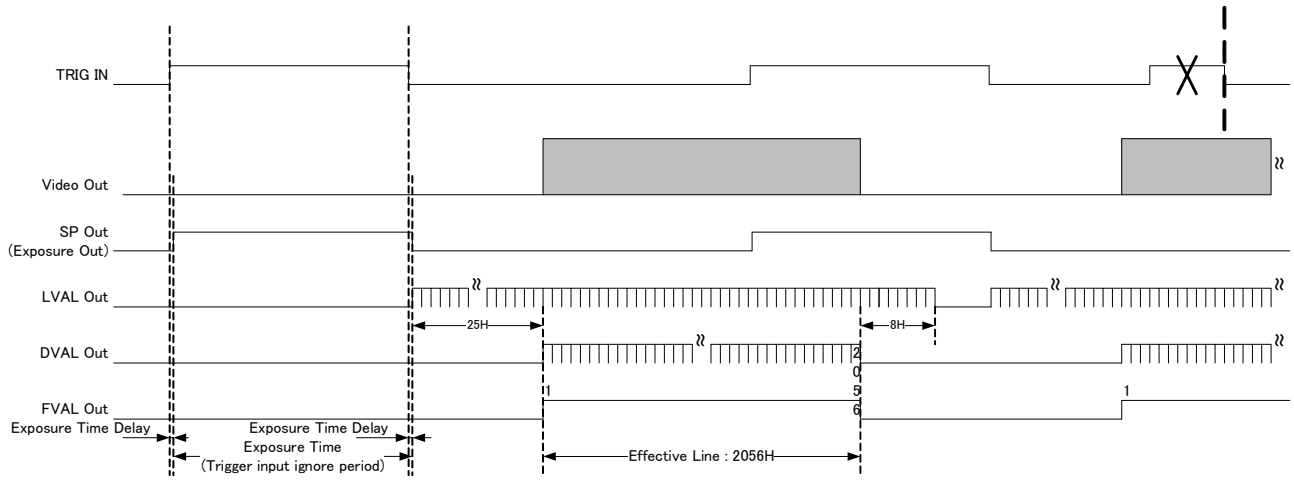
・3Tap Base Configuration — max 1HD (13.414us)

☐ Pulse width is min. 1HD (min) to approx. 2 frames.

Functionally, there is no upper limitation, but noises such as dark noises and shadings may be noticeable at long time exposure.

☐ Triggers can be accepted even when outputting video signals.

However, trigger signals for exposure to start the next video output prior to the completion of video transmission for the prior video output signals can not be accepted.



（Caution）Trigger Hsync Mode is available : Change the function ->SAVE->Camera restart

6. **Partial Scan Mode**

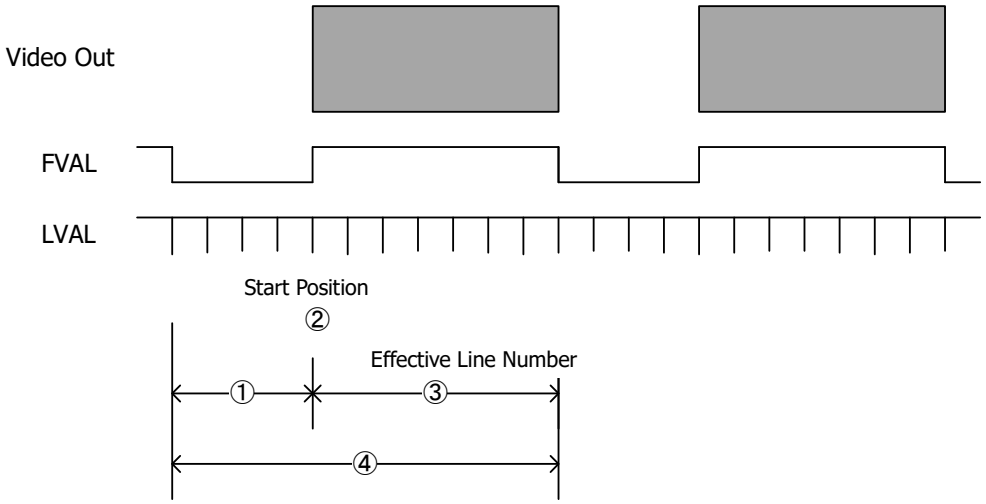
☐ 1 partial area can be set by serial commands.

Partial Scan Setting

Partial Scan Start Position Address : 40 - 41

Partial Scan Effective Line Number Address : 50 – 51

Example



① : V Blanking : 33H fixed

② : Partial Scan Start Position : 120H

③ : Partial Scan Effective Line Number : 400H

④ : Total Lines : 433H(①+③)

☐ When setting several partial scan areas, please set the start position and effective lines ->**4 x n.**

☐ Total Lines

= V blanking line number (33H fixed) + Partial Scan Effective line numbers

Note that "Sum total of partial effective line numbers (expect V blanking lines) < **2056** should be met.

☐ Frame Rate = 1 / (Total lines x Time for 1 line)

Time for 1 line = 14.586us(2Tap:85MHz) / 18.747us(2Tap:66MHz) / 13.414us(3Tap)

☐ Example

Effective lines	Frame Total Lines	Frame Rate		
		2Tap Base Configuration 85MHz	2Tap Base Configuration 66MHz	3Tap Base Configuration
4H(min)	37H	1852fps	1441fps	2014fps
.				
12H	45H	1523fps	1185fps	1656fps
.				
100H	133H	515fps	401fps	560fps
.				
400H	433H	158fps	123fps	172fps
.				
800H	833H	82.3fps	64fps	89.4fps
.				
1080H	1113H	61.5fps	47.9fps	66.9fps
.				
1600H	1633H	41.9fps	32.6fps	45.6fps
.				
2056H(max)	2089H	32.8fps	25.5fps	35.6fps

7. **Remote Communication**

Communication Settings	
Baud Rate	: 9600bps (Initial Setting)
Data	: 8bit
Stop bit	: 1bit
Parity	: None
XON / XOFF	: No Control

- Send Command Format （Host to Camera）

If send a command, set the command and parameter between STX and ETX.

STX (02H)	Command (2byte)	Parameter(ASCII code) (20H-7FH)	ETX (03H)

- Return Command Format（Camera to Host）

Normally, a camera returns a control code which is ACK or NAK.

If return value has a text message, the message is between STX and ETX.

ACK (06H)	··· Succeed

NAK (15H)	··· Fail

STX (02H)	command (2byte)	parameter(ASCII code) (2FH- 7FH)	ETX (03H)	··· return message

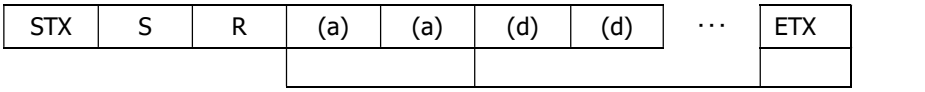
- Command list

Command	Function
SR	Set some values of resister
GR	Get some values of resister
SU	Set a user's data
GU	Get a user's data
CS	Save all configurations
CR	Restore all configurations
QM	Get a model name
QS	Get a serial number
QV	Get a firmware version
QE	Get a detail of error information

7.1.Command Specifications

1) Set some values of resister

【Command】 Set : Resister

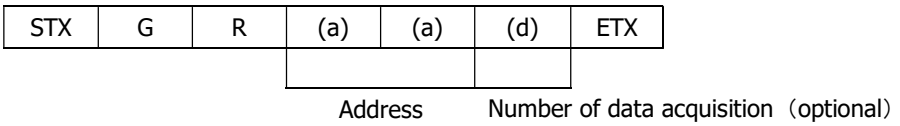


【Return Value】

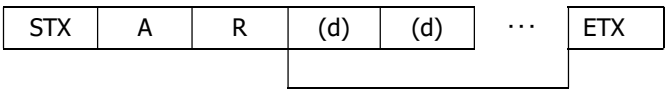
Succeed	···	ACK
Fail	···	NAK

2) Get some value of resister

【Command】 Get : Resister



【Return value】

Succeed ··· 

Fail ··· NAK

【Remarks】

The command gets some value of register of the specified address. The number of the acquisition is between '0' and 'F'(Hexadecimal).

If appoint '0' at the address, the command send data of 16 address. If the command is omitted at the address, the command send an address.

3) Set User's data

【Command】 Set : User's data

STX	S	U	(n)			···	ETX

Table No. (0~3)

User's data (fixed length :16byte)

【Return Value】

Succeed	···	ACK
Fail	···	NAK

【Remarks】

The commands, sets free data on the specified register, and can use 4 tables (1 table : 16 characters).

4) Get User's data

【Command】 Get : User's data

STX	G	U	0	ETX

Table No. (0~3)

【Response】

Succeed ···

STX	A	U	(d)	(d)	···	ETX

User's data (fixed length : 16byte)

Fail ···

NAK

5) Save all configurations

【Command】Configuration : Save

STX	C	S	ETX

【Return Value】

Succeed	···	ACK
Fail	···	NAK

6) Restore all configurations

【Command】Configuration : Restore

STX	C	R	ETX

【Return Value】

Succeed	···	ACK
Fail	···	NAK

7) Get a model name

【Command】Query : Model name

STX	Q	M	ETX

【Return Value】

Succeed ···

STX	R	M	(d)	(d)	···	ETX

Model name (Fixed length : 16byte)

Fail ···

NAK

8) Get a serial number

【Command】Query : Serial number

STX	Q	S	ETX

【Return Value】

Succeed ···

STX	R	S	(d)	(d)	···	ETX

Serial Number(Fixed length : 8byte)

Fail ···

NAK

9) Get a firmware version

【Command】Query : Version

STX	Q	V	ETX

【Return Value】

Succeed ··· | STX | R | V | (d) | (d) | ··· | ETX |

Version information (fixed length : 8byte)

Fail ··· | NAK |

10) Get a detail of error information

【Command】 Query : Error

STX	Q	E	ETX

【Return Value】

Succeed ··· | STX | R | E | (d) | (d) | (d) | ETX |

Kind Detal

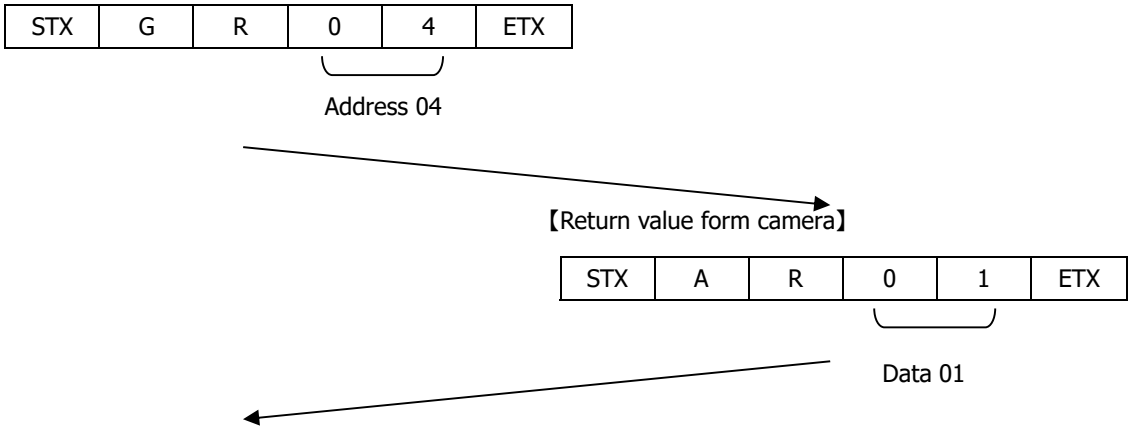
Fail ··· | NAK |

Kind		Detail	
0:	No Error	00:	Normal result
1:	Communication Protocol Error	00:	The command is undefined.
		01:	The command length is more than defined.
		02:	The address is undefined.
		03:	The value of data is undefined.
		04:	The length is more than defined.
		05:	The table number is undefined.
		06:	The string of user data was abnormal.
2:	Internal Control Error	00:	Internal control is abnormal.
		01:	A read only address was written by the command.
		02:	A protected address was written by the command.
		03:	Out of range address was written by the command.
		04:	The selected table number is abnormal.
		05:	The value of the man acquisition area is abnormal.
		06:	A function is not implemented.

7.2.Control Example

1) How to check trigger shutter mode. (The command gets a value from address 04)

【Send Command】

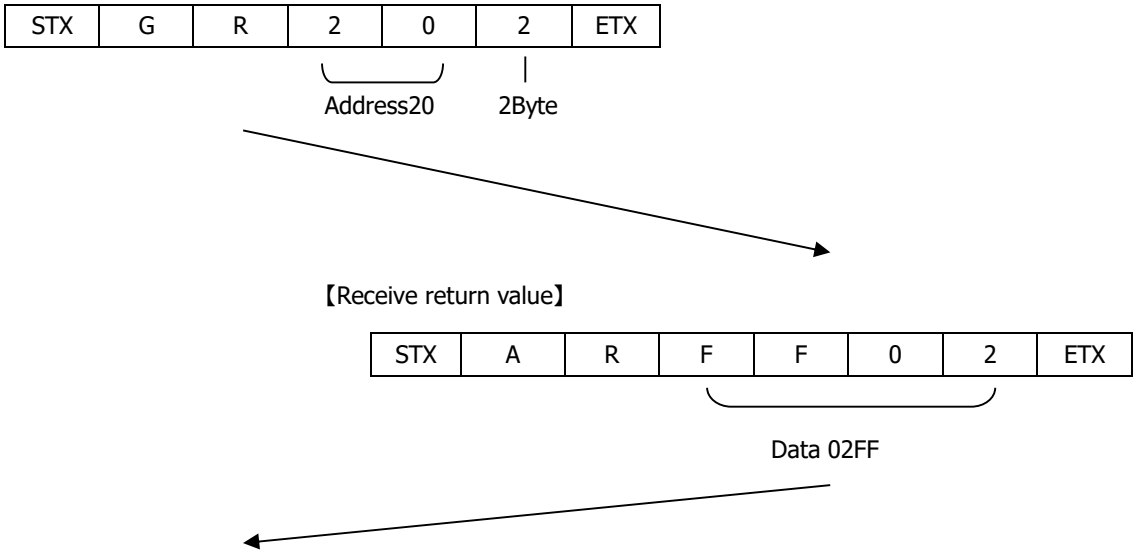


【Receive Return Value】

The camera is working with a trigger shutter mode, because the command received a 01 from the camera.

2) How to check trigger shutter mode. (The command gets consecutive 2 bytes values from address 20)

【Send Command】

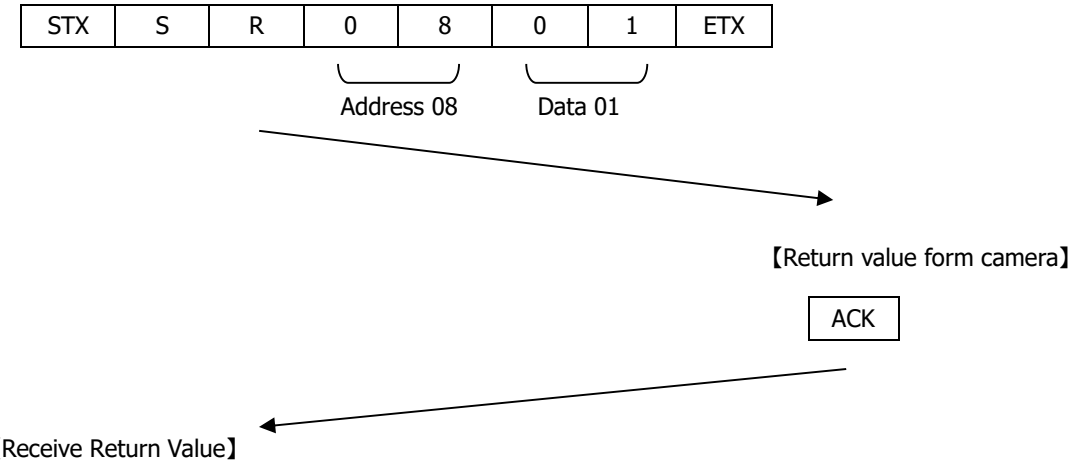


【Receive return value】

The shutter mode of camera is working +12dB, because the command received a 02FF(767) from the camera.

3) How to set partial scan mode. (The command sets 01 for address 08)

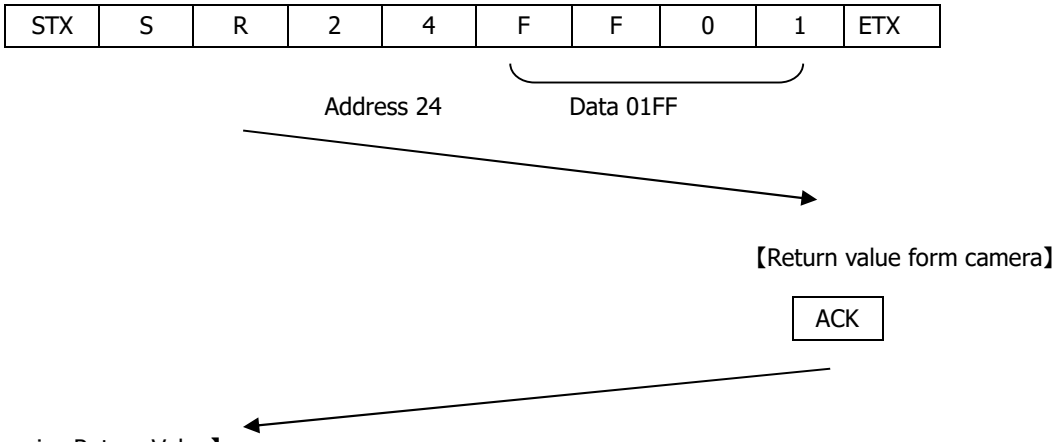
【Send Command】



The command finished normally, because the command received ACK from the camera.

4) How to set 01FF for manual shutter. (The command set 01FF for address 24)

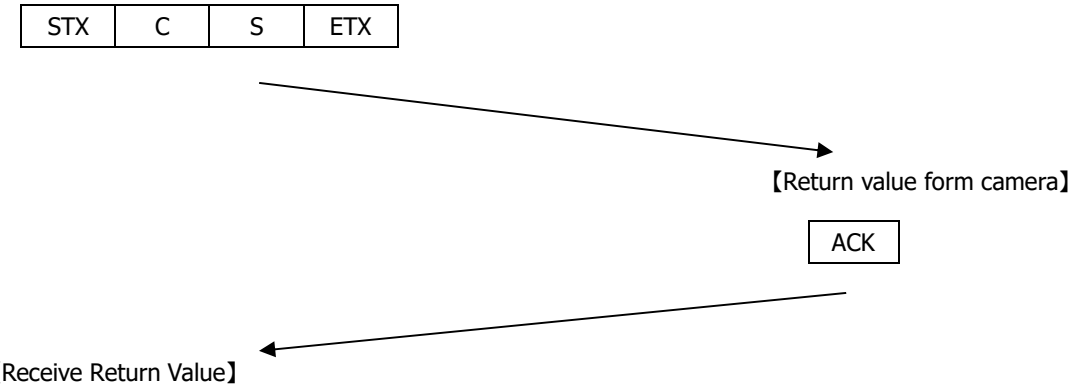
【Send Command】



The command finished normally, because the command received ACK from the camera.

5) How to save configurations of a camera. (The command send CS)

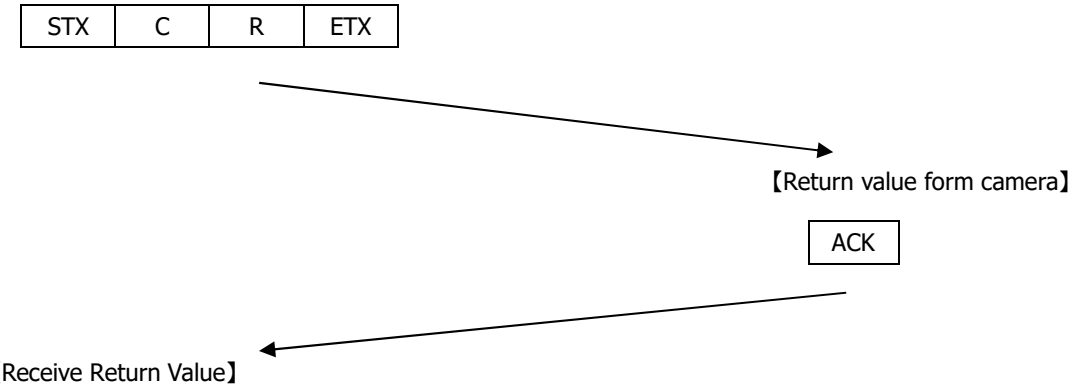
【Send Command】



The command finished normally, because the command received ACK from the camera.

6) How to restore the camera to initial settings. (The command send CR)

【Send Command】



The command finished normally, because the command received ACK from the camera.

*After executing the command, restart the camera.

7) How to get detail of a communication error.

【Send Command】

STX	G	R	@	0	ETX

Set the address invalid value

【Return value form camera】

NAK

【Receive return value】

The command finished abnormally, because the command received 'NAK' from the camera.

When the command did not finish normally, retry to send command or send to get detail of a detail error command.

【Send Command】

STX	Q	E	ETX

【Return value form camera】

STX	R	E	1	0	2	ETX

Kind1 Detail 02

【Receive Return Value】

The 'GR' command accessed invalid address , because the error command received kind '1' and detail '02'.

8. Function Setting

Function	Address(Hex)	Data(Hex)			
Preset-Shutter	01		2Tap Base Configuration 85MHz	2Tap Base Configuration 66MHz	3Tap Base Configuration
		00:	1/32.8s(OFF)	1/25.5s(OFF)	1/35.6s(OFF)
		01:	1/75s	1/75s	1/75s
		02:	1/150s	1/150s	1/150s
		03:	1/350s	1/350s	1/350s
		04:	1/500s	1/500s	1/500s
		05:	1/1000s	1/1000s	1/1000s
		06:	1/2500s	1/2500s	1/2500s
		07:	1/5000s	1/5000s	1/5000s
		08:	1/7500s	1/7500s	1/7500s
		09:	1/10000s	1/9000s	1/10000s
		0A:	1/14000s	1/11000s	1/15000s
		0B:	1/17000s	1/14000s	1/19000s
		0C:	1/23000s	1/20000s	1/25000s
		0D:	1/35000s	1/30000s	1/37000s
		0E:	1/35000s	1/30000s	1/37000s
		0F:	Manual Shutter (Address24-25)		
White Balance (Color model)	02	00:	THRU		
		01:	3200K		
		02:	THRU(Spare)		
		03:	Manual White Balance		
Trigger Mode	04	00:	Normal (Trigger OFF)		
		01:	Fixed Trigger (Address 01: set a shutter speed)		
		02:	Pulse width Trigger		
Trigger Polarity	05	00:	Positive		
		01:	Negative		
Trigger Input	06	00:	CC1		
		01:	12pin Connector (11pin- in)		
Slow Shutter	07	0 - FF:	min:0(0H) - max:255(FFH) 0: OFF, 255: +255 Time of Frame 1 frame = 2Tap Base Configuration 85MHz : 30.47ms 2Tap Base Configuration 66MHz : 39.16ms 3Tap Base Configuration : 28.02ms		
Partial Scan	08	00:	Full Frame		
		01:	Partial Scan		
Output Mode (＊1)	0A	00:	2Tap Base Configuration 85MHz		
		01:	3Tap Base Configuration 66MHz		
		02:	2Tap Base Configuration 66MHz		
Output (bit)	0B	00:	8bit		
		01:	10bit		
		02:	12bit		

＊1 : Change the function ->SAVE->Camera restart

Function	Address(Hex)	Data(Hex)	
Baud Rate (＊2)	10	00:	9600bps
		01:	19200bps
		02:	38400bps
		03:	57600bps
		04:	115200bps
Flip / Reverse	18	00:	Normal
		01:	Flip
		02:	L – R Reverse
		03:	Flip & L-R Reverse
LED ON/OFF	1B	00:	OFF
		01:	ON
Manual Gain	20-21	0 - 78:	min:0(0H) - max:120(78H) 0: x1(0dB), 120: x4(+12dB)
Manual Shutter	24-25	LLHH:	min:0(0H) - max:2079(81FH) 2Tap Base Configuration 85MHz Shutter time = 13.73us + (2080 - (setting value))×14.586us min:0=30.35ms(1/32.8s) , max:2079=28.32us(1/35000s) 2Tap Base Configuration 66MHz Shutter time = 13.73us + (2080 - (setting value))×18.747us min:0=39ms(1/25.5s) , max:2079=32.48us(1/30000s) 3Tap Base Configuration Shutter time = 13.73us + (2080 - (setting value))×13.414us min:0=27.92ms(1/35.6s) , max:2079=27.14us(1/37000s)
Manual White Balance R (Color)	28-29	LLHH:	min:0(0H) - max:767(2FFH) 0: x1(0dB), 767: x4(+12dB)
Manual White Balance G (Color)	2A-2B	LLHH:	min:0(0H) - max:767(2FFH) 0: x1(0dB), 767: x4(+12dB)
Manual White Balance B (Color)	2C-2D	LLHH:	min:0(0H) - max:767(2FFH) 0: x1(0dB), 767: x4(+12dB)
Partial Scan Start Position	40-41	LLHH:	min:0(0H) - max:2052(804H) ※setting value : **4 x n**
Partial Scan Effective Lines	50-51	LLHH:	min:4(4H) - max:2056(808H)

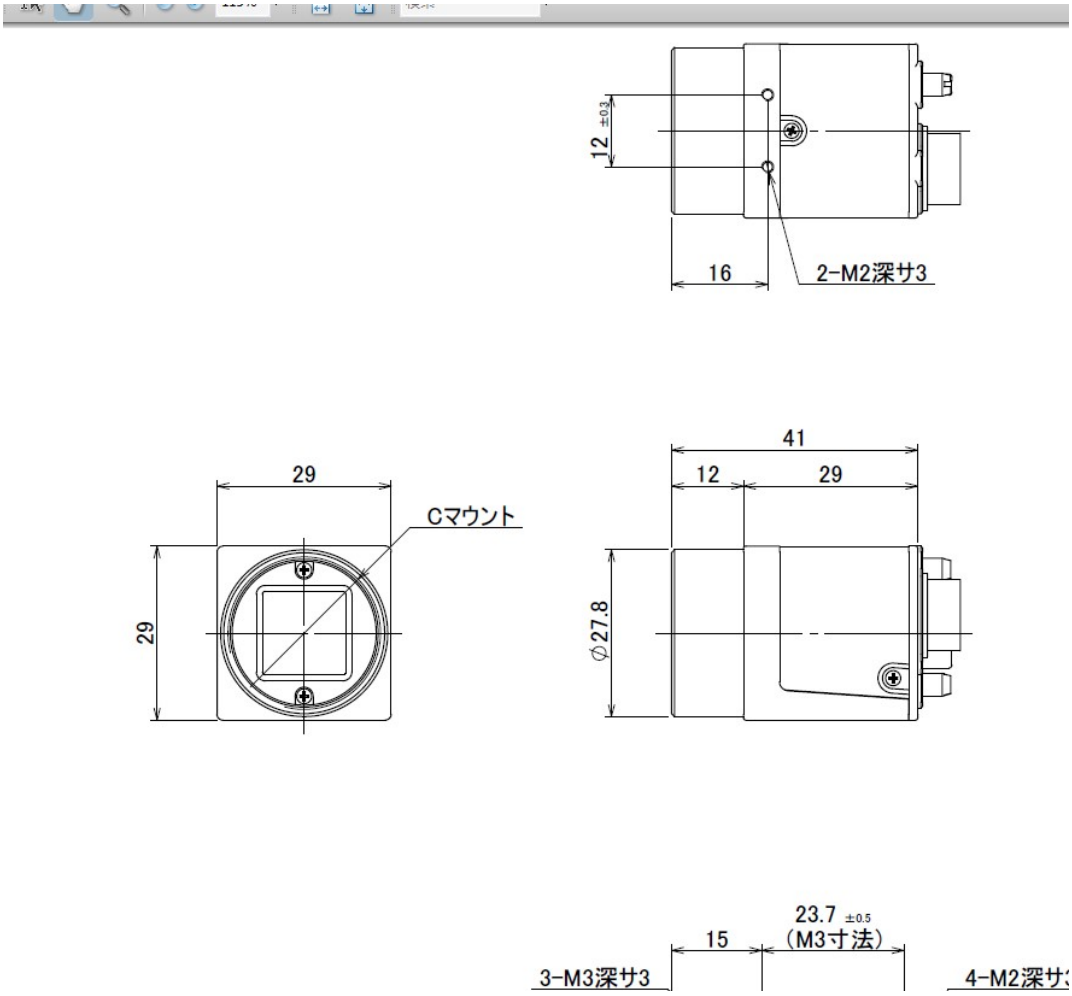
＊2 Change the function ->SAVE->Camera restart

※ LLHH : The data set with 2 Byte shall be set with Low Byte first, then set with High Byte.

< Example > Manual Gain(Address 24-25) ->767(02FFH)

STX SR 24 FF 02 ETX

8. **Dimensions**



(単位:mm)

9. **Initial Setting**

Function	Address	Data	
Shutter	01	00:	1/32.8s(OFF)
White Balance (Color model)	02	00:	THRU
Trigger Mode	04	00:	Normal (Trigger OFF)
Trigger Polarity	05	00:	Positive
Trigger Input	06	00:	CC1
Slow Shutter	07	00:	OFF
Partial Scan Mode	08	00:	Full Frame
Camera Output Mode	0A	00:	2Tap Base Configuration
Output Data Selection	0B	00:	8bit
Baud Rate	10	00:	9600bps
Output Image Flip	18	00:	Normal
LED ON/OFF	1B	01:	ON
Manual Gain	20-21	0000:	0dB
Manual Shutter	24-23	0000:	Shutter(OFF)
Manual White Balance R (Color model)	28-29	0000:	0dB
Manual White Balance G (Color model)	2A-2B	0000:	0dB
Manual White Balance B (Color model)	2C-2D	0000:	0dB
Partial Scan Start Position	40-41	0000:	Start Position 0
Partial Scan Effective Lines	50-51	0808:	Effective lines 2056

10. **Cases for Indemnity (Limited Warranty)**

We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user in the following cases.

- In case damage or losses are caused by fire, earthquake, or other acts of God, acts by third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.

- In case indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.

- In case damage or losses are caused by failure to observe the information contained in the instructions in this product specification & operation manual.

- In case damage or losses are caused by use contrary to the instructions in this product specification & operation manual.

- In case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.

- In case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).

11. **CMOS Pixel Defect**

IDULE compensates the noticeable CMOS pixel defects found at the shipping inspection prior to our shipment. On very rare occasions, however, CMOS pixel defects might be noted with time of usage of the products.

Cause of the CMOS pixel defects is the characteristic phenomenon of CMOS itself and IDULE is exempted from taking any responsibilities for them. Should you have any questions on CMOS pixel defects compensation, please contact us.

12. **Product Support**

When defects or malfunction of our products occur, and if you would like us to investigate on the cause and repair, please contact your distributors you purchased from to consult and coordinate.