



English

**VISION:elite™**  
**5M Pixel B/W Camera Link Camera**

**VCC-G60FV11CL**

**Product Specification**  
**& Operational Manual**

**CIS Corporation**

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## 1. Scope of Application

This is to describe VCC-G60FV11CL, Camera Link B/W CCD Camera. All specifications contained herein are subject to change without prior notice. Reproduction in whole or in part is prohibited.

## 2. Handling Precautions

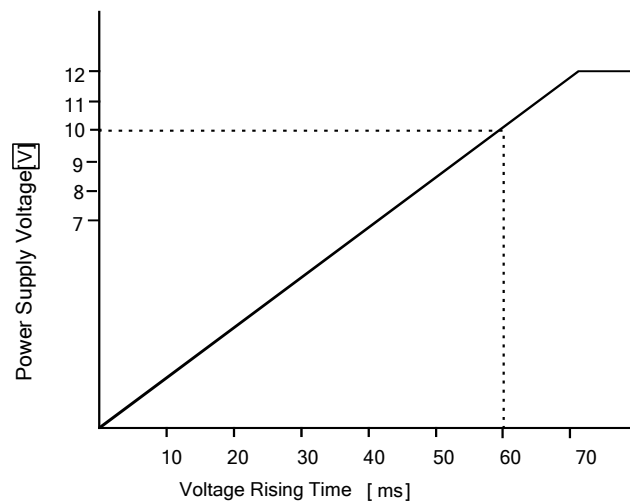
The camera must not be used for any nuclear equipments or aerospace equipments with which mechanical failure or malfunction could result in serious bodily injury or loss of human life. Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

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  $-5^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ )
  - 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.
  
- Follow the instructions in Chapter 6, "External connector pin assignment" for connecting the camera. Improper connection may cause damages not only to the camera but also to the connected devices.
  
- 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  $+12V \pm 10\%$  shall be within  $\pm 50mV$ . 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.
- 2ch output CCD, separated into right and left, is utilized for VCC-G60FV11CL. Image signals for right half screen and left half screen are output via each independent circuit. Therefore, differences between right screen and left screen could be seen depending on the usage conditions (shooting conditions /temperature conditions and so on). CIS tries its best to adjust this differences but please be noted it would not be perfect.



### 3. Product Outline

VCC-G60FV11CL is a Camera Link interfaced, high-resolution industrial black and white video camera module utilizing a 2/3 type PS IT CCD. 5M pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution. At Full Frame Scan Mode, entire pixels can be read out within approx. 1/16s.

#### Features

- Camera settings can be changed via serial communications.
- Shutter speed can be set from 1/16sec ~ 1/100,000sec by 1H.
- At partial scan mode, both capturing start position and capturing width can be set by 3H.

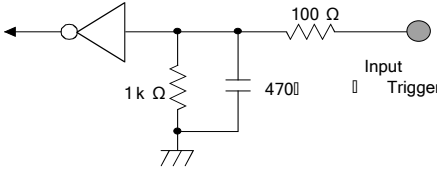
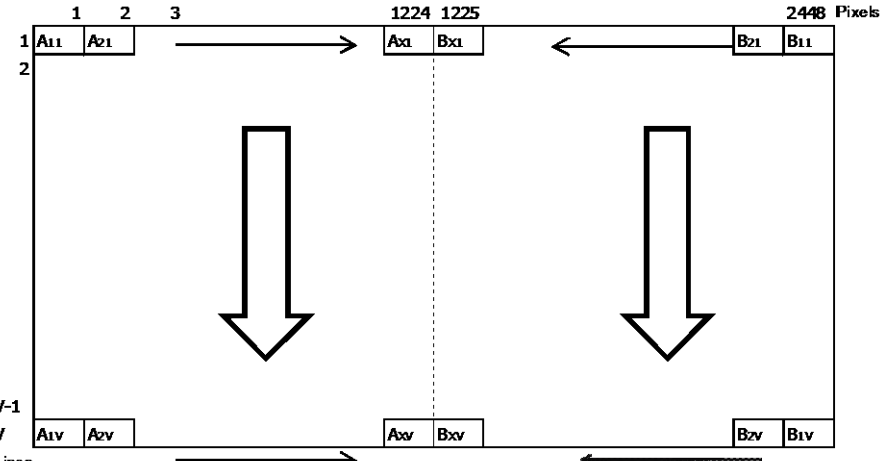
## 4. Specification

## 4.1. General Specification

Item	Specification	
Pickup device	Device Type	2/3 type Interline Transfer B/W CCD, Sony ICX625AL
	Effective Pixel Number	2456 (H) x 2058 (V)
	Unit Cell Size	3.45 $\mu$ m (H) x 3.45 $\mu$ m (V)
	Chip Size	9.93mm (H) x 8.70mm (V)
Videooutput frequency	Pixel Clock	64 MHz
	Horizontal Frequency	33.264 KHz Pixel Clock: 1924CLK
	Vertical Frequency	Full Frame Scan Mode: 2079 lines, approx 16.000Hz
Sync. system	Internal Sync. System	
Video output standard	Camera Link	
Resolution	2058 TV lines	
Resolving power	8bit / 10bit	
Sensitivity	F 5.6 400 lx (Shutter speed 1/16s, Gain 0dB)	
Minimum illumination	F 1.4 1.5 lx (Shutter speed 1/16s, Gain +21dB)	
Dust or stains in optical system	No dust or stain shall be detected on the testing screen with setting the camera aperture at F16.	
Power requirements	DC +12V $\pm$ 10% (Max voltage not to exceed +15V)	
Power consumption	Approx. 3.6 W (At DC +12V IN, normal mode, and full frame scan mode) Approx. 4.0 W (At DC +12V IN, normal mode, and partial scan mode)	
Dimension	Refer to overall dimension drawing (Clause 12) 55mm x 55mm x 45mm (excluding projection)	
Mass	Approx. 155 g	
Lens mount	C mount (Refer to overall dimension drawing )	
Optical axis accuracy	Refer to drawing for CCD Optical Axis Accuracy (Clause 11)	
Gain variable range	0~21dB (Analog Gain; 0dB~+15 dB, Digital Gain; 15 dB~+21dB)	
Shutter speed variable range	1/16~1/100,000s	
Trigger shutter mode	• Standard Trigger Mode • Pulse Width Trigger Mode	

Item	Specification	
Safety/Quality standards	UL: Conform to UL Standard including materials and others. RoHS: Conform to RoHS CE: EN55022:2006 Class A for Emission EN61000-6-2:2005 for Immunity FCC: To be applied to FCC Class A digital Device This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.	
Durability	Vibration	Acceleration 98 m/s <sup>2</sup> (10.0G)
		Frequency 20~200 Hz
		Direction XYZ 3 directions
		Testing time 120 min for each direction
	Shock	No malfunction shall be occurred with 980m/s <sup>2</sup> (100G) for X, Y, Z direction. (without package)
Operation environment	Temperature	Performance guaranteed temperature: 0°C~+40°C Camera operation guaranteed temperature: -5°C~+45°C ※ All the specifications specified in this manual is guaranteed under performance guaranteed temperature. ※All the camera functions operate normally under operation guaranteed temperature
	Humidity	RH 20~80% with no condensation
Storage environment	Temperature	-25°C ~ +60°C
	Humidity	RH 20~80% with no condensation

4.2. Camera Output Signal Specification

Item		Specification	
Video output data	Video out	2448 (H) x 2058 (V) (1224(H) x 2058(V) x 2TAP)	At Full Frame Scan Mode
		64MHz 2Tap output	
Sync. Signal I/O	LVAL output	LVTTL (3.3V Output)	HR10-10R-12PA
	FVAL output	LVTTL (3.3V Output)	
	DVAL output	LVTTL (3.3V Output)	
Trigger input	Polarity	POSI/NEGA Selectable	
	Trigger Pulse width	Over 2 H(min.) ~ Less than 4158 H(max.)	
	Camera Link Input	LVDS:CC1 input	Camera Link Connector
	TTL Input	Refer to the below.	HR10-10R-12PA
			VIH Min 2.0V VIL Max 0.8V
Video Signals	White Clip Level	At Digital 8bit	: FFh
	Setup Level	At Digital 8bit	: 08h
	Dark Shading	At Digital 8bit	: Under 08h for both horizontal and vertical. (Conditions: Gain 0dB)
	Level differences between right and left	At Digital 8bit	: Under 03h (Conditions: Gain 0dB)
Video Output Data Sequence	Axy: Left half image data, Yth line, Xth pixel from the left. BXY: Right half image data, Yth line, Xth pixel from the right. X: 1~1224 Y: 1~2058		
			

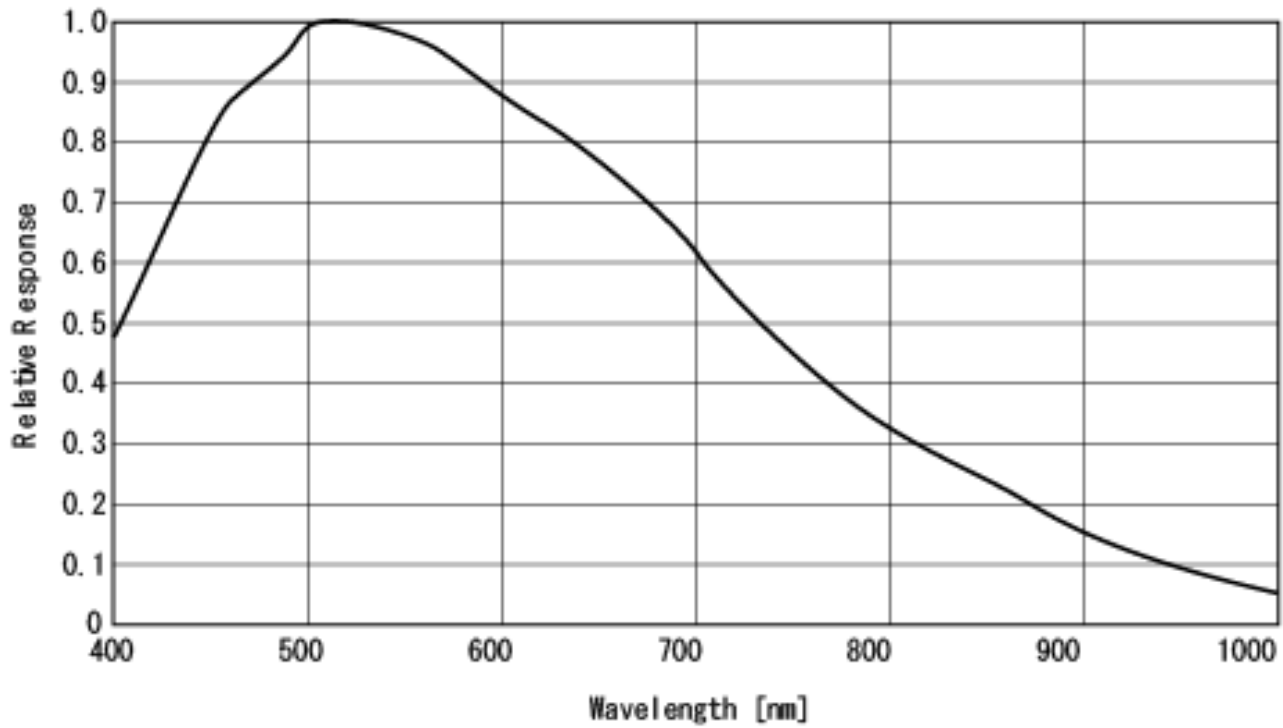
## Data Bit of Camera Link Port (Base Configuration)

Port/bit	At 8bit output setting	At 10bit output setting
Port A0	A0: Left half image data:bit0[LSB]	A0: Left half image data:bit0[LSB]
Port A1	A1: Left half image data:bit1	A1: Left half image data:bit1
Port A2	A2: Left half image data:bit2	A2: Left half image data:bit2
Port A3	A3: Left half image data:bit3	A3: Left half image data:bit3
Port A4	A4: Left half image data:bit4	A4: Left half image data:bit4
Port A5	A5: Left half image data:bit5	A5: Left half image data:bit5
Port A6	A6: Left half image data:bit6	A6: Left half image data:bit6
Port A7	A7: Left half image data:bit7[MSB]	A7: Left half image data:bit7
Port B0	B0: Right half image data:bit0[LSB]	A8: Left half image data:bit8
Port B1	B1: Right half image data:bit1	A9: Left half image data:bit9[MSB]
Port B2	B2: Right half image data:bit2	(-)
Port B3	B3: Right half image data:bit3	(-)
Port B4	B4: Right half image data:bit4	B8: Right half image data:bit8
Port B5	B5: Right half image data:bit5	B9: Right half image data:bit9[MSB]
Port B6	B6: Right half image data:bit6	(-)
Port B7	B7: Right half image data:bit7[MSB]	(-)
Port C0	(-)	B0: Right half image data:bit0[LSB]
Port C1	(-)	B1: Right half image data:bit1
Port C2	(-)	B2: Right half image data:bit2
Port C3	(-)	B3: Right half image data:bit3
Port C4	(-)	B4: Right half image data:bit4
Port C5	(-)	B5: Right half image data:bit5
Port C6	(-)	B6: Right half image data:bit6
Port C7	(-)	B7: Right half image data:bit7

※ 5 seconds shall be waited after turning on power to get proper camera operation.

#### 4.3. CCD Spectral Response (Representative Value)

※ Lens characteristics and luminous source characteristics are not considered.



## 5. Function Settings

Camera functions can be set with serial communications.

Function	Address	Data
Gain	001	0: 0 dB: Analog Fixed Gain
		1: +6 dB: Analog Fixed Gain
		2: +12 dB: Analog Fixed Gain
		3: +15 dB: Analog Fixed Gain
		4: +21 dB: Analog Gain (+15 dB) + Digital Gain (+6 dB)
		5: Manual Gain Interlocked right and left (Refer to Address 006)
		6: Manual Gain Independent right and left (Refer to Address 006 for the right. Refer to Address 008 for the left.)
E-Shutter	002	0: 1/16s(Off)
		1: 1/30s
		2: 1/60s
		3: 1/90s
		4: 1/120s
		5: 1/150s
		6: 1/200s
		7: 1/250s
		8: 1/500s
		9: 1/750s
		10: 1/1000s
		11: 1/2000s
		12: 1/5000s
		13: 1/10000s
		14: 1/15000s
		15: 1/100000s
		16: Manual Shutter (Refer to Address 009 & 010)
Trigger Mode	004	0: Normal Mode (Trigger Mode Off)
		1: Standard Trigger Mode (Shutter speed can be set with address 002.)
		2: Pulse Width Trigger Mode (Shutter speed can be set with trigger pulse width.)
Manual Gain (Total & Right)	006	0~255: ※ When the data of address 001 is 005, Total Gain (Interlocked R and L.) ※ When the data of address 001 is 006, Right Gain (Independent R and L.)
Manual Gain (Left)	008	0~255: ※ When the data of address 001 is 005/006, Left Gain (Independent R and L)
Manual Shutter Control	009&010	0~2078: 1/16s (Off)~1/100,000s ※ Set the address 002 data to 016. Address 009 MSB and address 010 LSB makes total 16 bit. Shutter speed = (2078-(009&010)) x30.0625 μs +10.00 μs Note: shutter speed will be 10 μs at 2078s (1/100,000) Max Data=2078
Trigger Polarity	011	0: Positive Input
		1: Negative Input
Trigger Input Select	012	0: Camera Link Connector 12226-1100-00-PL
		1: Circular Connector HR10-7R-6PA
Output Data Select	013	0: 8bit Output Data
		1: 10bit Output Data
Partial Scan Mode	015	0: Full Frame Scan Mode
		1: Partial Scan Mode

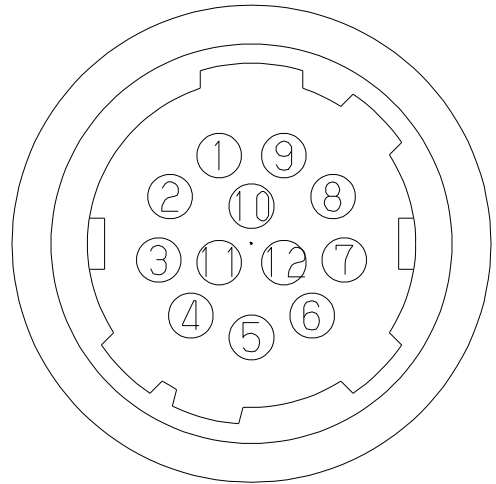
Function	Address	Data	
Partial Scan Start Position	016&017	0~685:	Set the address 015 data to 001. Address 016 MSB and address 017 LSB makes total 16 bit. Start Position: 3 Lines/step Min Data: 0 (0 Line)/Max Data : 685 (2055 Lines) Start Position (016&017)+ Effective Lines (019&020) <= 685
Partial Scan Effective Lines	019&020	0~684:	Set the address 015 data to 001. Address 019 MSB and address 020 LSB makes total 16 bit. Effective Lines: 3 Lines/step Min Data: 0 (3 Lines)/Max Data : 685 (2058 Lines) Start Position (016&017)+ Effective Lines (019&020) <= 685
Partial Scan Total Lines	021&022	0~2078:	Read Only Total line number at Partial Scan Mode or Full Frame Scan Mode minus 1 is set
Manual Digital Gain (Right)	126&127	256~ 512:	※ Set address 001 data to 005/006.
Manual Digital Gain (Left)	128&129	256~ 512:	※ Set address 001 data to 005/006.
Data Save	255		Input 083 to save the data in EEPROM.

Note: The data set with 2 Byte with Manual Analog/Digital Gain control, Manual Shutter Control, Partial Scan Start Position, and Partial Scan Effective Line shall be set with High Byte first, then set with Low Byte. The camera rewrites the internal register when receiving Low Byte.

## 6. External Connector Pin Assignment

### 6.1. 12 pins Circular Connector HR10-10R-12PA (HIROSE)

Pin No.	
1	GND
2	POWER IN DC +12V
3	GND
4	NC
5	GND
6	LVAL/OUT
7	FVAL/OUT
8	GND
9	NC
10	DVAL/OUT
11	Trigger IN
12	GND

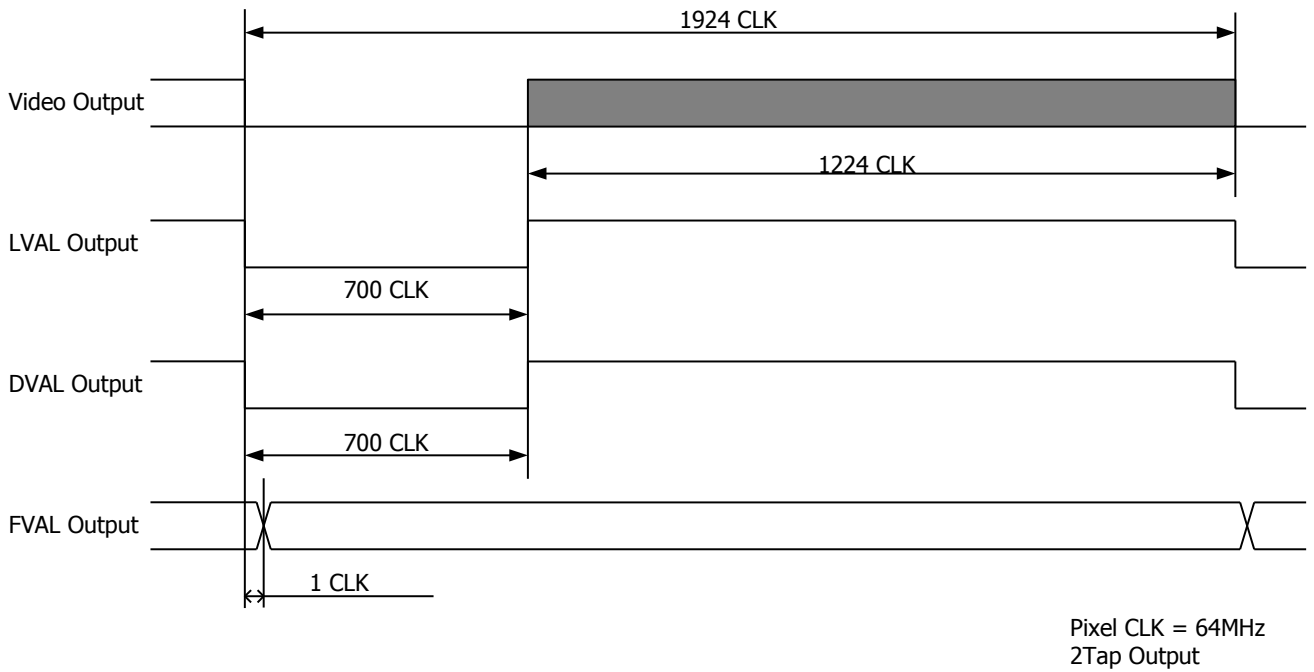


### 6.2. 26 pins Camera Link Connector 12226-1100-00 PL (SUMITOMO 3M)

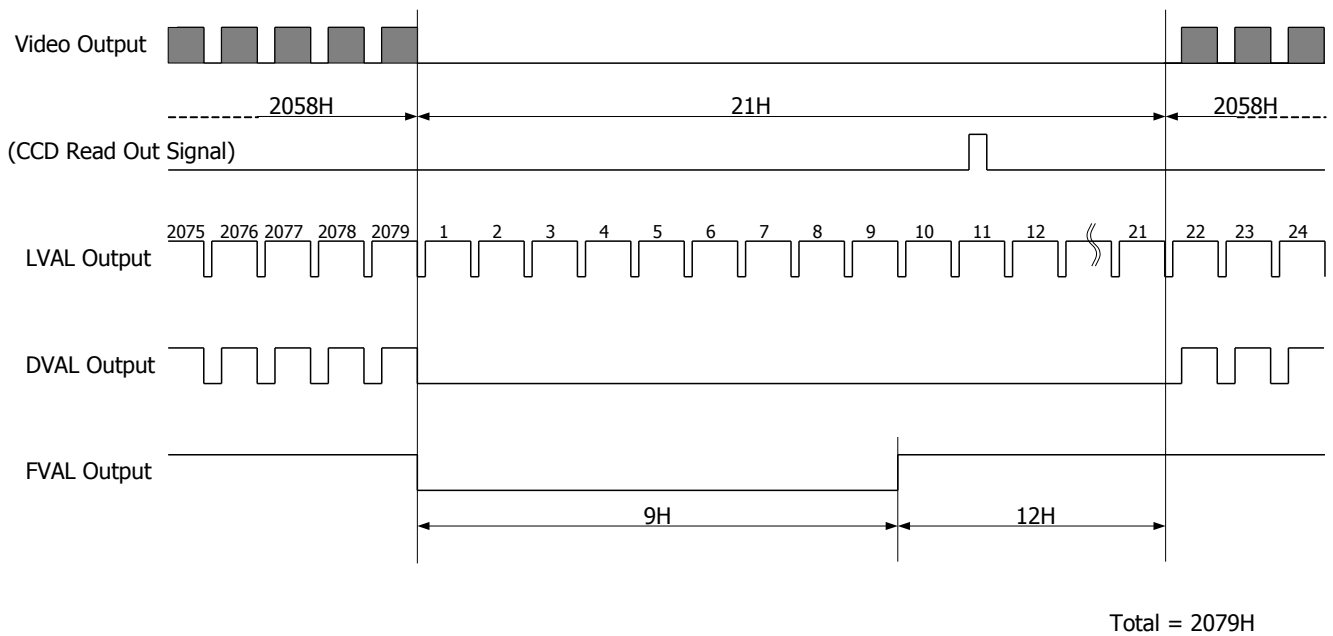
Pin No.		Pin No.	
1	GND	14	GND
2	X0-	15	X0+
3	X1-	16	X1+
4	X2-	17	X2+
5	Xclk-	18	Xclk+
6	X3-	19	X3+
7	SerTC+	20	SerTC-
8	SerTFG-	21	SerTFG+
9	CC1- (Trigger IN-)	22	CC1+ (Trigger IN+)
10	CC2+	23	CC2-
11	CC3-	24	CC3+
12	CC4+	25	CC4-
13	GND	26	GND

## 7. Timing Chart

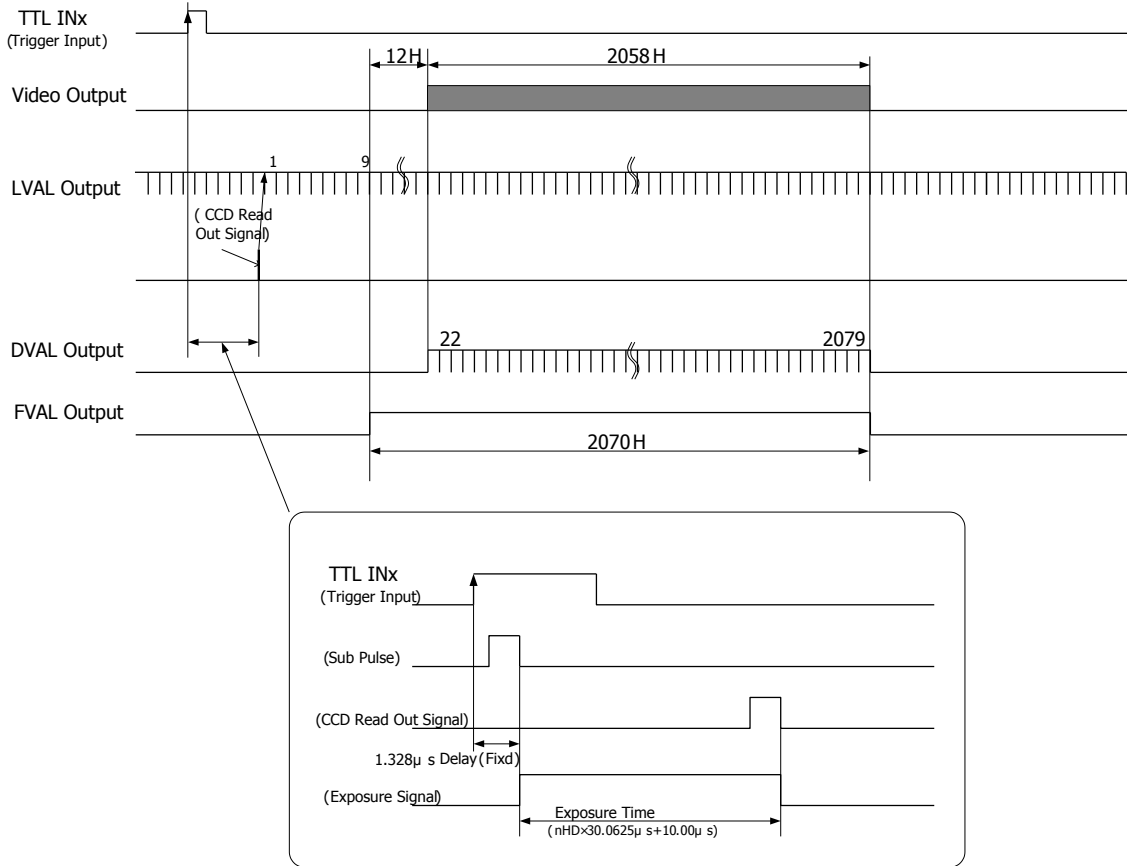
### 7.1. Horizontal Synchronous Signals Timing



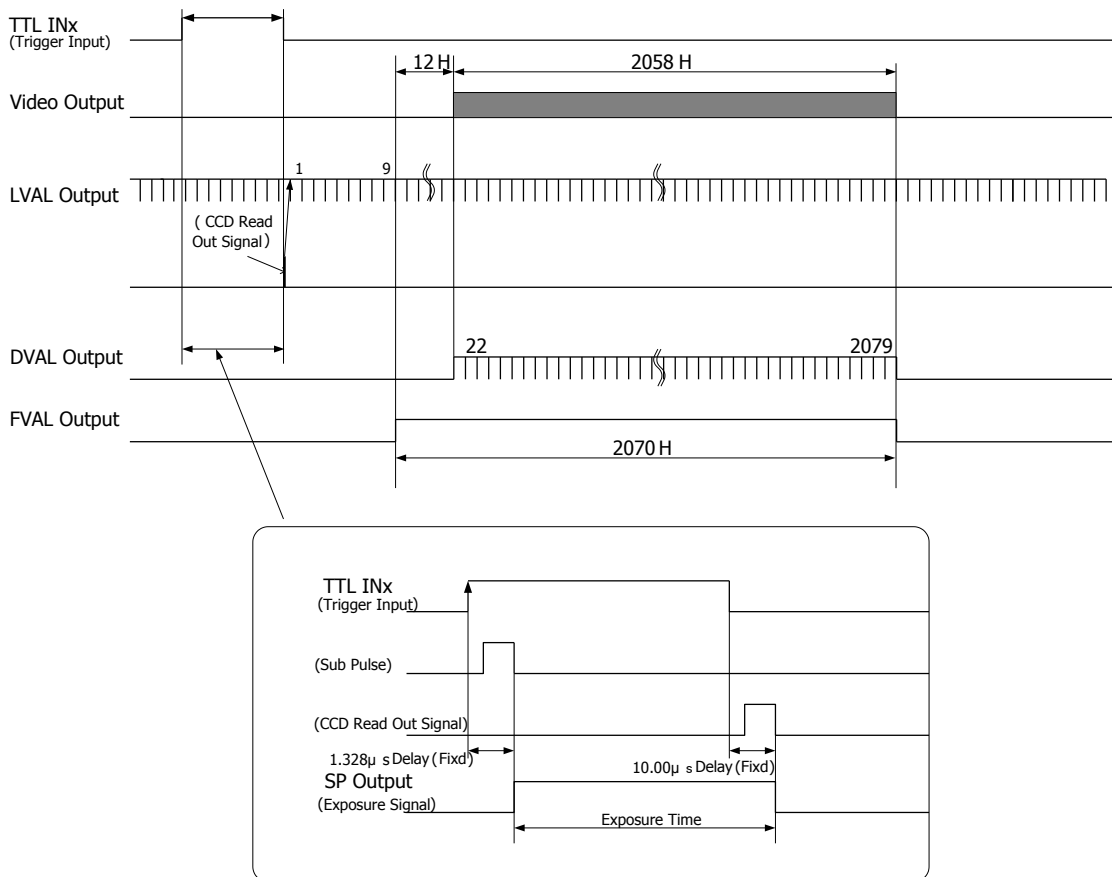
### 7.2. Full Frame Scan Mode Timing



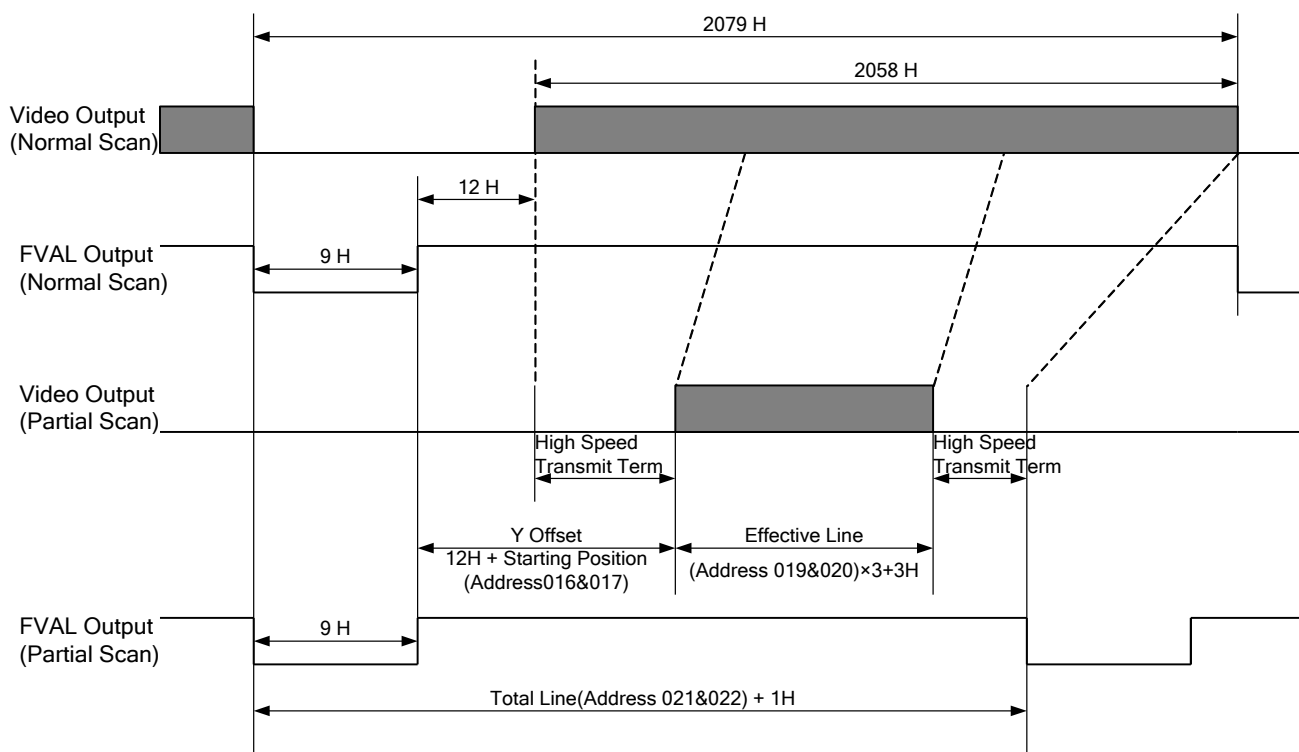
### 7.3. Standard Trigger Mode Timing



### 7.4. Pulse Width Trigger Timing



8. Partial Scan Mode Details



Reading out position register (Address 016 & 017): 0 (0Line) ~ 685 (2055Lines) 3Lines/step  
 Effective line register (Address 019 & 020): 0 (3Lines) ~ 685 (2058Lines) 3Lines/step  
 Total line register (Address 021 & 022): 706Lines + (Effective line register × 2) + 2 (Read Only)

Note: Reading out position and effective lines shall meet the following conditions.

**Reading out position register + Effective line register = < 685**

Otherwise, the value, **685 – reading out position register**, will be set to the effective line register.

<Example 1> Conditions: Reading out position register (Address 016 & 017) = 000

Effective line register (Address 019 & 020)	Effective lines	Total line register +1 Line	Frame Rate
0	3 Lines	709 Lines	46.92 fps
.	.	.	.
226	681 Lines	1161 Lines	28.65 fps
.	.	.	.
426	1281 Lines	1561 Lines	21.31 fps
.	.	.	.
685	2058 Lines	2079 Lines	16.00 fps

## 9. Remote Interface Function

Through serial port of 12pin connector at rear, the camera can be controlled.

### (1) The settings for RS-232C

Baud rate : 9600bps  
 Data : 8bit  
 Stop bit : 1bit  
 Parity : None  
 XOn/XOff : Not controlled

### (2) Control code

- The total control code is 14 bits, which conforms to ASCII code.
- The control code consists of camera No. process code, remote controller address, remote controller data, and CR. Execute Read/Write through PC, and the camera will reply the data.

1	2	3	4	5	6	7th Byte	8	9	10	11	12	13	14
Camera No.						Process code	Remote controller address			Remote controller data			CR
000000: fixed						"R" Read mode	Please refer to the address table of Section 5. Function Settings.			000~255			0 Dh
						"W" Write mode							
						"C" Camera mode							

Camera No. is fixed with 6 bite numerical strings, "000000".

#### Process code

Input any one of R, W, or C to the process code.

R (read mode) is to read the data of remote controller address.

Please be noted to set any dummy data (000~255) to 11<sup>th</sup> ~13<sup>th</sup>, since a command shall consists of 14 bytes.

W (write mode) is to write the data to the remote controller address.

Please be noted that the data cannot be saved into EEPROM of the camera.

(Reboot the camera, and the data is reset to the initial setting.)

To save the data into EEPROM, please refer to Section 5. Function Settings.

C is the code to send the data back from the camera.

**Note: Do not set code C when sending the data from PC side.**

Remote controller address

**Note: Do not write the data into the address other than specified, since it may cause the damages or malfunction of the camera.**

Remote controller data

Set the decimal number (000~255) for the remote controller data. Please be noted to set any dummy data at read control mode.

CR

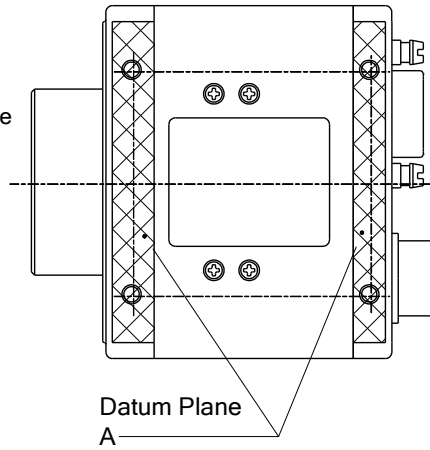
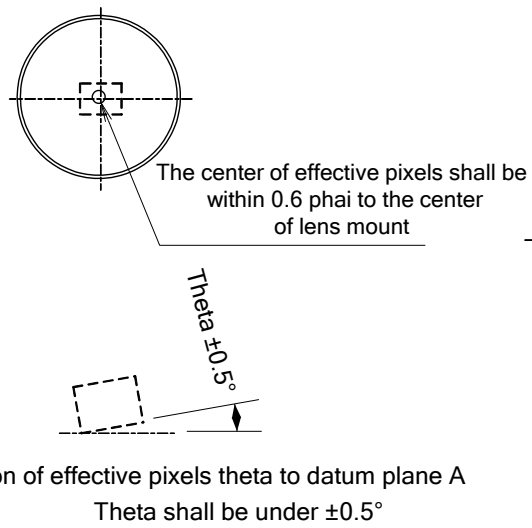
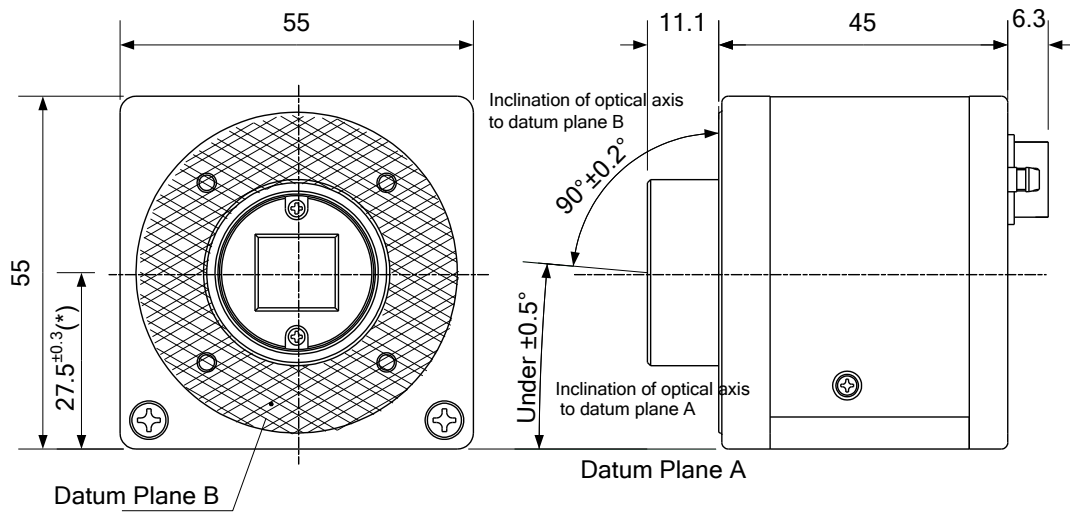
Be sure to input "CR" to confirm the end of the command.

※ Note: The data set with 2 Byte with Manual Analog/Digital Gain control, Manual Shutter Control, Partial Scan Start Position, and Partial Scan Effective Line shall be set with High Byte first, then set with Low Byte. The camera rewrites the internal register when receiving Low Byte.

## 10. Initial Settings

Function	Address	Data
Gain	001	0: 0dB
E-Shutter	002	0: 1/16s (Off)
Trigger Mode	004	0: Normal Mode (Trigger Mode Off)
Trigger Polarity	011	0: Positive Input
Output Data Select	013	0: 8 bit Output Data
Partial Scan Mode	015	0: Full Frame Scan Mode
Partial Scan Total Lines	021 & 022	2078: Read Only

11. CCD Optical Axis Accuracy

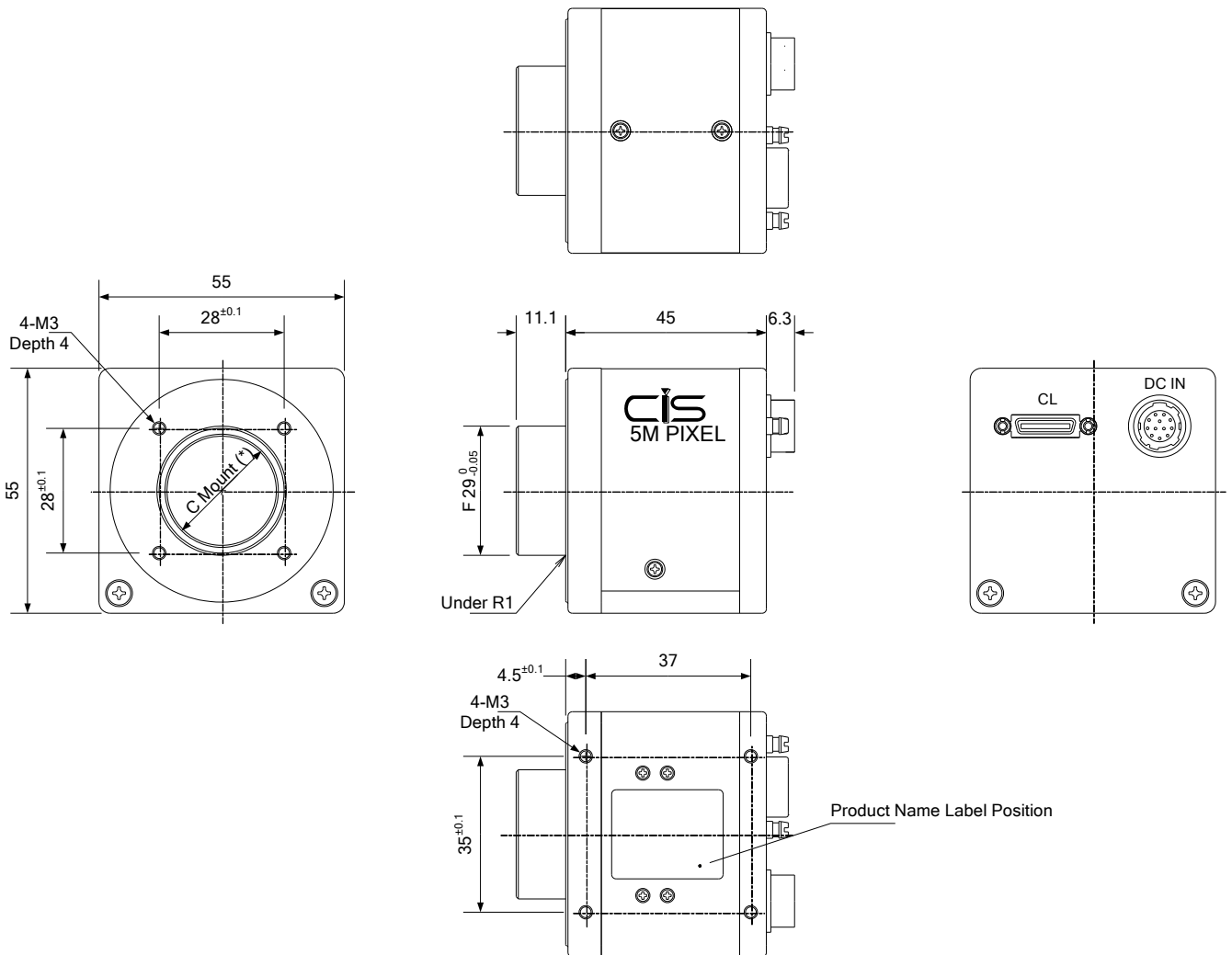


\*)Dimensions from datum plane A to the center of the lens mount

910-004-00-00

(Unit: mm)

12. Dimensions



\*) C Mount screws comply with ANSI/ASME B1.1, 1-32UN(2B).

\*) Screw length from C mount lens surface shall be under 6mm. And, protruding portion shall be less than 10mm.  
999-501-00-00  
(Unit: mm)

### 13. 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).
- ✧ Expenses we bear on this product shall be limited to the individual price of the product.

### 14. CCD Pixel Defect

CIS compensates the noticeable CCD pixel defects found at the shipping inspection prior to our shipment. On very rare occasions, however, CCD pixel defects might be noted with time of usage of the products. Cause of the CCD pixel defects is the characteristic phenomenon of CCD itself and CIS is exempted from taking any responsibilities for them. Should you have any questions on CCD pixel defects compensation, please contact us.

### 15. 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.