

# SONY

## Technical Catalogue

Line up 2015



### IMAGE SENSING SOLUTIONS

Colour Camera Block

Intelligent Cameras

Digital Interface IEEE 1394B

Digital Interface Camera Link

Digital Interface GigE Vision

Non TV Format

TV Format

3CCD Colour Video Cameras



# Image Sensing Products

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# NEW PRODUCTS INFORMATION

## XGC-C Series

GigE Vision® Version 2.0/1.2 Compliant PoE Cubic Series

1/3-type PS CCD  
VGA size 130 fps

**XCG-C30** (B/W)  
**XCG-C30C** (Color)

1/2-type PS CCD  
VGA size 104 fps

**XCG-C32** (B/W)  
**XCG-C32C** (Color)

1/3-type PS CCD  
SXGA size 31 fps

**XCG-C130** (B/W)  
**XCG-C130C** (Color)



Coming soon !

The XCG-C series using GigE Vision interface and supporting PoE and 12 VDC inputs are a new series of cameras that incorporate Sony's unique functions and a wide variety of functions in a compact cubic case. The lineup consists of VGA's and SXGA's black and white and color models.

XCG-C30 (B/W), XCG-C30C (Color) : 1/3-type CCD VGA Frame rate : 130fps\*  
XCG-C32 (B/W), XCG-C32C (Color) : 1/2-type CCD VGA Frame rate : 104fps\*  
XCG-C130 (B/W), XCG-C130C (Color) : 1/3-type CCD SXGA Frame rate : 31fps\*

\* DC 12V Power supply use

Dimension : 29 (W) x 29 (H) x 42 (D) mm\*

(\*excluding protrusions)

### Key Features

- Free run readout
- External trigger, Software trigger
- Partial scan, Binning (B/W model only)
- Short latency  
The time from the trigger acceptance to the exposure: XCG-C30/C30C 0.7μ sec (min)
- Trigger range (Noise filter)
- Special Trigger mode, Bulk Trigger, Sequential Trigger
- LUT (Look Up Table)
- Near-infrared Sensitivity: XCG-C130
- GigE Vision® Version 2.0/1.2
- PoE\*\* (IEEE802.3af) /DC12V  
\*\*PoE (Power over Ethernet)
- C mount
- High Shock and Vibration Resistance

\* "GigE Vision" is a trademark of the AIA (Automated Imaging Association).

\* SONY is a trademark of Sony Corporation.

# FCB-micro Series

**Exmor™ CMOS Sensor Ultra-compact All-in-one color block camera**

**One push AF**

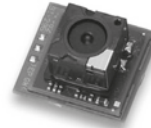
## FCB-MA130

**Fixed focus M12 Mount**

## FCB-MA132 **NEW**

## FCB-MA133 **NEW**

→ **Page 104**



FCB-MA130



FCB-MA132



FCB-MA133

**Exmor™**

The FCB-micro series are color camera modules that incorporate an Exmor™ CMOS image sensor and Sony's unique ISP in a compact size with high-density mounting technology, which is ideal for industrial applications. Combined with the FCB-MA130 using a specialized lens and incorporating one-push AF (auto focus) function, and newly launched FCB-MA132 and FCB-MA133 using fixed focus M12 mount lenses, and supporting 94° and 128° angle-of-view capabilities, a full line-up of FCB-micro series has finally been completed.

### ■ Angle-of-View Size

Product Name		FCB-MA130	FCB-MA132	FCB-MA133	
Lens Type		Single focal lens			
F Number		F2.8 (Fixed)	F2.2 (Fixed)	F2.8 (Fixed)	
Digital Zoom		16x			
Focus System		One push AF, Manual control	Manual control		
Angle-of-View	Moving Images 1080 mode (Full HD)	Horizontal	53°	85°	115°
		Vertical	29°	46°	62°
	Still Images (13 Mega)	Horizontal	58°	94°	128°
		Vertical	42°	67°	91°

### Key Features

- Exmor CMOS Sensor (13Mega pix)
- Focus System
  - FCB-MA130
    - One push AF, Manual control
  - FCB-MA132/MA133
    - Manual control
- Face Detection
- Image Stabilizer
- Adaptive Tone Reproduction (ATR)
- Backlight Correction
- Automatic Expose Mode

- Picture Effect
- Noise Reduction
- White Balance
- Video Output (CMOS/MIPI output)
- Dimensions, Mass
  - FCB-MA130 : 16.5 × 10.3 × 18.0 mm, Approx 2.2g
  - FCB-MA132 : 28.0 × 26.0 × 18.9 mm, Approx 9.7g
  - FCB-MA133 : 28.0 × 25.6 × 18.9 mm, Approx 8.7g

\* SONY and Exmor are trademarks of Sony Corporation.

# FCB-EV Series

Exmor™ CMOS Sensor Excellent high-definition color Camera Module

Full HD Model (1080p/60)

**FCB-EV7500** 30 x Optical Zoom

**FCB-EV7300** 20 x Optical Zoom **NEW**

**FCB-EV7310** 20 x Optical Zoom **NEW**  
(Near-infrared sensitivity)

**FCB-EV7100** 10 x Optical Zoom

→ Page 112

HD Model (720p/60)

**FCB-EV5500** 30 x Optical Zoom

**FCB-EV5300** 20 x Optical Zoom **NEW**

Exmor™



FCB-EV7500  
FCB-EV5500

FCB-EV7300  
FCB-EV7310  
FCB-EV5300

FCB-EV7100

Combined with three new 20x optical zoom color models, visibility has been greatly enhanced by various functions including 130dB achievable wide dynamic range function and three level selectable Defog function. The FCB-EV7310 with a high sensitive sensor in near-infrared domains enables you to capture images with high fidelity even in dark environments.

## Key Features

- Exmor CMOS Sensor
- Wide Dynamic range (Wide-D)  
FCB-EV7500/EV7300/EV7100/EV5500/EV5300
- Image Stabilizer  
FCB-EV7500/EV7300/EV5500/EV5300
- Defog
- Auto ICR
- Noise reduction (3D+2D)
- Digital Zoom (12 x )
- Privacy zone masking
- Motion detection
- Color Enhancement
- Slow AE Response
- Temperature readout
- Internal synchronise
- VISCA protocol (CMOS 5 V level)

\* SONY and Exmor are trademarks of Sony Corporation.

# XC Series Function Chart

## Digital Video Camera Function Chart

Interface		CameraLink				
Functions	Model	XCL-S900	XCL-S900C	XCL-S600	XCL-S600C	
Category	B/W	●		●		
	Color	RAW		●		●
		RGB		●		●
Image device	Progressive Scan	●	●	●	●	
CCD	Square Pixel	●	●	●	●	
	1/1-type	●	●	●	●	
	1/3-type					
	1/2-type					
	1/1.8-type					
	2/3-type					
Image size		9 Mega	9 Mega	6 Mega	6 Mega	
Frame rate	Sensor output 4ch*1	18 fps	18 fps	27 fps	27 fps	
	Sensor output 2ch	9 fps	9 fps	13 fps	13 fps	
	Sensor output 1ch	5 fps	5 fps	7.5 fps	7.5 fps	
Near infrared ray measures		●		●		
Lens Mount		C	C	C	C	
Read out mode	Normal	●	●	●	●	
	Binning	●		●		
	Partial scanning	●	●	●	●	
Shutter	Normal	●	●	●	●	
	External trigger shutter	Edge detection (Exposure time setting internal)	●	●	●	●
		Exposure time setting by trigger width	●	●	●	●
Trigger	S/W Trigger	●	●	●	●	
	Bulk Trigger	●	●	●	●	
	Sequential Trigger	●	●	●	●	
	Trigger delay	●	●	●	●	
	Trigger range	●	●	●	●	
White Balance	ATW					
	One Push		●		●	
	Preset					
	Manual		●		●	
Long exposure		●	●	●	●	
AGC		●	●	●	●	
Auto Shutter		●	●	●	●	
Shading Correction		●	●	●	●	
Defect Correction		●	●	●	●	
Temperature Readout		●	●	●	●	
Image Filter		3 x 3	3 x 3	3 x 3	3 x 3	
LUT		●	●	●	●	
Negative/Positive Reversal		●*2	●*2	●*2	●*2	
Memory Shot						
RS-232C Control		●	●	●	●	
See page		16	16	16	16	

\*1: Default setting

\*2: LUT setting available

XCL  
XCG  
XCD  
Digital Video Camera

XC (Non-TV Format)  
XC (TV Format)  
Analog Video Camera

Accessories

micro  
FCB-HD  
FCB-SD  
Color Camera Module

## Digital Video Camera Function Chart

Interface		CameraLink										
		Model	XCL-C500	XCL-C500C	XCL-C280	XCL-C280C	XCL-C130	XCL-C130C	XCL-C32	XCL-C32C	XCL-C30	XCL-C30C
Functions												
Category	B/W	●		●		●		●		●		
	Color	RAW		●		●		●		●		
		RGB		●		●		●		●		
Image device	Progressive Scan	●	●	●	●	●	●	●	●	●	●	
CCD	Square Pixel	●	●	●	●	●	●	●	●	●	●	
	1/1-type											
	1/3-type					●	●			●	●	
	1/2-type							●	●			
	1/1.8-type			●	●							
	2/3-type	●	●									
Image size		5 Mega	5 Mega	2.8 Mega	2.8 Mega	SXGA	SXGA	VGA	VGA	VGA	VGA	
Frame rate	Sensor output 2ch*1	15 fps	15 fps	26 fps	26 fps							
	Sensor output 1ch			15 fps	15 fps	31 fps	31 fps	104 fps	104 fps	130 fps	130 fps	
Near infrared ray measures				●		●						
Lens Mount		C	C	C	C	C	C	C	C	C	C	
Readout modes	Normal	●	●	●	●	●	●	●	●	●	●	
	Binning	●		●		●		●		●		
	Partial scanning	●	●	●	●	●	●	●	●	●	●	
Shutter	Normal	●	●	●	●	●	●	●	●	●	●	
	External trigger shutter	Edge detection (Exposure time setting internal)	●	●	●	●	●	●	●	●	●	●
		Exposure time setting by trigger width	●	●	●	●	●	●	●	●	●	●
Trigger	S/W Trigger	●	●	●	●	●	●	●	●	●	●	
	Bulk Trigger	●	●	●	●	●	●	●	●	●	●	
	Sequential Trigger	●	●	●	●	●	●	●	●	●	●	
	Trigger delay	●	●	●	●	●	●	●	●	●	●	
	Trigger range	●	●	●	●	●	●	●	●	●	●	
White Balance	ATW											
	One Push		●		●		●		●		●	
	Preset											
	Manual		●		●		●		●		●	
Long exposure		●	●	●	●	●	●	●	●	●	●	
AGC		●	●	●	●	●	●	●	●	●	●	
Auto Shutter		●	●	●	●	●	●	●	●	●	●	
Shading Correction		●	●	●	●	●	●	●	●	●	●	
Defect Correction		●	●	●	●	●	●	●	●	●	●	
Temperature Readout		●	●	●	●	●	●	●	●	●	●	
Image Filter		3 x 3	3 x 3	3 x 3	3 x 3	3 x 3	3 x 3	3 x 3	3 x 3	3 x 3	3 x 3	
LUT		●	●	●	●	●	●	●	●	●	●	
Negative/Positive Reversal		●*2	●*2	●*2	●*2	●*2	●*2	●*2	●*2	●*2	●*2	
Memory Shot												
RS-232C Control		●	●	●	●	●	●	●	●	●	●	
See page		22	22	22	22	22	22	22	22	22	22	

\*1: Default setting

\*2: LUT setting available



## Digital Video Camera Function Chart

Interface		GigE Vision							
Functions	Model	XCG-H280E	XCG-H280CR	XCG-5005E	XCG-5005CR	XCG-U100E	XCG-U100CR	XCG-SX99E	XCG-V60E
Category	B/W	●		●		●		●	●
	Color	RAW		●		●		●	
		RGB							
Image device	Progressive Scan	●	●	●	●	●	●	●	●
CCD	Square Pixel	●	●	●	●	●	●	●	●
	1/1-type								
	1/3-type								●
	1/2-type								
	1/1.8-type					●	●		
	2/3-type	●	●	●	●			●	
Image size		2.8 Mega	2.8 Mega	5 Mega	5 Mega	UXGA	UXGA	SXGA	VGA
Frame rate	Sensor output 4ch	59 fps	59 fps						
	Sensor output 2ch*1	32 fps	32 fps	15 fps	15 fps				
	Sensor output 1ch	26 fps	26 fps			15 fps	27 fps	90 fps	90 fps
Near infrared ray measures		●						●	
Lens Mount		C	C	C	C	C	C	C	C
Readout modes	Normal	●	●	●	●	●	●	●	●
	Binning	●		●		●		●	●
	Partial scanning	●	●	●	●	●	●	●	●
Shutter	Normal	●	●	●	●	●	●	●	●
	External trigger shutter	Edge detection (Exposure time setting internal)	●	●	●	●	●	●	●
		Exposure time setting by trigger width	●	●	●	●	●	●	●
Trigger	S/W Trigger	●	●	●	●	●	●	●	●
	Bulk Trigger	●	●	●	●	●	●	●	●
	Sequential Trigger	●	●	●	●	●	●	●	●
	Trigger delay	●	●	●	●	●	●	●	●
	Trigger range								
White Balance	ATW								
	One Push		●		●		●		
	Preset				●		●		
	Manual		●		●		●		
Long exposure		●	●	●	●	●	●	●	●
AGC		●	●	●	●	●	●	●	●
Auto Shutter		●	●						
Shading Correction									
Defect Correction									
Temperature Readout		●	●						
Image Filter									
LUT		●	●	●	●	●	●	●	●
Negative/Positive Reversal		●	●	●	●	●	●	●	●
Memory Shot		●	●						
RS-232C Control									
See page		30	30	34	34	34	34	34	34

\*1: Default setting

XCL  
XCG  
XCD

XC (Non-TV Format)  
XC (TV Format)

Accessories

micro  
FCB-HD  
FCB-SD

Digital Video Camera

Analog Video Camera

Color Camera Module

## Digital Video Camera Function Chart

Interface		XCD-U100	XCD-U100CR	XCD-SX90	XCD-SX90CR	XCD-V60	XCD-V60CR	
Functions	Model							
Category	B/W	●		●		●		
	Color	RAW	●		●		●	
		RGB						
Image device	Progressive Scan	●	●	●	●	●	●	
CCD	Square Pixel	●	●	●	●	●	●	
	1/1-type							
	1/3-type			●	●	●	●	
	1/2-type							
	1/1.8-type	●	●					
	2/3-type							
Image size		UXGA	UXGA	SXGA	SXGA	VGA	VGA	
Frame rate		15 fps	15 fps	30 fps	30 fps	90 fps	90 fps	
Near infrared ray measures								
Lens Mount		C	C	C	C	C	C	
Readout modes	Normal	●	●	●	●	●	●	
	Binning	●		●		●		
	Partial scanning	●	●	●	●	●	●	
Shutter	Normal	●	●	●	●	●	●	
	External trigger shutter	Edge detection (Exposure time setting internal)	●	●	●	●	●	●
		Exposure time setting by trigger width	●	●	●	●	●	●
Trigger	S/W Trigger	●	●	●	●	●	●	
	Bulk Trigger	●	●	●	●	●	●	
	Sequential Trigger	●	●	●	●	●	●	
	Trigger delay	●	●	●	●	●	●	
	Trigger range							
White Balance	ATW		●		●		●	
	One Push		●		●		●	
	Preset		●		●		●	
	Manual		●		●		●	
Long exposure		●	●	●	●	●	●	
AGC		●	●	●	●	●	●	
Auto Shutter		●	●	●	●	●	●	
Shading Correction								
Defect Correction								
Temperature Readout								
Image Filter		3 × 3		3 × 3		3 × 3		
LUT		●	●	●	●	●	●	
Negative/Positive Reversal		●	●	●	●	●	●	
Memory Shot		●	●	●	●	●	●	
RS-232C Control								
See page		40	40	40	40	40	40	

## Analog Video Camera Function Chart

Interface		Non-TV format							
Functions		Model	XC-HR90	XC-HR70	XC-HR50	XC-HR57	XC-HR58	XC-56	XC-56BB
Signal output	Non-TV format		●	●	●	●	●	●	●
	TV format								
B/W			●	●	●	●	●	●	●
Image device	Progressive Scan		●	●	●	●	●	●	●
	CCD								
CCD	Square Pixel		●	●	●	●	●	●	●
	1/3-type		●	●	●			●	●
	1/2-type					●	●		
	2/3-type								
Lens Mount			C	C	C	C	C	C	NF
Output	VS (Video Sync.)		●	●	●	●	●	●	●
	VBS								
	Y/C								
Image size			SXGA	XGA	VGA	VGA	SVGA	VGA	VGA
Frame rate			30/15 fps Selectable	30 fps	60 fps	60 fps	50 fps	30 fps	30 fps
Near infrared ray measures									
Near ultraviolet ray measures									
Readout modes	Normal		●	●	●	●	●	●	●
	Binning		●	●	●	●	●	●	●
	Partial scanning		●	●	●	●	●	●	●
External synchroni- zaion	HD/VD		●	●	●	●	●	●	●
	VS								
	VBS								
Shutter	Normal		●	●	●	●	●	●	●
	External trigger shutter	Mode1 (Non reset mode)		●	●	●	●	●	●
		Mode2 (Reset mode)		●	●	●	●	●	●
Restart/Reset (Long exposure)			●	●	●	●	●	●	●
AGC									
RS-232C Control			●						
See page			48	52	56	56	60	64	68

XCL  
XCG  
XCD

XC (Non-TV Format)  
XC (TV Format)

Accessories

micro  
FCB-HD  
FCB-SD

Digital Video Camera

Analog Video Camera

Color Camera Module

## Analog Video Camera Function Chart

Interface		TV format											
Model		XC-ST70 XC-ST70CE	XC-ST50 XC-ST50CE	XC-ST51 XC-ST51CE	XC-ST30 XC-ST30CE	XC-ES50 XC-ES50CE	XC-ES51 XC-ES51CE	XC-ES30 XC-ES30CE	XC-EI50 XC-EI50CE	XC-EI30 XC-EI30CE	XC-EU50 XC-EU50CE	XC-ES50L	
Signal output	Non-TV format												
	TV format	●	●	●	●	●	●	●	●	●	●	●	
B/W		●	●	●	●	●	●	●	●	●	●	●	
Image device	Progressive Scan												
	Square Pixel												
CCD	1/3-type				●			●		●			
	1/2-type		●	●		●	●		●		●	●	
	2/3-type	●											
Lens Mount		C	C	C	C	C	C	C	C	C	C	C	
Output	VS (Video Sync.)	●	●	●	●	●	●	●	●	●	●	●	
	VBS												
	Y/C												
Image size	VGA*1	●	●	●	●	●	●	●	●	●	●	●	
	SVGA*2	●	●	●	●	●	●	●	●	●	●	●	
Frame rate*3		30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	30 fps/ 25 fps	
Near infrared ray measures									●	●			
Near ultraviolet ray measures											●		
Readout modes	Normal	●	●	●	●	●	●	●	●	●	●	●	
	Binning												
	Partial scanning												
External synchroni- zation	HD/VD	●	●	●	●	●	●	●	●	●	●	●	
	VS	●	●	●	●								
	VBS												
Shutter	Normal	●	●	●	●	●	●	●	●	●	●	●	
	External trigger shutter	Mode1 (Non reset mode)	●	●	●	●	●	●	●	●	●	●	●
		Mode2 (Reset mode)	●	●	●	●	●	●	●	●	●	●	●
Restart/Reset (Long exposure)		●	●	●	●	●	●	●	●	●	●	●	
AGC		●	●	●	●	●	●	●	●	●	●	●	
RS-232C Control													
See page		74	74	74	74	78	78	78	82	82	86	92	

\*1 EIA (NTSC) model (The upper model in the Model Name): 30 fps

\*2 CCIR (PAL) model (The lower model in the Model Name): 25 fps

\*3 As for the TV signal formats, the image signal is output as interlaced signals, and the frame rate of the TV signal format are as follows.

# Effectiveness of 3 x 3 filter

Depending on the patterns of parameters, you can reduce noise, apply edge enhancement and extract the contour.

XCL-S series, XCL-C series, XCD series (B/W models)

3 x 3 filter: OFF



Laplacian filter

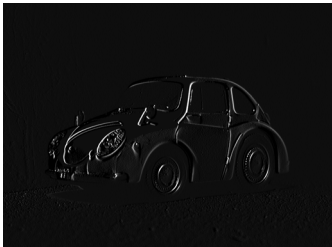


Edge-detect filter

For Up side



For Left side



3 x 3 filter: OFF



For Right side



For Down side



Edge enhancement

Softening



3 x 3 filter: OFF





sharpening



# Image comparison at near-infrared domains

## ■ The feature of the camera with sensitivity in near-infrared domains

The one which is difficult to be seen in the visible wavelength becomes able to be seen by changing a light source. For example, if using the camera which has sensitivity of the infrared wavelength, in the machine vision, you can see the inside of the substrate. Also in case of using security, you can see a thing under the night-vision.

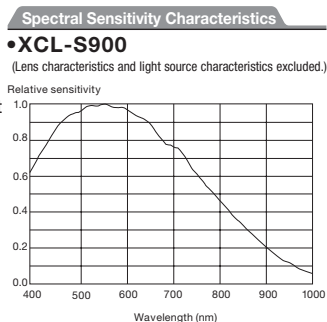
<p><b>Camera for good performance at visible wavelengths</b>                  CameraLink: XCL-C500                  2/3-type CCD 5 Megapixels                  Frame rate: 15 fps                  Image acquisition condition: F4, Shutter 1/30 sec, Gain 0 dB                  (Light source: Infrared light (800 to 850 nm))</p> <p>Image taken by XCL-C500                  (Frame rate: 15 fps)</p>		<p><b>Camera for good performance at near-infrared wavelength</b>                  GigE Vision: XCG-H280E                  2/3-type CCD 2.8 Megapixels                  Frame rate: 32 fps                  Image acquisition condition: F4, Shutter 1/30 sec, Gain 0 dB                  Light source: Infrared light (800 to 850 nm)</p> <p>Image taken by XCG-H280E                  (Frame rate: 32 fps)</p>	
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Digital video camera: XCL-S900, XCL-S600, XCL-C280, XCL-C130, XCG-H280E, XCG-SX99E  
 Analog video camera: XC-EI50, XC-EI50CE, XC-EI30, XC-EI30CE

## ■ Digital video camera with sensitivity in near-infrared domains

### CameraLink: non-PoCL XCL-S900

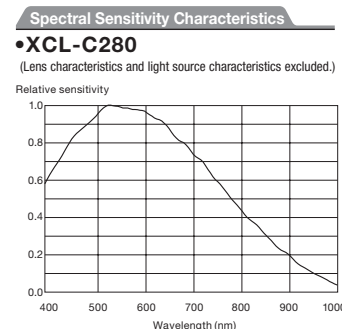
- EXview HAD CCD II™
- 1/1-type CCD, 9 Megapixels, 18 fps (Sensor output 4ch, Output pixels (H x V, Full resolution): 3,388 x 2,712)



➔ Page 16

### CameraLink: PoCL/non-PoCL XCL-C280

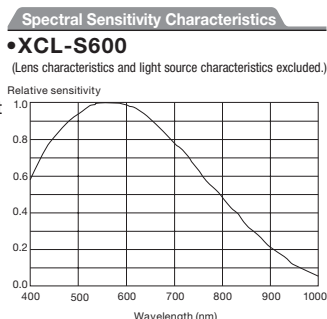
- EXview HAD CCD II™
- 1/1.8-type CCD which supports Full HD, 2.8 Megapixels, permitting image acquisition at 26 fps



➔ Page 22

### CameraLink: non-PoCL XCL-S600

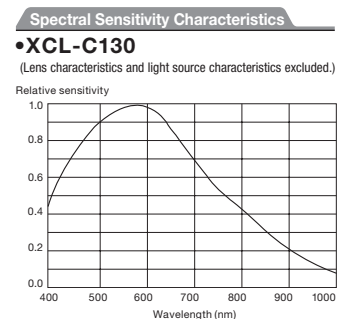
- EXview HAD CCD II™
- 1/1-type CCD, 6 Megapixels, 27 fps (Sensor output 4ch, Output pixels (H x V, Full resolution): 2,578 x 2,208)



➔ Page 16

### CameraLink: PoCL/non-PoCL XCL-C130

- EXview HAD CCD II™
- 1/3-type CCD, SXGA, permitting image acquisition at 31 fps



➔ Page 22

GigE Vision  
**XCG-H280E**

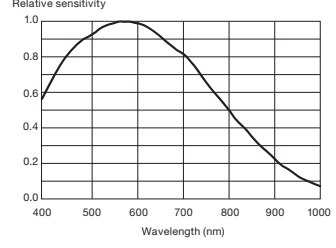
- EXview HAD CCD II™
- 2/3-type CCD which supports Full HD, 2.8 Megapixels, permitting image acquisition at 32 fps



Spectral Sensitivity Characteristics

•**XCG-H280E**

(Lens characteristics and light source characteristics excluded.)



→ Page 30

GigE Vision  
**XCG-SX99E**

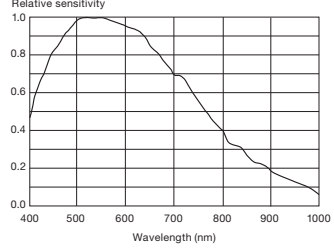
- 2/3-type CCD which supports SXGA 1.3 Megapixels, permitting image acquisition at 27 fps



Spectral Sensitivity Characteristics

•**XCG-SX99E**

(Lens characteristics and light source characteristics excluded.)



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■ Analog video camera with sensitivity in near-infrared domains

**XC-EI50**  
**XC-EI50CE**

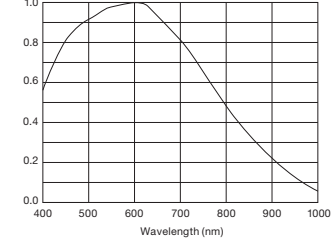
- 1/2-type IT CCD
- High sensitivity: 0.1 lx (F1.4)
- S/N ratio: 60 dB



Spectral Sensitivity Characteristics

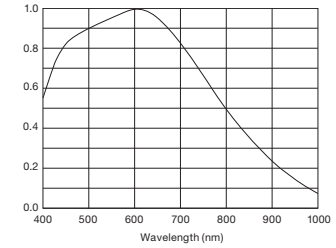
•**XC-EI50** S/No. 500001~

(Lens characteristics and light source characteristics excluded.)



•**XC-EI50CE** S/No. 200001~

(Lens characteristics and light source characteristics excluded.)



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**XC-EI30**  
**XC-EI30CE**

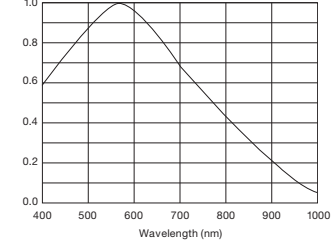
- 1/3-type IT CCD
- High sensitivity: 0.2 lx (F1.4)
- S/N ratio: 60 dB



Spectral Sensitivity Characteristics

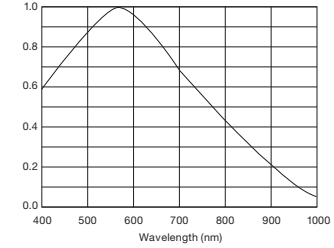
•**XC-EI30** S/No. 500001~

(Lens characteristics and light source characteristics excluded.)



•**XC-EI30CE** S/No. 200001~

(Lens characteristics and light source characteristics excluded.)



→ Page 82

EXview HAD CCD II and EXview HAD CCD are trademarks of Sony Corporation.

**B/W model**      **Color model**  
**XCL-S900**    **XCL-S900C**  
**XCL-S600**    **XCL-S600C**

<b>CL</b> Output	<b>Progressive</b> Scan	<b>1/1</b> Type CCD	<b>Square</b> Pixels	<b>C</b> Lens Mount	<sup>*1</sup> <b>9 MEGA</b> Output	<sup>*2</sup> <b>6 MEGA</b> Output	<b>Long</b> Exposure
<b>Normal</b> Shutter	<b>External</b> Trigger Shutter	<b>Auto</b> Shutter	<b>Bulk</b> Trigger	<b>Sequential</b> Trigger	<b>Partial</b> Scan	<b>Shading</b> Correction	<b>Temperature</b> Readout
<sup>*3</sup> <b>Blemish</b> Correction	<sup>*3</sup> <b>One-Push</b> White Balance	<sup>*3</sup> <b>Manual</b> White Balance	<b>LUT</b>	<b>RS232C</b> Control	<sup>*4</sup> <b>B/W</b>	<sup>*3</sup> <b>RGB</b> RAW	<sup>*4</sup> <b>Near-IR</b> Sensitivity

Connection Diagram P45

\*1: XCL-S900/S900C    \*2: XCL-S600/S600C    \*3: XCL-S900C/S600C  
 \*4: XCL-S900/S600



**Outline**

The XCL-S Series cameras incorporate a 1/1-type EXview HAD CCD II™ sensor which provides extremely high sensitivity. The XCL-S900 series (XCL-S900/S900C) cameras achieve high-resolution image capturing with 9 megapixels, and the XCL-S600 series (XCL-S600/S600C) cameras also achieve 6 megapixels image capturing. With their compact size (50(W) x 50(H) x 57.5(D) mm) and useful features, these cameras are suitable for various applications.

**Features**

■ **High definition and high speed image capture**  
 The unit includes a 9,000,000-pixel or 6,000,000-pixel high-resolution CCD, with high speed read out depending on each model. You can select 1ch, 2ch or 4ch sensor output. The frame rate depends on the channel selected.

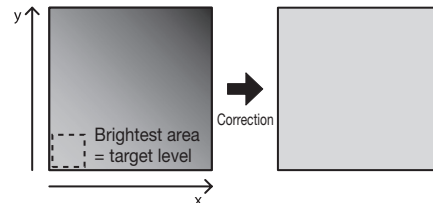
CCD/Image size		B/W Model	Color Model
1/1-type CCD	9 Mega	XCL-S900	XCL-S900C
1/1-type CCD	6 Mega	XCL-S600	XCL-S600C

Sensor Tap	XCL-S900/S900C	
	Frame rate	Maximum output of pixels (H x V)
4ch	18 fps	3,388 x 2,712
2ch	9 fps	
1ch	5 fps	

Sensor Tap	XCL-S600/S600C	
	Frame rate	Maximum output of pixels (H x V)
4ch	27 fps	2,758 x 2,208
2ch	13 fps	
1ch	7.5 fps	

■ **Near-infrared Sensitivity: XCL-S900, XCL-S600**  
 Utilizing EXview HAD CCD II technology enables the XCL-S900 and XCL-S600 cameras to capture clear images in near-infrared wavelengths.

- **Shading Correction**  
 Shadings caused by a drop in the amount of light around the lens or light source variation are corrected. The shading correction can be set to ON or OFF.
  - XCL-S900/S900C: 6 settings
  - XCL-S600/S600C: 10 settings

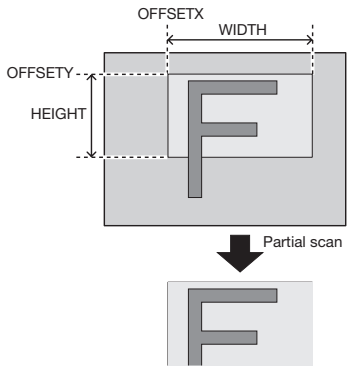


- **Temperature Readout**  
 The camera's internal temperature can be read from the temperature sensor installed in the circuit board.
- **Defect correction**  
 It corrects clear defect points and opaque defect points which increase under the high/low temperature or when exposed for a long time (seconds). From the peripheral pixels, correction is performed on coordinate pixels in which defects are detected. Factory setting and user setting can be selected.  
 \* Factory setting: OFF
- **Trigger modes**  
 Free run/Special trigger mode  
 (Bulk trigger/Sequential trigger)
- **Readout modes**  
 Normal/Binning (Monochrome camera only)/Partial scan
- **Binning (Monochrome camera only)**  
 <Vertical Binning/Horizontal Binning>  
 By adding 2 vertical pixels or 2 horizontal pixels, the frame rate in vertical binning is increased along with the sensitivity. The color camera cannot set this. This can be set with or without a trigger. Partial scan can be used concurrently and horizontal and vertical can be set at the same time.



■ Partial scan

Only the area selected from the effective pixel area can be read out. Clearing unnecessary parts at high-speed allows high-speed reading. The area size is selected by the HEIGHT and WIDTH commands, and the read beginning point is selected by the OFFSETX and OFFSETY commands.



	WIDTH (Pixel)	HEIGHT (Line)
XCL-S900 XCL-S900C	16 to 3388	4 to 2712
XCL-S600 XCL-S600C	16 to 2758	4 to 2208

\* Binning(horizontal and vertical)can be used at the same time. The value will be half during Binnig operation.  
\* Configurable values: WIDTH: 2-step increments, HEIGHT: 4-step increments

■ Shutter: Manual/External trigger shutter/Auto

■ Shutter speed: Manual 2sec to 1/100,000 sec in 1 μs increments

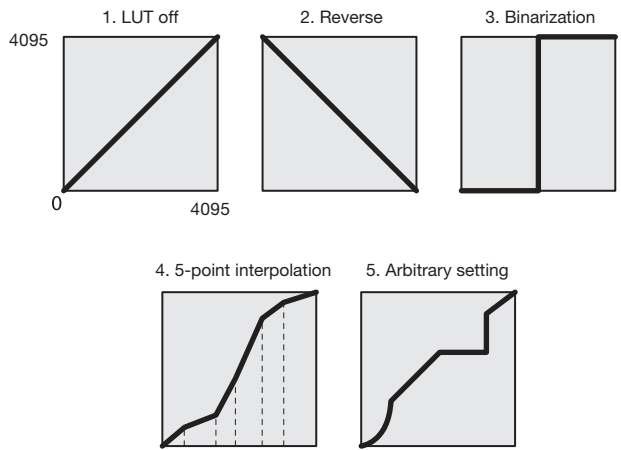
■ Synchronization: Hardware trigger, Software trigger

■ White balance (color camera only)

- One push WB  
The white balance can be automatically adjusted once when the WHITEBALANCE-AUTO command is executed. The detection area is set to the screen center by default. The detection frame can be changed arbitrarily (AWB-FRAME).
- Manual  
Each Gain of R, G, and B is adjustable manually.

■ Readout features

- Built-in test pattern  
B/W model: monochrome chart  
Color model: monochrome chart/color chart
- LUT (Look-Up Table)  
The following Five types of presets are provided. Binarization, 5-point interpolation, and arbitrary setting can be changed. LUT off, Reverse, Binarization, 5-point interpolation, Arbitrary setting.



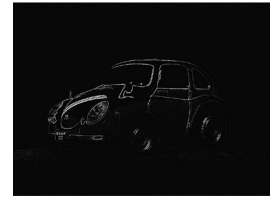
■ 3 x 3 filter

Utilizing the 3 x 3 filter, you can obtain images in various processing conditions. Depending on the patterns of parameters, you can reduce noise, apply edge enhancement and extract the contour.

3 x 3 filter: OFF



Laplacian filter



■ Sensor Tap and Camera Link Tap

1tap output or 2tap output can be selected, regardless of the camera settings. The output of sensor tap4 is only available for the selection of camera link tap2. Output clock frequencies are as follows.

Sensor Tap	CameraLink Tap	
	1	2
1	available (Clock 54 MHz)	available (Clock 27 MHz)
2	available (Clock 84 MHz)	available (Clock 42 MHz)
4	unavailable	available (Clock 84 MHz)

■ Dimensions (excluding protrusions):

50 (W) × 50 (H) × 57.5 (D) mm

■ Mass: Approx. 181 g

■ C-mount

■ High Shock and Vibration Resistance

Accessories

■ Compact camera adaptor  
DC-700/700CE

■ 12-pin camera cable (CE standard)

CCXC-12P02N (2 m)

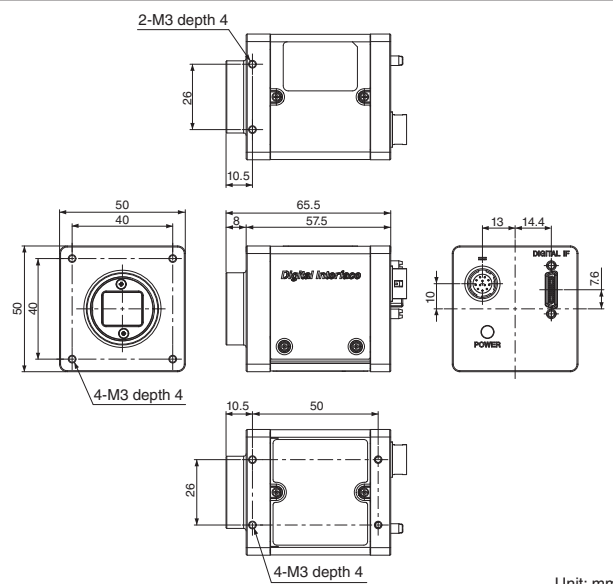
CCXC-12P05N (5 m)

CCXC-12P10N (10 m)

CCXC-12P25N (25 m)

■ Tripod adaptor  
VCT-ST70I

Dimensions



Unit: mm

# Specifications

	XCL-S900	XCL-S900C	XCL-S600	XCL-S600C
<b>Camera</b>				
Image type	B/W	Color	B/W	Color
Image size	9 Mega	9 Mega	6 Mega	6 Mega
Image sensor	1/1-type PS IT CCD (EXview HAD CCD II)	1/1-type PS IT CCD (EXview HAD CCD II)	1/1-type PS IT CCD (EXview HAD CCD II)	1/1-type PS IT CCD (EXview HAD CCD II)
Number of effective pixels (H x V)	3,388 x 2,712		2,758 x 2,208	
Cell size (H x V)	3.69 μm x 3.69 μm		4.54 μm x 4.54 μm	
Standard output pixels (H x V)	3,384 x 2,704		2,752 x 2,200	
Color filter	—	RGB color moxaic filter	—	RGB color moxaic filter
Frame rate	18 fps (Sensor output 4ch) 9 fps (Sensor output 2ch) 5 fps (Sensor output 1ch)		27 fps (Sensor output 4ch) 13 fps (Sensor output 2ch) 7.5 fps (Sensor output 1ch)	
Minimum illumination	0.5 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/18 sec)	6 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/18 sec)	0.5 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/27 sec)	6 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/27 sec)
Sensitivity	F8 (400 lx, Gain: 0 dB)	F8 (2000 lx, Gain: 0 dB)	F8 (400 lx, Gain: 0 dB)	F8 (2000 lx, Gain: 0 dB)
SNR	More than 50 dB (Lens close, Gain: 0 dB, 8 bits)			
Gain	Auto, Manual: 0 dB to 18 dB			
Shutter speed	Auto, Manual: 2 sec to 1/100,000 sec in 1 μs increments			
White balance	—	Manual, One push	—	Manual, One push
Reference video output level	235 steps (12 bits) (default setting 8 bits)			
Reference pedestal level	15 steps (12 bits) (default setting 8 bits)			
<b>Camera Features</b>				
Readout modes	Normal, Binning (2 × 1, 1 × 2, 2 × 2), Partial scan	Normal, Partial scan	Normal, Binning (2 × 1, 1 × 2, 2 × 2), Partial scan	Normal, Partial scan
Readout features	LUT (Binarization, Gamma (arbitrary setting), Test pattern (monochrome chart), 3 × 3 filter	LUT (Binarization, Gamma (arbitrary setting), Test pattern (Monochrome chart/color chart), 3 × 3 filter, Color matrix (for RGB output)	LUT (Binarization, Gamma (arbitrary setting), Test pattern (monochrome chart), 3 × 3 filter	LUT (Binarization, Gamma (arbitrary setting), Test pattern (Monochrome chart/color chart), 3 × 3 filter, Color matrix (for RGB output)
Synchronization	Internal/External (Hardware trigger, Software trigger)			
Trigger modes	OFF (Free run), ON (Trigger edge detection, Trigger width detection), Special trigger (Bulk/Sequential)			
User Set/Memory channel	16 channels			
User memory	32 kbytes + 64 bytes x 16 ch			
Partial scan	W (Pixel)	16 to 3388		16 to 2758
	H (Line)	4 to 2712		4 to 2208
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor readout/Trigger through/Pulse generation signal/User definition 1, 2, 3, 4 (Selectable)			
Other features	Shading correction, Defect correction, Temperature readout, Sensor tap switching			
<b>Interface</b>				
Video data output	digital Mono 8, 10, 12-bit (default setting 8 bits)	digital Raw 8, 10, 12-bit (default setting Raw 8 bits), RGB	digital Mono 8, 10, 12-bit (default setting 8 bits)	digital Raw 8, 10, 12-bit (default setting Raw 8 bits), RGB
Digital interface	LVDS			
Camera specification	Base Configuration, CameraLink® Version 1.2			
Output data clock (* ) shows CAMERALINK TAP	Sensor Tap 1ch 54 MHz (1 tap)/27 MHz(2 tap) Sensor Tap 2ch 84 MHz (1 tap)/42 MHz(2 tap) Sensor Tap 4ch — /84 MHz(2 tap)			
Digital I/O	TTL IN (x1), TTL IN/OUT (x2), ISO IN (x1), ISO OUT (x2)			
<b>General</b>				
Lens mount	C-mount			
Flange focal length	17.526 mm			
Power requirements	DC +12 V (10.5 V to 15.0 V: DC IN terminal)			
Power consumption	6.0 W			
Operating temperature	-10°C to +45°C			
Performance guarantee temperature	0°C to 40°C			
Storage temperature	-30°C to +60°C			
Operating humidity	20% to 80% (no condensation)			
Storage humidity	20% to 95% (no condensation)			
Vibration resistance	10 G (20 Hz to 200 Hz)			
Shock resistance	70 G			
Dimensions (W x H x D)	50 x 50 x 57.5 mm (excluding protrusions)			
Mass	Approx. 181 g			
MTBF	76,300 hours (Approx. 8.7years)			
Regulations	UL60950-1, FCC Class A, CSA C22.2-No.1, IC Class A Digital Device, CE: EN61326 (Class A), AS EMC: EN61326, VCCI Class A, KCC			
Supplied accessories	Lens mount cap (1), Operating Instructions (1)			

\* CameraLink and related symbols are trademarks or registered trademarks of AIA (Automated Imaging Association).

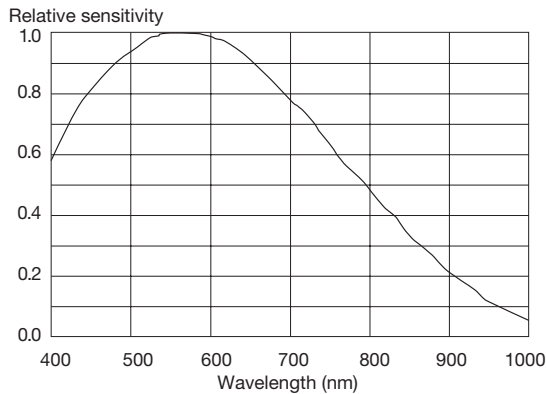
\* EXview HAD CCD II is a trademark of Sony Corporation.

## Spectral Sensitivity Characteristics

### B/W model

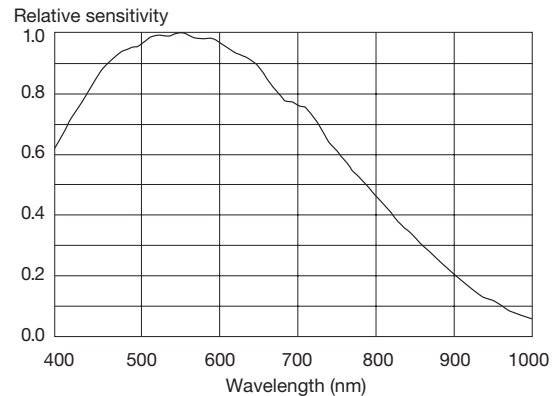
#### • XCL-S600

(Lens characteristics and light source characteristics excluded.)



#### • XCL-S900

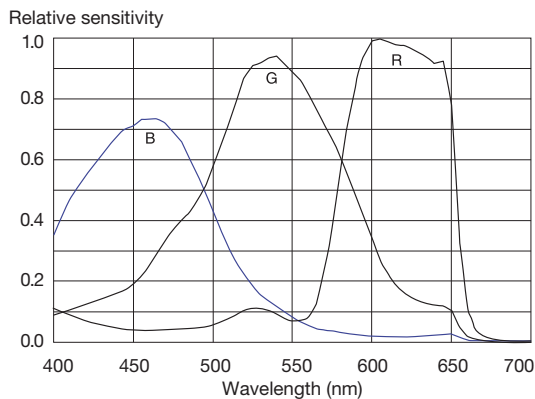
(Lens characteristics and light source characteristics excluded.)



### Color model

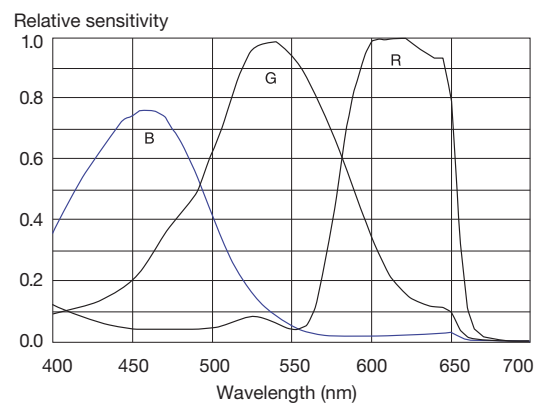
#### • XCL-S600C

(Lens characteristics and light source characteristics excluded.)

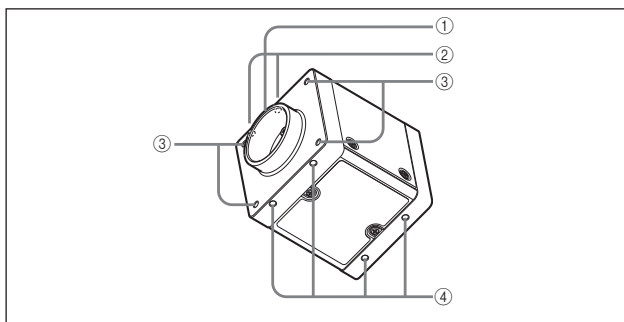


#### • XCL-S900C

(Lens characteristics and light source characteristics excluded.)



## Location and Function of Parts and Controls

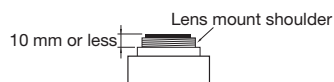


#### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

##### Note

The lens must not project more than 10 mm from the lens mount.



#### ② Guide screw holes (Top)

#### ③ LED light screw holes

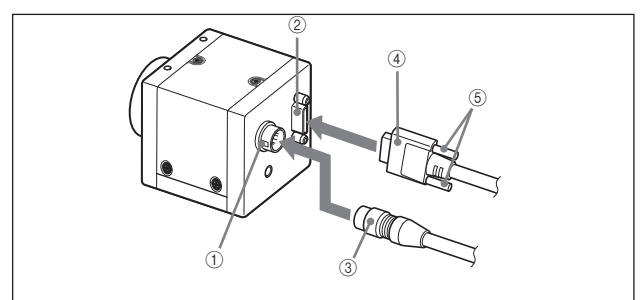
Use these screw holes to attach the LED light to the camera module. Use an adapter appropriate for the LED light as required.

#### ④ Guide screw holes / Tripod screw holes (Bottom)

These precision screw holes are for locking the camera module. Locking the camera module into these holes secures the optical axis alignment.

When using a tripod, use these four screw holes to attach a VCT-ST70I tripod adaptor.

## Connecting the Cables

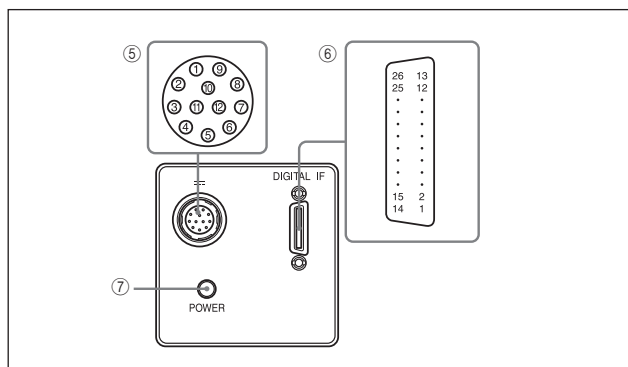


Connect the camera cable to the DC IN connector and the Camera Link cable to the DIGITAL IF cable respectively. When you connect the Camera Link cable, turn the two fastening screws on the connector to secure the cable tightly.

Connect the other end of the camera cable to the DC-700/700CE and the other end of the Camera Link cable to the camera module interface board.

- ① DC IN Connector
- ② DIGITAL IF connector
- ③ Camera Cable
- ④ Camera Link Cable
- ⑤ Fastening Screws

## Rear Panel/Pin Assignments



### ⑤ DC IN (DC power input) connector (12-pin)

Pin No.	Signal	Pin No.	Signal
1	Ground	7	GPI3/GPO3 *
2	DC +12 V	8	GPI4 (ISO-)
3	ISO Ground	9	GPO4 (ISO)
4	GPI1/GPO1 *	10	GPI4 (ISO+)
5	GPO2 (ISO-)	11	GPI2
6	GPO2 (ISO+)	12	ISO Ground

#### Power input

Pin 1 (Ground) and pin 2 (DC +12 V) are used.

#### Signal input

Pins 4, 7, 10 and 11 (GPI1/3/4/2) are used for GPI input or trigger input.

When selecting 1 system for GPI (ISO):

– GPI4 (ISO+) (pin 10) and GPI4 (ISO-) (pin 8) are used.

When selecting 2 systems for GPI:

– GPI1 (pin 4\*) and Ground (pin 1) are used.

– GPI3 (pin 7\*) and Ground (pin 1) are used.

\* Pins 4 and 7 can switch GPI input and GPO output, by external command. The initial value is GPI.

#### Signal output

Pins 4, 6, 7 and 9 (GPO1/2/3/4) allow you to select GPO from the exposure signal, strobe control signal, Hi/Low fixed value, etc.

When selecting 2 systems for GPO (ISO):

– GPO4 (ISO) (pin 9) and ISO Ground (pins 3 and 12) are used.

– GPO2 (ISO+) (pin 6) and GPO2 (ISO-) (pin 5) are used.

When selecting 2 systems for GPO:

– GPO1 (pin 4\*) and Ground (pin 1) are used.

– GPO3 (pin 7\*) and Ground (pin 1) are used.

\* The initial value of pins 4 and 7 is GPI. Switch to GPO output by external command.

### ⑥ DIGITAL IF (Interface) connector (26-pin)

Camera Link Base Configuration:

Pin No.	Signal	Pin No.	Signal
1	Ground	14	Ground
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-	22	CC1+
10	CC2+	23	CC2-
11	CC3-	24	CC3+
12	CC4+	25	CC4-
13	Ground	26	Ground

### ⑦ Status LED (Green)

When power is on, this LED lights up.

## Controlling the Camera From the Host Device

You can control the camera from host device such as a computer. The following table shows the major control functions.

Control functions	Description	
Operating mode	Free run/Trigger	
Shutter speed	Free run	1/100,000 sec to 2 sec
	Trigger edge detection	1/100,000 sec to 2 sec
	Trigger pulse width detection	Setting by trigger pulse width
Gain	0 dB to 18 dB	
Partial Scan	Variable, 4-line increments	
LUT (Look Up Table)	OFF/ON (Mode: 5 types)	
External trigger input	DIGITAL IF connector/DC IN connector	
Video output switch	Monochrome model: Mono 8/10/12-bit Color model: Raw 8/10/12-bit, RGB 24-bit	
Binning (Monochrome camera only)	2 × 1, 1 × 2, 2 × 2	
Defect correction	OFF/ON	
Shading correction	OFF/ON	

## Trigger Signal Input

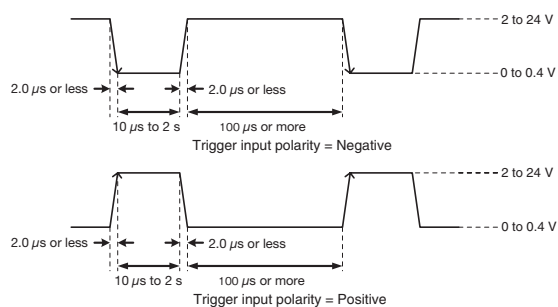
Trigger signals can be input via the 4th/7th/10th/11th pins of the DC IN connector, the CC1, CC2, CC3, CC4 pins of the Digital IF connector, or the software command. Switchover of the trigger signal can be changed via the TRG-SRC command.

command	param	Trigger signal assigned pin
TRG-SRC	4	DC IN connector 4th pin*
	7	DC IN connector 7th pin*
	10	DC IN connector 10th pin
	11	DC IN connector 11th pin
	101	Digital IF connector 22nd [+]/9th [-] (CC1)
	102	Digital IF connector 10th [+]/23th [-] (CC2)
	103	Digital IF connector 24th [+]/11th [-] (CC3)
	104	Digital IF connector 12nd [+]/25th [-] (CC4)
	0	Software command (TRG-SOFT)
	20	OR of DC IN connector 4th/7th/10th/11th pin

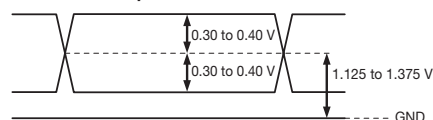
\* DC IN connector 4th pin and 7th pin are available only when the GPIO input/output setting is switched to input.

## Trigger Signal Specifications

### DC IN connector specification



### Digital IF connector specifications



#### Note

When inputting a trigger signal to the camera using the DC-700/DC-700CE, use DC 5 V or less at the logical high level.

## Trigger Modes

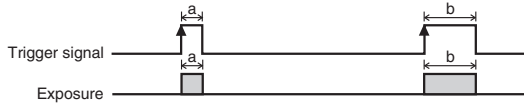
There are three modes, Free run, Special trigger (Bulk Trigger/Sequential Trigger).

The camera operates without a trigger signal and performs the video output operation continuously after the shutter (exposure) is finished when operating in Free run mode.

- Trigger edge detection (Polarity: positive)

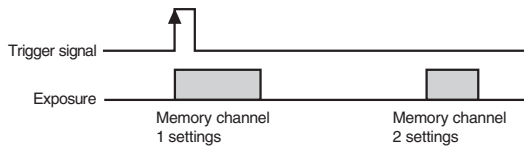


- Trigger width detection (Polarity: positive)



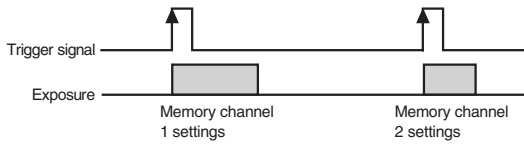
### Bulk Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied to acquire multiple video images at each trigger event. In the following diagram, two images are acquired in one cycle.



### Sequential Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied in sequence to acquire a different image with each trigger event. In the following diagram, two images with different exposure settings are acquired in one cycle.



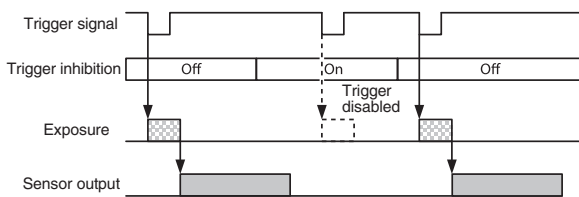
## External Trigger Signals and Timing of Shooting

In Trigger Edge mode, the time from when detecting a trigger signal to when starting exposure is 1.1 to 1.4  $\mu$ s (differ depending on the cameras). In Trigger Width mode, "Minimum Delay" operation (1.2 to 1.5  $\mu$ s) or "Exact Exposure Time" operation can be selected.

## Trigger Inhibition

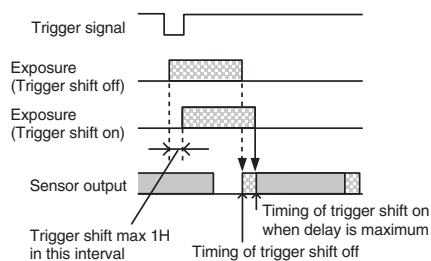
Trigger input can be disabled. This function is effective when disabling the trigger signal to a specific camera in the environment where multiple cameras are connected by the same trigger signal and when preventing false operations caused by noise contamination to the trigger signal line (due to the installed environment).

- Exposure condition (detecting the drop edge):



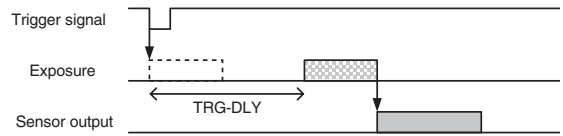
## Trigger Shift

This device can accept exposure by the next trigger even while a video is output (except for the special trigger operation). In this case, the trigger signal can become a noise source. When trigger shift is enabled, adjustment is made automatically for operations from trigger input to exposure to prevent noise contamination. (The time from trigger input to exposure start will be delayed up to 1 line.)



## Trigger Delay

The camera can delay the trigger signal.



## Trigger Range Limit

Only signals in the set trigger width can be accepted as the trigger signal. This functions as a noise filter, which removes chattering or disturbance noise in the trigger signal line. This also functions as a trigger selector, whereby only a specific camera can be operated by the trigger when multiple cameras share one trigger signal line.

## User Set

Main set values can be saved to the channels 1 to 16 of USERSET. User set is available during special trigger mode (Bulk Trigger/Sequential Trigger).

## Gain

The camera provides both manual and automatic gain control.

### Manual gain control

This manual gain control can be variably set from 0 to 18 dB in 1 dB unit, or 0.0358 dB steps. In addition to the above, the XCL-S900/S900C/S600/S600C provides independent left and right controls (GainL and GainR).

### Auto gain control

The camera provides the auto gain control function to automatically control image brightness according to a userspecified detection frame and image average level (variable from 0 to 16383 in 14 bit). The variable range is the same as for manual gain control. Also, the auto gain control detection frame showing each area's image average level can be displayed and adjusted. The detection frame is defined by Offset X and Y, Width and Height percentage values (relative to the [100%] width and height of the output video image).

## Switching Sensor Tap

This unit has a CCD with 4-channel output which is available for 4-channel, 2-channel and 1-channel reading. The reading speed becomes faster as the value of the channel number increases.

## GPIO

Switching input/output setting is available on the DC IN connector 4th pin and 7th pin.

The input/output setting of the next startup is set to input, because the setting is not saved to User Set/Memory Channel.

### GPI

The value can be checked by detecting the signals input to the DC IN connector 4th, 7th, 10th, and 11th using the GPI command. Since 11th pin is pulled up, 1 (Hi level) is returned if they are opened. Pins 10 and 8 can switch ISO input.

### GPO

GPO output can be transmitted from the DC IN connector 4th, 6th, 7th and 9th pins. After selecting a signal, the output polarity should be determined by GPO-INVERTER. DC IN connector 9th/3th pins and 6th/5th pins can switch ISO output.

command	param1	param2	Setting
GPO-SRC	4/6/7/9*	0	Exposure signal
		1	Strobe control signal
		2	LVAL signal
		3	FVAL signal
		4	Sensor readout signal
		5	Trigger through signal
		6	Pulse generation signal
		7	User definition 1
		8	User definition 2
		9	User definition 3
10	User definition 4		

\* DC IN connector 4th pin and 7th pin are available only when the GPIO input/output setting is switched to input.

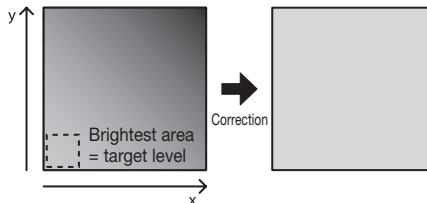
<b>B/W model</b>	<b>Color model</b>
<b>XCL-C500</b>	<b>XCL-C500C</b>
<b>XCL-C280</b>	<b>XCL-C280C</b>
<b>XCL-C130</b>	<b>XCL-C130C</b>
<b>XCL-C32</b>	<b>XCL-C32C</b>
<b>XCL-C30</b>	<b>XCL-C30C</b>



<b>CL</b> Output	Progressive Scan	<sup>*1</sup> 2/3 Type CCD	<sup>*2</sup> 1/1.8 Type CCD	<sup>*3</sup> 1/3 Type CCD	<sup>*4</sup> 1/2 Type CCD	Square Pixels	<b>C</b> Lens Mount
<sup>*1</sup> 5Mega CCD	<sup>*2</sup> 2.8 MEGA Output	<sup>*5</sup> SXGA Output	<sup>*6</sup> VGA Output	Long Exposure	Normal Shutter	External Trigger Shutter	Auto Shutter
Bulk Trigger	Sequential Trigger	Partial Scan	Shading Correction	Temperature Readout	Blemish Correction	<sup>*8</sup> One-Push White Balance	<sup>*8</sup> Manual White Balance
<b>LUT</b>	RS232C Control	<sup>*7</sup> <b>B/W</b>	<sup>*8</sup> <b>RGB</b> RAW	<sup>*9</sup> Near-IR Sensitivity	Connection Diagram <b>P45</b>		

\*1: XCL-C500/C500C    \*2: XCL-C280/C280C    \*3: XCL-C130/C130C/C30/C30C  
 \*4: XCL-C32/C32C    \*5: XCL-C130/C130C    \*6: XCL-C32/C32C/C30/C30C  
 \*7: XCL-C500/C280/C130/C32/C30    \*8: XCL-C500C/C280C/C130C/C32C/C30C  
 \*9: XCL-C280/C130

- **Shading Correction**  
 Shadings caused by a drop in the amount of light around the lens or light source variation are corrected. Three sets of user settings can be saved.



- **Temperature Readout**  
 The camera's internal temperature can be read from the temperature sensor installed in the circuit board.
- **Defect correction**  
 It corrects clear defect points and opaque defect points which increase under the high/low temperature or when exposed for a long time (seconds). From the peripheral pixels, correction is performed on coordinate pixels in which defects are detected. Factory setting and user setting can be selected.  
 \* Factory setting: OFF
- **Trigger modes**  
 Free run/Special trigger mode  
 (Bulk trigger/Sequential trigger)
- **Readout modes**  
 Normal/Binning (Monochrome camera only)/Partial scan
- **Binning (Monochrome camera only)**  
 <Vertical Binning/Horizontal Binning>  
 By adding 2 vertical pixels or 2 horizontal pixels, the frame rate in vertical binning is increased along with the sensitivity. The color camera cannot set this. This can be set with or without a trigger. Partial scan can be used concurrently and horizontal and vertical can be set at the same time.  
 \* The XCL-C500 can perform vertical binning only when Height is ≥ 2048.
- **Partial scan**  
 Only the area selected from the effective pixel area can be read out. Clearing unnecessary parts at high-speed allows high-speed reading. The area size is selected by the HEIGHT and WIDTH commands, and the read beginning point is selected by the OFFSETX and OFFSETY commands.

## Outline

The XCL-C Series cameras incorporate compactly various features and some Sony's unique features including Shading Correction with its cubic shaped-design. With high frame rate performance, the XCL-C Series lineup consists of 10 models ranging from VGA to 5 Mega model in monochrome and color versions.

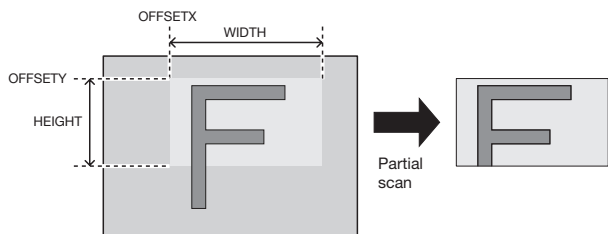
## Features

### ■ High frame rate

CCD/Image size		Frame rate	B/W Model	Color Model
1/3-type CCD	VGA	130 fps	XCL-C30	XCL-C30C
1/2-type CCD	VGA	104 fps	XCL-C32	XCL-C32C
1/3-type CCD	SXGA	31 fps	XCL-C130	XCL-C130C
1/1.8-type CCD	2.8 Mega	26 fps (Sensor output 2ch) 15 fps (Sensor output 1ch)	XCL-C280	XCL-C280C
2/3-type CCD	5 Mega	15 fps	XCL-C500	XCL-C500C

The XCL-C280/C280C cameras are equipped with sensor output 1ch or 2ch, and the frame rate depends on the channel selected. (Default setting 26 fps)

- **Near-infrared Sensitivity: XCL-C280, XCL-C130**  
 Utilizing high sensitivity sensor, the XCL-C280 and XCL-C130 cameras are usable ever in the near-infrared region.  
 XCL-C280: EXview HAD CCD II™  
 XCL-C130: EXview HAD CCD™

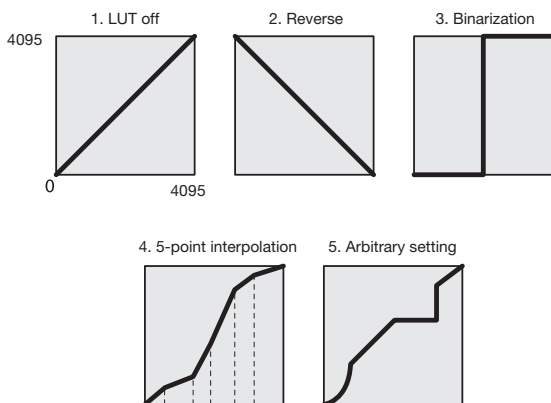


**Configurable range**

	WIDTH	HEIGHT
XCL-C30/C30C	16 to 658	2 to 494
XCL-C32/C32C	16 to 658	2 to 494
XCL-C130/C130C	16 to 1296	2 to 966
XCL-C280/C280C	16 to 1940	2 to 1460
XCL-C500/C500C	16 to 2456	480 to 2058

\* Configurable values  
The values of OFFSETX, OFFSETY, WIDTH and HEIGHT increase or decrease in steps of 2.

- Shutter: Manual/External trigger shutter/Auto
- Shutter speed: Manual 2 sec to 1/100,000 sec in 1  $\mu$ s increments
- Synchronization: Hardware trigger, Software trigger
- White balance (color camera only)
  - One push WB  
The white balance can be automatically adjusted once when the WHITEBALANCE-AUTO command is executed. The detection area is set to the screen center by default. The detection frame can be changed arbitrarily (AWB-FRAME).
  - Manual  
Each Gain of R, G, and B is adjustable manually.
- Readout features
  - Built-in test pattern  
B/W model: monochrome chart  
Color model: monochrome chart/color chart
  - LUT (Look-Up Table)  
The following Five types of presets are provided. Binarization, 5-point interpolation, and arbitrary setting can be changed.  
LUT off, Reverse, Binarization, 5-point interpolation, Arbitrary setting.



- 3 x 3 filter  
Utilizing the 3 x 3 filter, you can obtain images in various processing conditions.  
Depending on the patterns of parameters, you can reduce noise, apply edge enhancement and extract the contour.  
3 x 3 filter: OFF  
Laplacian filter



■ Camera Link Tap

1tap output or 2tap output can be selected, regardless of the camera settings. Output clock frequencies are as follows.

	param	XCL-C30 XCL-C30C	XCL-C32 XCL-C32C	XCL-C130 XCL-C130C	XCL-C280 XCL-C280C	XCL-C500 XCL-C500C
CAMERALINK-TAP	1	50 MHz	40 MHz	50 MHz	81 MHz	80 MHz
	2	25 MHz	20 MHz	25 MHz	40.5MHz	40 MHz

\* The camera link cable can be extended when the 2tap output is selected. However, the 2tap output can't be selected when RGB 24 bit output mode is selected.  
\* Factory setting: 2tap output

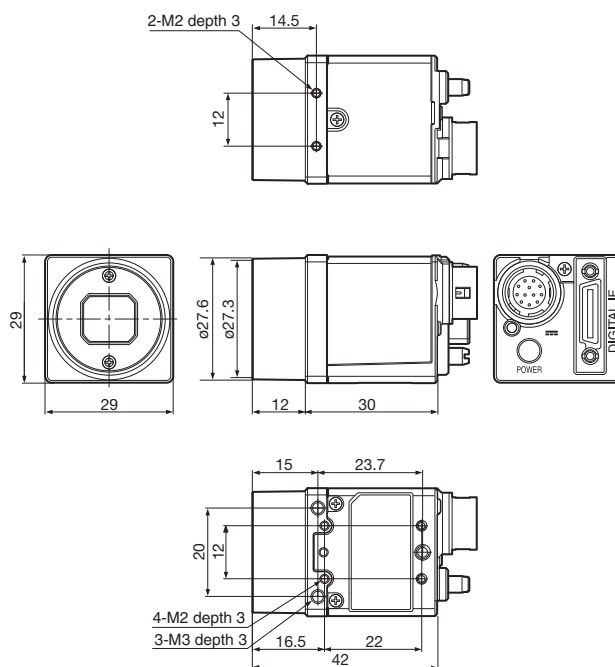
■ CameraLink: PoCL/non-PoCL

- Dimensions (excluding protrusions):  
29 (W) x 29 (H) x 30 (D) mm
- Mass: Approx. 200 g
- C-mount
- High Shock and Vibration Resistance

**Accessories**

- Compact camera adaptor  
DC-700/700CE
- 12-pin camera cable (CE standard)  
CCXC-12P02N (2 m)  
CCXC-12P05N (5 m)  
CCXC-12P10N (10 m)  
CCXC-12P25N (25 m)
- Tripod adaptor  
VCT-333I

**Dimensions**



Unit: mm

# Specifications

## B/W model

	XCL-C30	XCL-C32	XCL-C130	XCL-C280	XCL-C500
<b>Camera</b>					
Image size	VGA	VGA	SXGA	2.8 Mega	5 Mega
Image sensor	1/3-type PS IT CCD	1/2-type PS IT CCD	1/3-type PS IT CCD (EXview HAD CCD)	1/1.8-type PS IT CCD (EXview HAD CCD II)	2/3-type PS IT CCD
Number of effective pixels (H × V)	659 × 494	659 × 494	1,296 × 966	1,940 × 1,460	2,456 × 2,058
Cell size (H × V)	7.4 μm × 7.4 μm	9.9 μm × 9.9 μm	3.75 μm × 3.75 μm	3.69 μm × 3.69 μm	3.45 μm × 3.45 μm
Standard output pixels (H × V)	640 × 480	640 × 480	1,280 × 960	1,920 × 1,440	2,448 × 2,048
Color filter	—	—	—	—	—
Frame rate	130 fps	104 fps	31 fps	26 fps*1	15 fps
Minimum illumination	1.5 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/90 sec)	1.0 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/60 sec)	0.5 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/30 sec)	0.5 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/25 sec)	0.5 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/15 sec)
Sensitivity	F5.6 (400 lx, Gain: 0 dB)	F5.6 (400 lx, Gain: 0 dB)	F5.6 (400 lx, Gain: 0 dB)	F5.6 (400 lx, Gain: 0 dB)	F8 (400 lx, Gain: 0 dB)
SNR	More than 50 dB (Lens close, Gain: 0 dB, 8 bits)				
Gain	Auto, Manual: 0 dB to 18 dB				
Shutter speed	Auto, Manual: 2 sec to 1/100,000 sec in 1 μs increments				
Reference video output level	235 steps (default setting 8 bit)				
Reference pedestal level	16 steps (default setting 8 bit)			15 steps (default setting 8 bit)	
<b>Camera Features</b>					
Readout modes	Normal, Binning (2 × 1, 1 × 2, 2 × 2), Partial scan				
Readout features	LUT (Binarization, Gamma (arbitrary setting), Test pattern (monochrome chart), 3x3 filter				
Synchronization	Internal/External (Hardware trigger, Software trigger)				
Trigger modes	OFF (Free run), ON (Trigger edge detection, Trigger width detection), Special trigger (Bulk/Sequential)				
User Set/Memory channel	16 channels				
User memory	32 kbytes + 64 bytes × 16 ch				
Partial scan	W (Pixel)	16 to 658	16 to 1296	16 to 1940	16 to 2456
	H (Line)	2 to 494	2 to 966	2 to 1460	480 to 2058
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor readout/Trigger through/Pulse generation signal/User definition 1, 2, 3 (Selectable)				
Other features	Shading correction, Defect correction, Temperature readout, Sensor tap switching*2				
<b>Interface</b>					
Video data output	digital Mono 8, 10, 12-bit (default setting 8 bits)				
Digital interface	LVDS				
Camera specification	PoCL, Base Configuration, CameraLink® Version 1.2				
Output data clock	50 MHz (1 tap)	40 MHz (1 tap)	50 MHz (1 tap)	81 MHz (1 tap)	80 MHz (1 tap)
	25 MHz (2 tap)	20 MHz (2 tap)	25 MHz (2 tap)	40.5 MHz (2 tap)	40 MHz (2 tap)
Digital I/O	TTL IN (x3), TTL OUT (x3)				
<b>General</b>					
Lens mount	C-mount				
Flange focal length	17.526 mm				
Power requirements	DC +12 V (10.5 V to 15.0 V: DC IN terminal/ 10 V to 13 V: Digital IF terminal)				
Power consumption	2.8 W		2.4 W	3.0 W	3.2 W
Operating temperature	-5°C to +45°C				
Performance guarantee temperature	0°C to 40°C				
Storage temperature	-30°C to +60°C				
Operating humidity	20% to 80% (no condensation)				
Storage humidity	20% to 95% (no condensation)				
Vibration resistance	10 G (20 Hz to 200 Hz)				
Shock resistance	70 G				
Dimensions (W × H × D)	29 × 29 × 30 mm (excluding protrusions)				
Mass	Approx. 56 g				
MTBF	69,400 hours (Approx. 7.9 years)				
Regulations	UL60950, FCC Class A, CSA C22.2-No.1, IC Class A Digital Device, CE: EN55022 (Class A), AS EMC: EN61326, VCCI Class A, KCC				
Supplied accessories	Lens mount cap (1), Operating Instructions (1)				

\*1: Sensor Tap 2ch  
\*2: XCL-C280 only

\* "CameraLink", "PoCL(Power over Camera Link)" and related symbols are trademarks or registered trademarks of AIA (Automated Imaging Association).  
\* EXview HAD CCD II and EXview HAD CCD are trademarks of Sony Corporation.



## Color model

	XCL-C30C	XCL-C32C	XCL-C130C	XCL-C280C	XCL-C500C
<b>Camera</b>					
Image size	VGA	VGA	SXGA	2.8 Mega	5 Mega
Image sensor	1/3-type PS IT CCD	1/2-type PS IT CCD	1/3-type PS IT CCD (EXview HAD CCD)	1/1.8-type PS IT CCD (EXview HAD CCD II)	2/3-type PS IT CCD
Number of effective pixels (H × V)	659 × 494	659 × 494	1,296 × 966	1,940 × 1,460	2,456 × 2,058
Cell size (H × V)	7.4 μm × 7.4 μm	9.9 μm × 9.9 μm	3.75 μm × 3.75 μm	3.69 μm × 3.69 μm	3.45 μm × 3.45 μm
Standard output pixels (H × V)	640 × 480	640 × 480	1,280 × 960	1,920 × 1,440	2,448 × 2,048
Color filter	RGB color moxaic filter				
Frame rate	130 fps	104 fps	31 fps	26 fps*1	15 fps
Minimum illumination	15 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/90 sec)	12 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/60 sec)	12 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/30 sec)	10 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/25 sec)	8 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/15 sec)
Sensitivity	F5.6 (2,000 lx, Gain: 0 dB)	F5.6 (2,000 lx, Gain: 0 dB)	F5.6 (2,000 lx, Gain: 0 dB)	F5.6 (2,000 lx, Gain: 0 dB)	F8 (2,000 lx, Gain: 0 dB)
SNR	More than 50 dB (Lens close, Gain: 0 dB, 8 bits)				
Gain	Auto, Manual: 0 dB to 18 dB				
Shutter speed	Auto, Manual: 2 sec to 1/100,000 sec in 1 μs increments				
White balance	Manual, One push				
Reference video output level	235 steps (default setting 8 bit)				
Reference pedestal level	16 steps (default setting 8 bit)			15 steps (default setting 8 bit)	
<b>Camera Features</b>					
Readout modes	Normal, Partial scan				
Readout features	LUT (Binarization, Gamma (arbitrary setting), Test pattern (Monochrome chart/color chart), 3x3 filter				
Synchronization	Internal/External (Hardware trigger, Software trigger)				
Trigger modes	OFF (Free run), ON (Trigger edge detection, Trigger width detection), Special trigger (Bulk/Sequential)				
User Set/Memory channel	16 channels				
User memory	32 kbytes + 64 bytes × 16 ch				
Partial scan	W (Pixel)	16 to 658	16 to 1296	16 to 1940	16 to 2456
	H (Line)	2 to 494	2 to 966	2 to 1460	480 to 2058
GPO	EXPOSURE/Strobe/LVAL/FVAL/Sensor readout/Trigger through/Pulse generation signal/User definition 1, 2, 3 (Selectable)				
Other features	Shading correction, Defect correction, Temperature readout, Sensor tap switching*2				
<b>Interface</b>					
Video data output	digital Raw 8, 10, 12-bit (default setting Raw 8 bits), RGB				
Digital interface	LVDS				
Camera specification	PoCL, Base Configuration, CameraLink® Version 1.2				
Output data clock	50 MHz (1 tap)	40 MHz (1 tap)	50 MHz (1 tap)	81 MHz (1 tap)	80 MHz (1 tap)
	25 MHz (2 tap)	20 MHz (2 tap)	25 MHz (2 tap)	40.5 MHz (2 tap)	40 MHz (2 tap)
Digital I/O	TTL IN (x3), TTL OUT (x3)				
<b>General</b>					
Lens mount	C-mount				
Flange focal length	17.526 mm				
Power requirements	DC +12 V (10.5 V to 15.0 V: DC IN terminal/ 10 V to 13 V: Digital IF terminal)				
Power consumption	2.8 W		2.4 W	3.0 W	3.2 W
Operating temperature	-5°C to +45°C				
Performance guarantee temperature	0°C to 40°C				
Storage temperature	-30°C to +60°C				
Operating humidity	20% to 80% (no condensation)				
Storage humidity	20% to 95% (no condensation)				
Vibration resistance	10 G (20 Hz to 200 Hz)				
Shock resistance	70 G				
Dimensions (W × H × D)	29 × 29 × 30 mm (excluding protrusions)				
Mass	Approx. 56 g				
MTBF	69,400 hours (Approx. 7.9 years)				
Regulations	UL60950, FCC Class A, CSA C22.2-No.1, IC Class A Digital Device, CE: EN55022 (Class A), AS EMC: EN61326, VCCI Class A, KCC				
Supplied accessories	Lens mount cap (1), Operating Instructions (1)				

\*1: Sensor Tap 2ch (default setting)  
\*2: XCL-C280 only

\* "CameraLink", "PoCL(Power over Camera Link)" and related symbols are trademarks or registered trademarks of AIA (Automated Imaging Association).  
\* EXview HAD CCD II and EXview HAD CCD are trademarks of Sony Corporation.

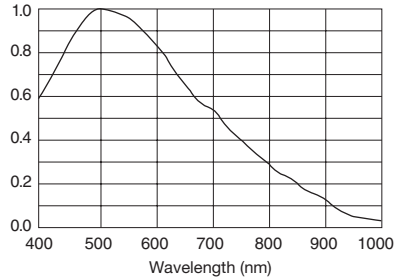
# Spectral Sensitivity Characteristics

## B/W model

### • XCL-C30

(Lens characteristics and light source characteristics excluded.)

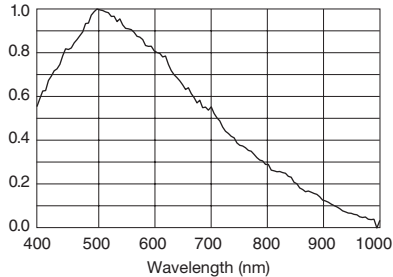
Relative sensitivity



### • XCL-C32

(Lens characteristics and light source characteristics excluded.)

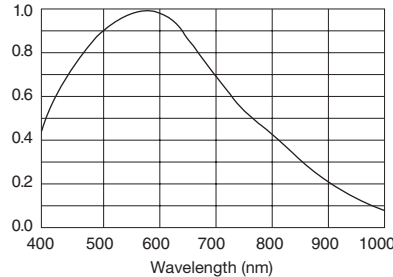
Relative sensitivity



### • XCL-C130

(Lens characteristics and light source characteristics excluded.)

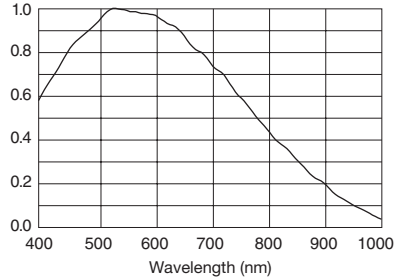
Relative sensitivity



### • XCL-C280

(Lens characteristics and light source characteristics excluded.)

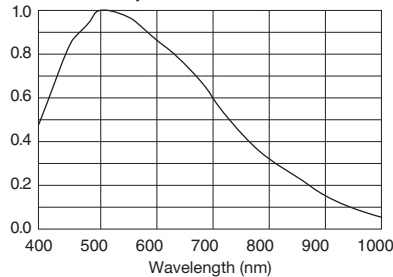
Relative sensitivity



### • XCL-C500

(Lens characteristics and light source characteristics excluded.)

Relative sensitivity

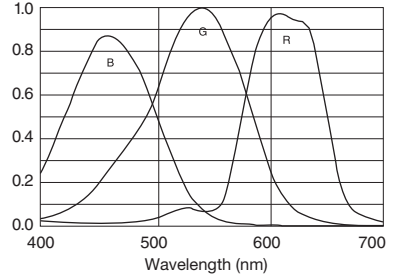


## Color model

### • XCL-C30C

(Lens characteristics and light source characteristics excluded.)

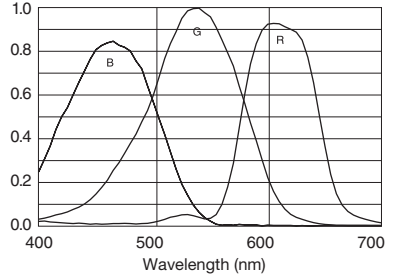
Relative sensitivity



### • XCL-C32C

(Lens characteristics and light source characteristics excluded.)

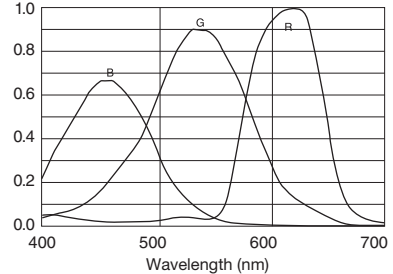
Relative sensitivity



### • XCL-C130C

(Lens characteristics and light source characteristics excluded.)

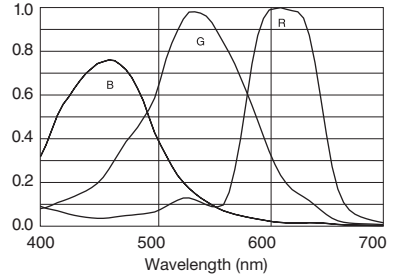
Relative sensitivity



### • XCL-C280C

(Lens characteristics and light source characteristics excluded.)

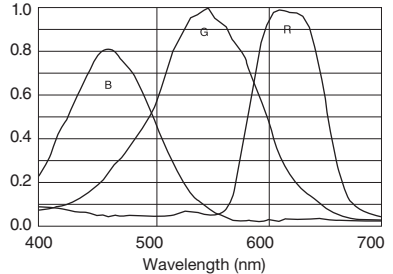
Relative sensitivity



### • XCL-C500C

(Lens characteristics and light source characteristics excluded.)

Relative sensitivity

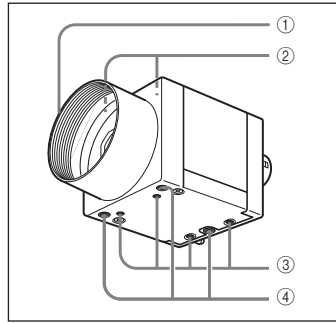
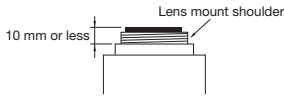


## Location and Function of Parts and Controls

- ① **Lens mount (C-mount)**  
Attach any C-mount lens or other optical equipment.

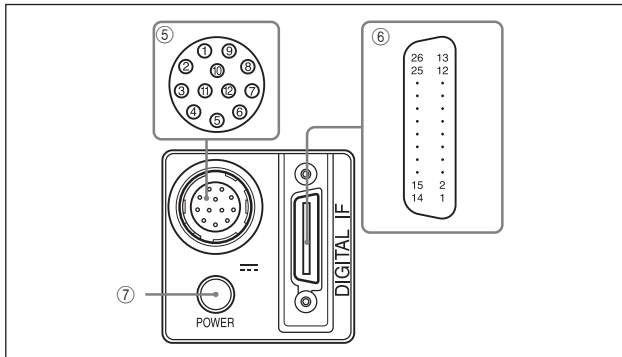
**Note**

The lens must not project more than 10 mm from the lens mount.



- ② **Guide screw holes (Top)**  
③ **Guide screw holes/Tripod screw holes (bottom)**  
When using a tripod, use these four screw holes to attach a VCT-333I tripod adaptor.  
④ **Reference screw holes (bottom)**  
These precision screw holes are for locking the camera module. Locking the camera module into these holes secures the optical axis alignment.

## Rear Panel/Pin Assignments



- ⑤ **DC IN (DC power input) connector (12-pin)**

Pin No.	Signal	Pin No.	Signal
1	Ground	7	GPI3 *2
2	DC12V	8	Ground
3	Ground	9	GPO3 *1
4	GPO1 *1	10	GPI2 *2
5	Ground	11	GPI1 *2
6	GPO2 *1	12	Ground

- \*1 **Signal output from pin 4, 6, 9 (GPO1/2/3) of DC IN connector**

This setting allows you to select from exposure signal, strobe control signal, Hi/Low fixed value, etc.  
The initial values of GPO1/2/3 are all Hi fixed.

- \*2 **Signal output from pin 7, 10, 11 (GPI3/2/1) of DC IN connector**

Function as GPI input or trigger input. The initial setting is GPI1 for trigger input and GPI2/3 for GPI input.

- ⑥ **DIGITAL IF (Interface) connector (26-pin miniconnector)**

Camera Link Base Configuration:

Pin No.	Signal	Pin No.	Signal
1	Power supply or Ground*	14	Ground
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-	22	CC1+
10	CC2+	23	CC2-
11	CC3-	24	CC3+
12	CC4+	25	CC4-
13	Ground	26	Power supply or Ground*

- \***About the 1st pin and 26th pin of the DIGITAL IF connector**

The connection differs depending on the type of camera module interface board you use.

In the case of PoCL support:

Both the 1st pin and 26th pin are Power supply

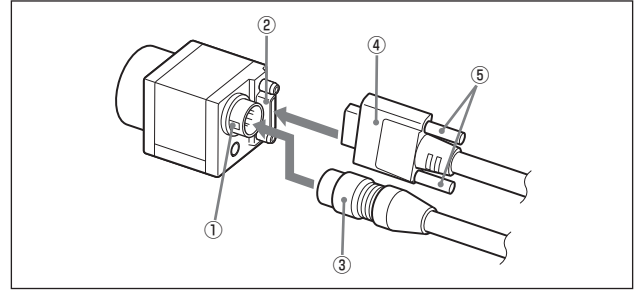
In the case of non-PoCL support:

Both the 1st pin and 26th pin are Ground

- ⑦ **Status LED (Green)**

When power is supplied to the camera, this button is lit. Various settings are available, such as to light up when interlocking with the trigger signal.

## Connecting the Cables



Connect the camera cable to the DC IN connector and the Camera Link cable to the DIGITAL IF cable respectively. If you use a camera module interface board with support for PoCL, you can operate the camera even if you do not connect the camera cable to the DC IN connector. When you connect the Camera Link cable, turn the two fastening screws on the connector to secure the cable tightly. Connect the other end of the camera cable to the DC-700/700CE and the other end of the Camera Link cable to the camera module interface board.

- ① DC IN Connector ② DIGITAL IF (Interface) Connector  
③ Camera Cable ④ Camera Link Cable ⑤ Fastening Screws

**Note**

When using the camera with a PoCL connection, make sure you connect a PoCL compatible cable. Connecting a cable that is not compatible with PoCL (non-PoCL) may cause a malfunction of the camera or camera module interface board.

## Controlling the Camera From the Host Device

You can control the camera from host device such as a computer. The following table shows the major control functions.

Control functions	Description	
Operating mode	Free run/Trigger	
Shutter speed	Free run	2 sec to 1/100,000 sec
	Trigger edge detection	2 sec to 1/100,000 sec
	Trigger pulse width detection	Setting by trigger pulse width
Gain	0 dB to 18 dB	
Partial Scan	Variable, 2-line increments (more than 480 lines for XCL-C500)	
LUT (Look Up Table)	OFF/ON (Mode: 5 types)	
External trigger input	DIGITAL IF connector/DC IN connector	
Video output switch	Monochrome model: Mono 8/10/12-bit Color model: Raw 8/10/12-bit, RGB 24-bit	
Binning (Monochrome camera only)	2 × 1, 1 × 2, 2 × 2	
Defect correction	OFF/ON	
Shading correction	OFF/ON	

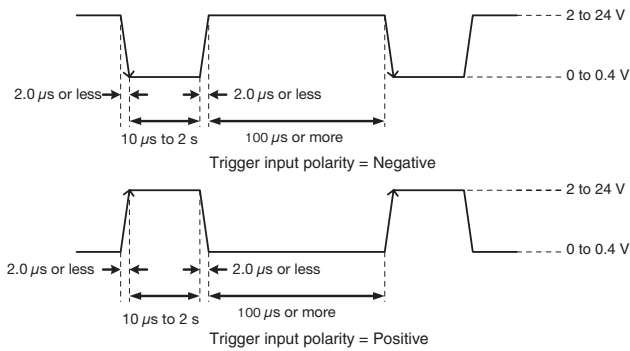
## Trigger Signal Input

Trigger signals can be input via the 7th, 10th, 11th pins of the DC IN connector, the CC1, CC2, CC3, CC4 pins of the Digital IF connector, or the software command. Switchover of the trigger signal can be changed via the TRG-SRC command.

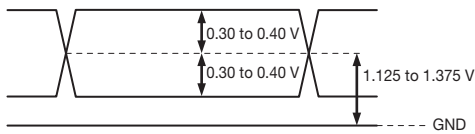
command	param	Trigger signal assigned pin
TRG-SRC	7	DC IN connector 7th pin (GPI3)
	10	DC IN connector 10th pin (GPI2)
	11	DC IN connector 11th pin (GPI1)
	101	Digital IF connector 22nd [+] / 9th [-] (CC1)
	102	Digital IF connector 10th [+] / 23rd [-] (CC2)
	103	Digital IF connector 24th [+] / 11th [-] (CC3)
	104	Digital IF connector 12th [+] / 25th [-] (CC4)
	0	Software command (TRG-SOFT)
	20	OR of GPI1/GPI2/GPI3

## Trigger Signal Specifications

### DC IN connector specification



### Digital IF connector specifications



#### Note

When inputting a trigger signal to the camera using the DC-700/DC-700CE, use DC 5 V or less at the logical high level.

## Trigger Modes

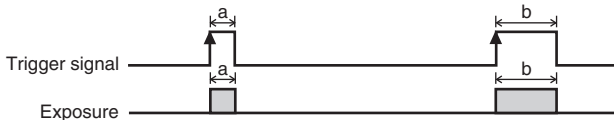
There are three modes, Free run, Special trigger (Bulk Trigger/Sequential Trigger).

The camera operates without a trigger signal and performs the video output operation continuously after the shutter (exposure) is finished when operating in Free run mode.

- Trigger edge detection (Polarity: positive)

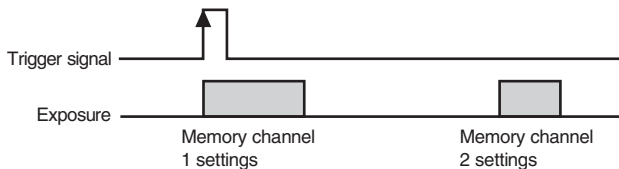


- Trigger width detection (Polarity: positive)



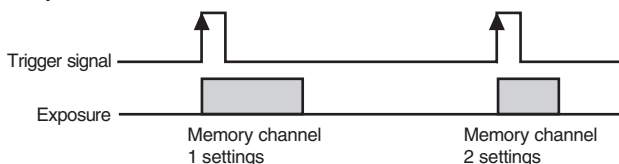
### Bulk Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied to acquire multiple video images at each trigger event. In the following diagram, two images are acquired in one cycle.



### Sequential Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied in sequence to acquire a different image with each trigger event. In the following diagram, two images with different exposure settings are acquired in one cycle.



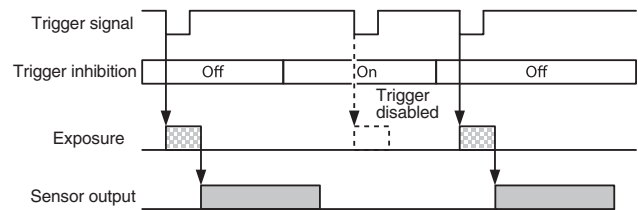
## External Trigger Signals and Timing of Shooting

In Trigger Edge mode, the time from when detecting a trigger signal to when starting exposure is 0.7 to 1.5  $\mu$ s (differ depending on the cameras). In Trigger Width mode, "Minimum Delay" operation (0.7 to 1.7  $\mu$ s) or "Exact Exposure Time" operation can be selected.

## Trigger Inhibition

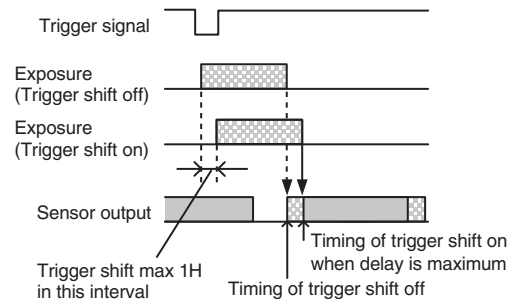
Trigger input can be disabled. This function is effective when disabling the trigger signal to a specific camera in the environment where multiple cameras are connected by the same trigger signal and when preventing false operations caused by noise contamination to the trigger signal line (due to the installed environment).

- Exposure condition (detecting the drop edge):



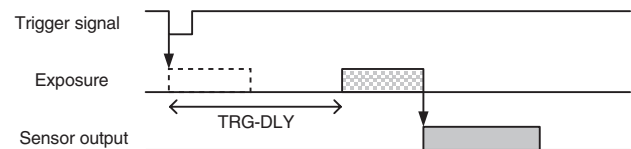
## Trigger Shift

This device can accept exposure by the next trigger even while a video is output (except for the special trigger operation). In this case, the trigger signal can become a noise source. When trigger shift is enabled, adjustment is made automatically for operations from trigger input to exposure to prevent noise contamination. (The time from trigger input to exposure start will be delayed up to 1 line.)



## Trigger Delay

The camera can delay the trigger signal.



## Trigger Range Limit

Only signals in the set trigger width can be accepted as the trigger signal. This functions as a noise filter, which removes chattering or disturbance noise in the trigger signal line. This also functions as a trigger selector, whereby only a specific camera can be operated by the trigger when multiple cameras share one trigger signal line.

## User Set

Main set values can be saved to the channels 1 to 16 of USERSET. User set is available during special trigger mode (Bulk Trigger/Sequential Trigger).

## Gain

The camera provides both manual and automatic gain control.

### Manual gain control

This manual gain control can be variably set from 0 to 18 dB in 1 dB unit, or 0.0358 dB steps.

In addition to the above, the XCL-C280/C280C/C500/C500C provides independent left and right controls (GainL and GainR).

### Auto gain control

The camera provides the auto gain control function to automatically control image brightness according to a user-specified detection frame and image average level (variable from 0 to 16383 in 14 bit). The variable range is the same as for manual gain control. Also, the auto gain control detection frame showing each area's image average level can be displayed and adjusted. The detection frame is defined by Offset X and Y, Width and Height percentage values (relative to the [100%] width and height of the output video image).

## Switching Sensor Tap

XCL-C280/C280C has a CCD with 2-channel output. Reading speed is faster in 2-channel output than 1-channel output. Although XCL-C500/C500C has a CCD with 2-channel output, the number of sensor taps cannot be switched.

## GPIO

### GPI

The value can be checked by detecting the signals input to the DC IN connector 7th, 10th, and 11th using the GPI command. Since all pins are pulled up, 1 (Hi level) is returned if they are opened.

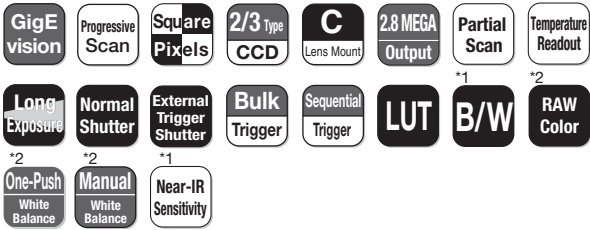
### GPO

GPO1, GPO2, and GPO3 outputs can be transmitted from the DC IN connector 4th, 6th, and 9th pins, respectively. After selecting a signal, the output polarity should be determined by GPO-INVERTER. The strobe control signal can be set separately for GPO1, GPO2, and GPO3.

command	param1	param2	Setting
GPO-SRC	4/6/9	0	Exposure signal
		1	Strobe control signal
		2	LVAL signal
		3	FVAL signal
		4	Sensor readout signal
		5	Trigger through signal
		6	Pulse generation signal
		7	User definition 1
		8	User definition 2
9	User definition 3		

# XCG-H280E

# XCG-H280CR



\*1: XCG-H280E  
\*2: XCG-H280CR

Connection Diagram P46



**GIGÉ**  
VISION

## Outline

The XCG-H280 series cameras are digital video camera module that incorporate a 2/3-type 2.8-megapixel PS CCD, supports 1000BASE-T interface.

Conforming to GigE Vision standards (Ver. 1.2), the unit is capable of transmitting uncompressed images via a LAN cable at high efficiency.

Furthermore, the EXview HAD CCD II™ that has sensitivity in near-infrared domains and supports Full HD is employed, permitting image acquisition at 32 fps and shooting of fast-moving objects even in the night-vision environment.

With external trigger input interface and strobe control output, the XCG-H280 Series cameras are ideally suited to the various applications such as ITS (Intelligent Transportation Systems) as well as traditional machine-vision applications.

## Features

■ 2/3-type 2,830,000-pixel progressive scan CCD (Full-HD)

■ High-quality and high-speed image capturing

Sensor Tap	Data output	XCG-H280 Series	
		Frame rate	Maximum output of pixels (H x V)
4ch	8-bit	59 fps	1,920 x 1,080
2ch	12-bit	32 fps*	1,920 x 1,080
1ch	12-bit	26 fps	1,920 x 1,440

\* Default setting

■ Near-infrared Sensitivity: XCG-H280E

Utilizing EXview HAD CCD II technology enables the XCG-H280E camera to capture clear images in near-infrared wavelengths.

■ GigE Vision Interface: GigE Vision® Version 1.2

■ Readout modes

Normal/Binning (B/W model only)/Partial scan

■ Trigger modes

Free run/Special trigger mode  
(Bulk trigger/Sequential trigger)

■ Trigger Operations (2 sec to 1/100,000 sec)

In addition to external trigger signal input, the software trigger input that can be controlled by command from PC are also selectable. Edge detection or Pulse width detection can be selected, and the shutter speed can be set in 1 μsec increments.

■ Trigger delay

The camera can delay the trigger signal. The setting range is 0 μs to 4,000,000 μs in 1 μs increments.

■ Trigger inhibition

Trigger input can be disabled. This function is effective when disabling the trigger signal to a specific camera in the environment where multiple cameras are connected by the same trigger signal and when preventing false operations caused by noise contamination to the trigger signal line (due to the installed environment).

■ Video data output

XCG-H280E: digital Mono, 8, 10, 12-bit  
(default setting 8 bits)

XCG-H280CR: digital Raw, 8, 10, 12-bit  
(default setting Raw 8 bits)

■ Readout features

- Built-in test pattern
- LUT (Look-Up Table)

The following Five types of presets are provided. Binarization, 5-point interpolation, and arbitrary setting can be changed. LUT off, Reverse, Binarization, 5-point interpolation, Arbitrary setting.

■ Binning (XCG-H280E)

<Vertical Binning/Horizontal Binning>

By adding 2 vertical pixels or 2 horizontal pixels, the frame rate in vertical binning is increased along with the sensitivity. The color camera cannot set this. This can be set with or without a trigger. Partial scan can be used concurrently and horizontal and vertical can be set at the same time.

■ White balance (XCG-H280CR)

One push WB/Manual

■ Frame Rate Control

You can change the frame rate while maintaining the shutter setting. This is useful when you want to reduce packet sizes per time by lowering the frame rate and reduce network traffic.

■ Image Buffer (Memory Shot)

Images exposed from the sensor can be stored in built-in memory of the unit, and read using the host PC when required.

■ Temperature Readout

The camera's internal temperature can be read from the temperature sensor installed in the circuit board.

■ Dimensions (excluding protrusions):

50 (W) × 50 (H) × 57.5 (D) mm

■ Mass: Approx. 200 g

"GigE Vision" is a trademark of the AIA (Automated Imaging Association).

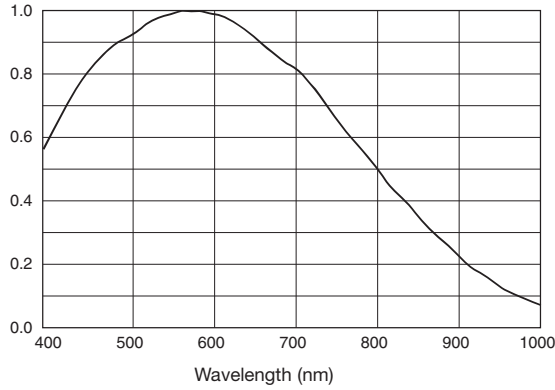
## Accessories

- Tripod adaptor: VCT-ST701

## Spectral Sensitivity Characteristics

### • XCG-H280E

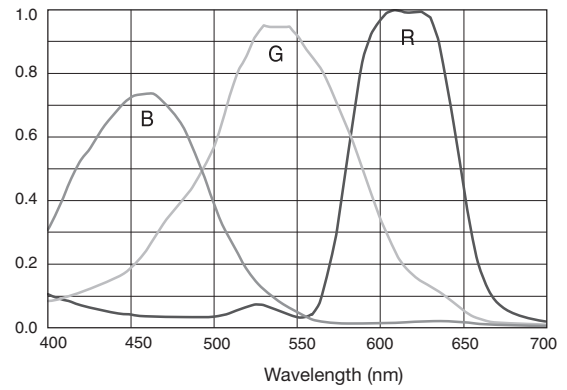
Relative sensitivity



(Lens characteristics and light source characteristics excluded.)

### • XCG-H280CR

Relative sensitivity



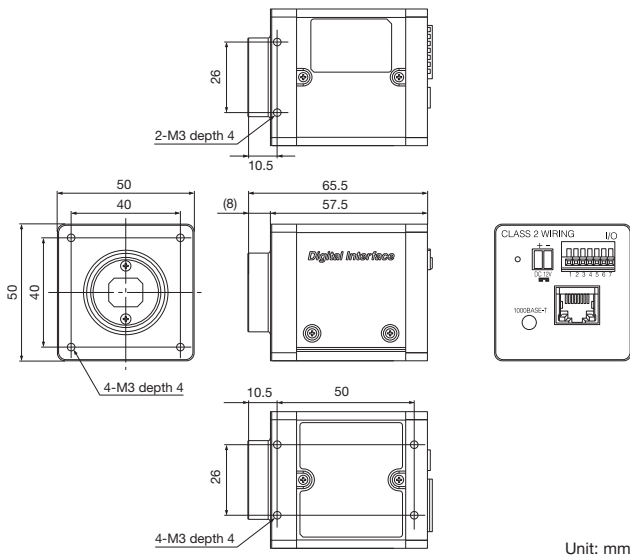
(Lens characteristics and light source characteristics excluded.)

## Specifications

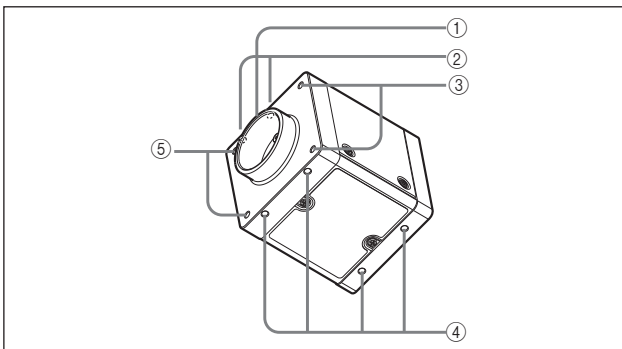
	XCG-H280E	XCG-H280CR
<b>Camera</b>		
Image type	B/W	Color
Image size	2.8 Mega	
Image sensor	2/3-type PS IT CCD (EXview HAD CCD II)	
Number of effective pixels (H × V)	1,940 × 1,460	
Cell size (H × V)	4.54 μm × 4.54 μm	
Standard output pixels (H × V)	1,920 × 1,080	
Color filter	—	Color mosaic
Frame rate	32 fps (4 ch 59 fps)	
Minimum illumination	0.5 lx Iris: F1.4, Gain: +18 dB, Shutter: 1/32 sec	6 lx Iris: F1.4, +18 dB, Shutter: 1/32 sec
Sensitivity	F8 (400 lx, Gain: 0 dB)	F8 (2000 lx, Gain: 0 dB)
SNR	More than 50 dB (Lens close, Gain: 0 dB, 8 bits)	
Gain	Auto, Manual: 0 dB to 18 dB	
Shutter speed	Auto, Manual: 2 sec to 1/100,000 sec	
White balance	—	Manual, One push
<b>Camera Features</b>		
Readout modes	Normal/Binning (2 × 2, 1 × 2, 2 × 1), Partial scan	Normal, Partial scan
Readout features	Gamma (variable), Test pattern	
Synchronization	Hardware trigger, Software trigger	
Trigger modes	Edge Detection, Pulse Width Detection, Trigger Delay, Bulk Trigger, Sequential Trigger, Software Trigger (via 1000BASE-T)	
User Set/Memory channel	16 channels	
User memory	64 byte × 16 channels	
Image buffer	16 frames	
Other features	Temperature Readout	
<b>Interface</b>		
Video data output	digital Mono, 8, 10, 12-bit (default setting 8 bits)	digital Raw, 8, 10, 12-bit (default setting Raw 8 bits)
Interface	Gigabit Ethernet (1000BASE-T)	
Camera specification	GigE Vision® Version 1.2 Compliant	
Digital I/O	TTL IN (x2), TTL OUT (x2)	
<b>Others</b>		
Lens mount	C-mount	
Flange focal length	17.526 mm	
Power requirements	DC 12 V (10.5 V to 15.0 V)	
Power consumption	5.8 W	
Operating temperature	-10°C to +50°C	
Performance guarantee temperature	0°C to 40°C	
Storage temperature	-30°C to +60°C	
Operating humidity	20% to 80% (no condensation)	
Storage humidity	20% to 95% (no condensation)	
Vibration resistance	10 G (20 Hz to 200 Hz, 20 minutes for each direction-x, y, z)	
Shock resistance	70 G	
MTBF	Approx. 8.8 years	
Dimensions (W × H × D)	50 × 50 × 57.5 mm (excluding protrusions)	
Mass	Approx. 200 g	
Regulations	UL2044, FCC Class A, CE: EN55022, AS/NZ: EN55022, VCCI: Class A, KC: KN22/KN24: Class A	
Supplied accessories	Lens mount cap (1), Connector plug 2P (1), Operating Instructions (1)	

\* "GigE Vision" is a trademark of the AIA (Automated Imaging Association).  
\* EXview HAD CCD II is a trademark of Sony Corporation.

## Dimensions



## Location and Function of Parts and Controls

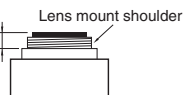


### 1 Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

The lens must not project more than 10 mm from the lens mount. 10 mm or less



### 2 Guide screw holes (Top)

### 3 LED light screw holes

Use these screw holes to attach the LED light to the camera module.

Use an adapter appropriate for the LED light as required.

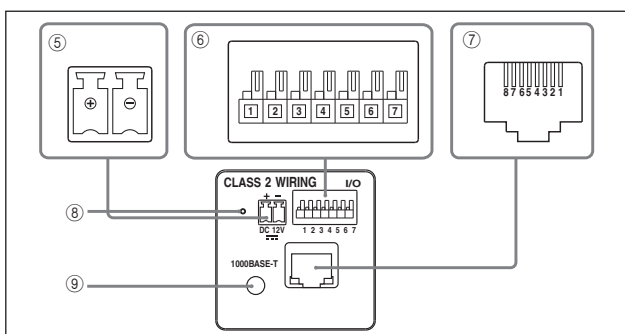
### 4 Guide screw holes/Tripod screw holes (bottom)

These precision screw holes are for locking the camera module. Locking the camera module into these holes secures the optical axis alignment. When using a tripod, use these four screw holes to attach a VCT-ST701 tripod adaptor.

#### Note

Use the screws (M3 × 8 (4)) supplied with the tripod adaptor when installing it on the camera module.

## Rear Panel/Pin Assignments



### 5 DC 12 V (DC power input) connector

Connect the DC power cord to input the +12 V DC power supply. The pin configuration of this connector is as follows.

Pin No.	Signal
+	+12 V
-	GND

### 6 I/O (Input/Output) connector

Pin No.	Signal
1	GPO[1]
2	GPO[2]
3	TRIGGER IN[1]
4	TRIGGER IN[2]
5	GPI[1]
6	GPI[2]
7	GND

### 7 RJ45 connector

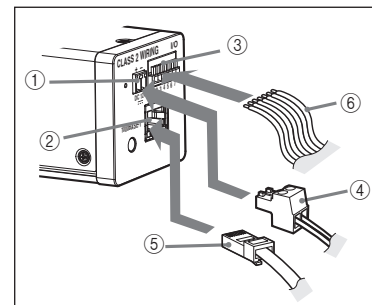
You can connect a LAN cable to this connector to control the camera module from a host device to output image to a host device.

Pin No.	Signal	Pin No.	Signal
1	TP1 +	5	TP3 -
2	TP1 -	6	TP2 -
3	TP2 +	7	TP4 +
4	TP3 +	8	TP4 -

## Connecting the Cables

Connect the DC power cord to the DC 12 V connector and the LAN cable to the RJ45 connector respectively. Connect the I/O cable to the I/O connector.

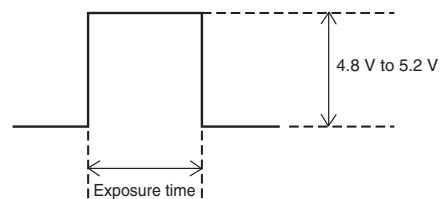
- DC 12 V connector
- RJ45 connector
- I/O connector
- DC power cord
- LAN cable
- I/O cable



## GPO Output Specifications

When exposure output is selected, signal output is valid during image sensor exposure. When strobe control output is selected, output signal timing and pulse width can be precisely set to control external devices such as strobes connected to the camera. The sensor readout signal indicates that the imager is outputting images. If you select user output, the High/Low-fixed output is obtained according to the register set value. The polarity of the GPO output signal can be changed, using the line selector. When connecting the GPO output signal, terminate the connection with 10 kΩ or higher impedance.

The figure shows an example in which the polarity of GPO output is positive.



## GPI Input Specifications

Be sure to use an external power supply between 5 V and 24 V DC in combination with resistance.



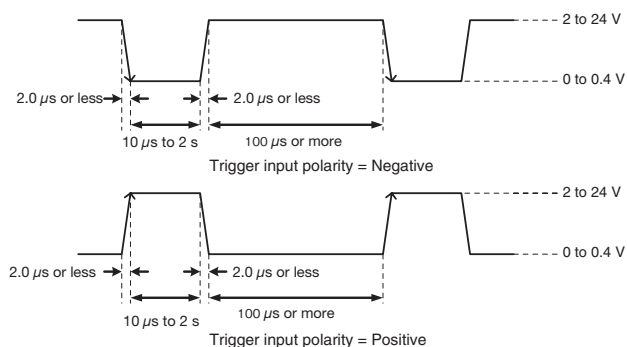
## Trigger Signal Input

Trigger signals can be input via the 3rd, 4th, 5th and 6th pins of the I/O (Input/Output) connector, or the software command.

Name	Data	Description
SpecialTriggerSource TriggerSource	0	3rd pin
	1	4th pin
	2	3rd or 4th pin
	3	3rd, 4th pin
	4	Software
	5	5th pin
6	6th pin	

## Trigger Input Specifications

### DC IN connector specification



## Trigger Modes

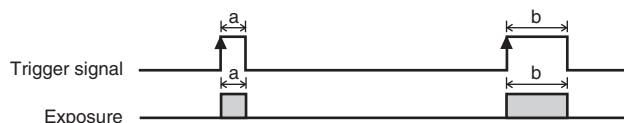
There are three modes, Free run, Special trigger (Bulk Trigger/ Sequential Trigger).

The camera operates without a trigger signal and performs the video output operation continuously after the shutter (exposure) is finished when operating in Free run mode.

- Trigger edge detection (Polarity: positive)

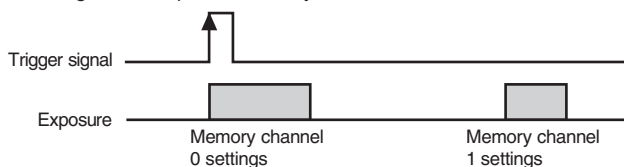


- Trigger width detection (Polarity: positive)



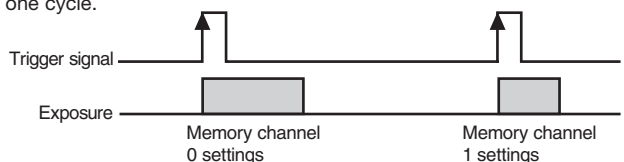
### Bulk Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied to acquire multiple video images at each trigger event. In the following diagram, two images are acquired in one cycle.



### Sequential Trigger

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied in sequence to acquire a different image with each trigger event. In the following diagram, two images with different exposure settings are acquired in one cycle.



## External Trigger Signals and Timing of Shooting

In Trigger Edge mode, the time from when detecting a trigger signal to when starting exposure is 1.5 μsec.

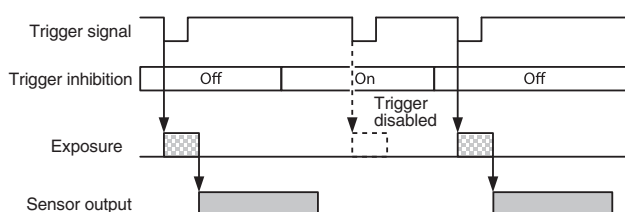
Shooting is performed according to the “Exposure Time” specified in advance.

In Trigger Width mode, “Minimum Delay” operation or “Exact Exposure Time” operation can be selected. Time till starting exposure is 1.5 μsec (Minimum Delay) and 35 μsec (Exact Exposure Time), and the duration of exposure is Valid period of Trigger Width +35 μsec (Minimum Delay) and Valid period of Trigger Width (Exact Exposure Time).

## Trigger Inhibition

Trigger input can be disabled. This function is effective when disabling the trigger signal to a specific camera in the environment where multiple cameras are connected by the same trigger signal and when preventing false operations caused by noise contamination to the trigger signal line (due to the installed environment).

- Exposure condition (detecting the drop edge):

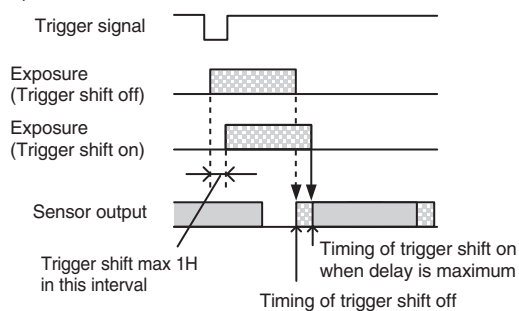


## Trigger Shift

This device can accept exposure by the next trigger even while a video is output (except for the special trigger operation).

In this case, the trigger signal can become a noise source. When trigger shift is enabled, adjustment is made automatically for operations from trigger input to exposure to prevent noise contamination.

(The time from trigger input to exposure start will be delayed up to 1 line.)



## Vertical Binning

Vertical Binning increases sensitivity and doubles frame rate by adding vertically adjacent pixel data.

When Vertical Binning is activated, the maximum vertical image size is halved.

## Horizontal Binning

Horizontal Binning increases sensitivity by adding horizontally adjacent pixel data.

When Horizontal Binning mode is activated, the maximum horizontal image size is halved.

### Note

Frame rate is not doubled by activating Horizontal Binning mode.

# XCG-5005E (B/W)

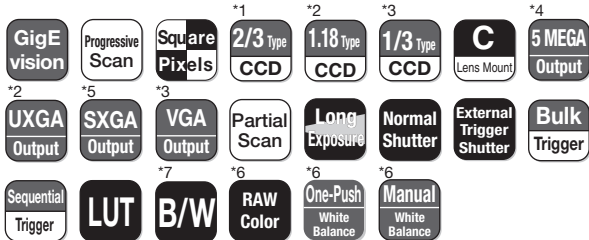
# XCG-5005CR (RAW Color)

# XCG-U100E (B/W)

# XCG-U100CR (RAW Color)

# XCG-SX99E (B/W)

# XCG-V60E (RAW Color)



\*1: XCG-5005E/XCG-5005CR/SX99E      \*2: XCG-U100E/XCG-U100CR  
 \*3: XCG-V60E      \*4: XCG-5005E/XCG-5005CR  
 \*5: XCG-SX99E      \*6: XCG-5005CR/XCG-U100CR  
 \*7: XCG-5005E/XCG-V100E/XCG-SX99E/XCG-V60E

Connection Diagram P47



**GIGÉ**  
VISION

## Outline

The XCG Series incorporates the GigE Vision interface, which is specifically standardized for machine vision applications based on Gigabit Ethernet technology. The newly expanded XCG Series now consists of seven models – the XCG-5005E, the XCG-U100E, the XCG-SX99E, and the XCG-V60E. In addition, the XCG-SX99E, and XCG-5005E feature critical camera functions for security applications such as IR wavelength coverage (XCG-SX99E) and ultra-high 5-megapixel resolution (XCG-5005E).

The XCG camera series offers choice, flexibility, and high image quality options to match your specific inspection application requirements. By utilizing the features and benefits of the GigE Vision interface, the XCG Series expands the possibilities for factory automation and security applications, while also delivering the potential of significant cost savings.

## Features

### ■ High image quality, high speed image output (B/W model)

XCG-5005E equips a 5,000,000-pixel 2/3-type CCD that enables image output at 15 fps.

XCG-U100E equips a 2,000,000-pixel 1/1.8-type CCD that enables image output at 15 fps.

XCG-SX99E equips a 1,450,000-pixel 2/3-type CCD that enables image output at 27 fps.

XCG-V60E equips a 330,000-pixel 1/3-type CCD that enables image output at 90 fps.

### ■ Near-infrared sensitivity: XCG-SX99E

### ■ GigE vision Interface: GigE vision® version 1.2

\* "GigE Vision" is a trademark of the AIA (Automated Imaging Association).  
 \* "Genicam" is a trademark of EMVA (European Machine Vision Association).

### ■ Digital clamp XCG-5005E/XCG-5005CR

The XCG-5005E and XCG-5005CR provides the digital clamp function to correct black level difference between left and right images. The digital clamp has the following three modes.

- One-Shot Clamp
- Auto Clamp
- OFF

### ■ External trigger shutter function (2 sec to 1/100,000 sec)

You can obtain still images by synchronizing with external trigger signals and operating the shutter at your own timing. This function is useful to shoot a fast-moving object clearly.

### ■ Trigger modes

Free run/Special trigger mode  
 (Bulk trigger/Sequential trigger)

### ■ Trigger delay

This function applies a trigger delay within the camera. Use it to synchronize trigger timing when the trigger signal is offset from the desired object exposure timing. Setting range is 0  $\mu$ s to 4,000,000  $\mu$ s, in 1  $\mu$ s units.

### ■ Partial scan

The partial scan function outputs a user-defined region (Area of Interest) within the overall image area.

Cut-out position settings are specified with the following units:

- Vertical: 4-scan line units
- Horizontal: 8-pixel units

### ■ Binning mode (B/W model only)

This mode increases sensitivity and frame rate by combining vertically adjacent pixel data from the CCD.

### ■ Frame rate control

You can change the frame rate while maintaining the shutter setting. This is useful when you want to reduce packet sizes per time by lowering the frame rate and reduce network traffic.

### ■ Strobe control outputs

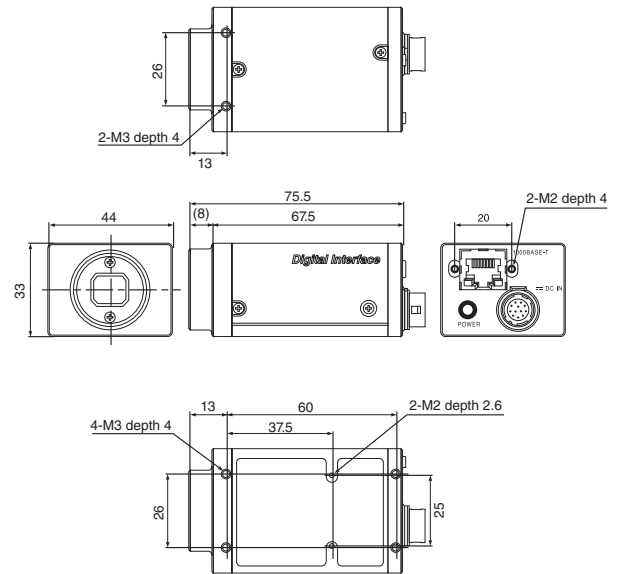
### ■ Auto gain control

The camera provides the auto gain control function to automatically control image brightness according to a user-specified detection frame and image average level.

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-ST70I

## Dimensions



Unit: mm

## Specifications

	XCG-5005E	XCG-5005CR	XCG-U100E	XCG-U100CR	XCG-SX99E	XCG-V60E	
<b>Camera</b>							
Image type	B/W	Color	B/W	Color	B/W	B/W	
Image size	5 Mega	5 Mega	UXGA	UXGA	SXGA	VGA	
Image sensor	2/3-type PS IT CCD	2/3-type PS IT CCD	1/1.8-type PS IT CCD	1/1.8-type PS IT CCD	2/3-type PS IT CCD (EXview HAD CCD)	1/3-type PS IT CCD	
Number of effective pixels (H × V)	2456 × 2058	2456 × 2058	1628 × 1236	1628 × 1236	1392 × 1040	659 × 494	
Cell size (H × V)	3.45 μm × 3.45 μm	3.45 μm × 3.45 μm	4.4 μm × 4.4 μm	4.4 μm × 4.4 μm	6.45 μm × 6.45 μm	7.4 μm × 7.4 μm	
Standard output pixels (H × V)	2,448 × 2,048	2,448 × 2,048	1,600 × 1,200	1,600 × 1,200	1,360 × 1,024	640 × 480	
Color filter	—	Color moxaic	—	Color moxaic	—	—	
Frame rate	15 fps	15 fps	15 fps	27 fps	27 fps	90 fps	
Minimum illumination	1 lx (Lens: F1.4, Gain: 18 dB, Shutter: 1/15 sec)	6 lx (Lens: F1.4, Gain: 18 dB, Shutter: 1/15 sec)	1 lx (Lens: F1.4, Gain: 18 dB, Shutter: 1/15 sec)	6 lx (Lens: F1.4, Gain: 18 dB, Shutter: 1/15 sec)	0.4 lx (Lens: F1.4, Gain: 18 dB, Shutter: 1/15 sec)	1 lx (Lens: F1.4, Gain: 18 dB, Shutter: 1/605 sec)	
Sensitivity	F5.6 (400 lx, Gain 0 dB)	F8 (2,000 lx, Gain 0 dB)	F5.6 (400 lx, Gain 0 dB)	F5.6 (2,000 lx, Gain 0 dB)	F8 (400 lx, Gain 0 dB)	F5.6 (400 lx, Gain 0 dB)	
SNR	1 step (Lens close, Gain: 0 dB, 8 bits)						
Gain	Auto/Manual: 0 to 18 dB						
Shutter speed	2 sec to 1/100,000 sec						
Mwhite balance	—	Manual One push	—	Manual One push	—	—	
<b>Camera Features</b>							
Readout modes	Normal/Binning (1 × 2) /Partial scan	Normal/Partial scan	Normal/Binning (1 × 2) /Partial scan	Normal/Partial scan	Normal/Binning (1 × 2) /Partial scan	Normal/Binning (1 × 2) /Partial scan	
Readout features	Binarization, Gamma (arbitrary setting) Gray scale chart	Gamma (arbitrary setting), color bar pattern	Binarization, Gamma (arbitrary setting) Gray scale chart	Gamma (arbitrary setting), color bar pattern	Binarization, Gamma (arbitrary setting) Gray scale chart	Binarization, Gamma (arbitrary setting) Gray scale chart	
Trigger modes	Edge/Width mode, Software trigger (1000BASE-T), Bulk trigger, Sequential trigger, Trigger inhibit, Trigger/Strobe delay						
User Set/Memory channel	16 channels						
User memory	16 bytes + 64 bytes × 16 channels	64 bytes × 16 channels	16 bytes + 64 bytes × 16 channels	64 bytes × 16 channels	16 bytes + 64 bytes × 16 channels	16 bytes + 64 bytes × 16 channels	
<b>Interface</b>							
Video data output	digital Mono, 8, 10, 12-bit (default setting 8 bits)	digital Raw, 8, 10, 12-bit (default setting Raw 8 bits)	digital Mono, 8, 10, 12-bit (default setting 8 bits)	digital Raw, 8, 10, 12-bit (default setting Raw 8 bits)	digital Mono, 8, 10, 12-bit (default setting 8 bits)	digital Mono, 8, 10, 12-bit (default setting 8 bits)	
Interface	Gigabit Ethernet (1000BASE-T)						
Camera specification	GigE Vision® Version 1.2 Compliant						
Digital I/O	ISO IN (x1), ISO OUT (x1), TTL OUT (x1)						
<b>Others</b>							
Lens mount	C-mount						
Flange focal length	17.526 mm						
Transfer rate	1 Gbps						
Power requirements	DC +12 V (10.5 V to 15.0 V) (from 12-pin connector)						
Power consumption	4.3 W	4.3 W	3.1 W	3.5 W	3.6 W	3.1 W	
Operating temperature	-5°C to +45°C	-10°C to +45°C	-5°C to +45°C	-10°C to +45°C	-5°C to +45°C	-5°C to +45°C	
Performance guarantee temperature	0°C to 40°C						
Storage temperature	-30°C to +60°C						
Operating humidity	20% to 80% (no condensation)						
Storage humidity	20% to 95% (no condensation)						
Vibration resistance	10 G (20 Hz to 200 Hz, 20 minutes for each direction-x, y, z)						
Shock resistance	70 G						
Dimensions (W × H × D)	44 × 33 × 67.5 mm (excluding protrusions)						
Mass	Approx. 145 g						
MTBF	Approx. 8.5 years	Approx. 8.5 years	Approx. 9.9 years	Approx. 9.9 years	Approx. 9.9 years	Approx. 9.7 years	
Regulations	UL60950-1, CSA C22, 2 NO60950-1, FCC/IC: Class A, CE: EN61326-1, VCCI: Class A, AS/NZ: IEC61326-1, KC: KN22/KN24: Class A	UL2044, FCC Class A, CE: EN55022, AS/NZ: EN55022, VCCI: Class A, KC: KN22/KN24: Class A	UL60950-1, CSA C22, 2 NO60950-1, FCC/IC: Class A, CE: EN61326-1, VCCI: Class A, AS/NZ: IEC61326-1, KC: KN22/KN24: Class A	UL2044, FCC Class A, CE: EN55022, AS/NZ: EN55022, VCCI: Class A, KC: KN22/KN24: Class A	UL60950-1, CSA C22, 2 NO60950-1, FCC/IC: Class A, CE: EN61326-1, VCCI: Class A, AS/NZ: IEC61326-1, KC: KN22/KN24: Class A	UL60950-1, CSA C22, 2 NO60950-1, FCC/IC: Class A, CE: EN61326-1, VCCI: Class A, AS/NZ: IEC61326-1, KC: KN22/KN24: Class A	UL60950-1, CSA C22, 2 NO60950-1, FCC/IC: Class A, CE: EN61326-1, VCCI: Class A, AS/NZ: IEC61326-1, KC: KN22/KN24: Class A
Supplied accessories	Lens mount cap (1), Operating Instructions (1)						

\* "GigE Vision" is a trademark of the AIA (Automated Imaging Association).

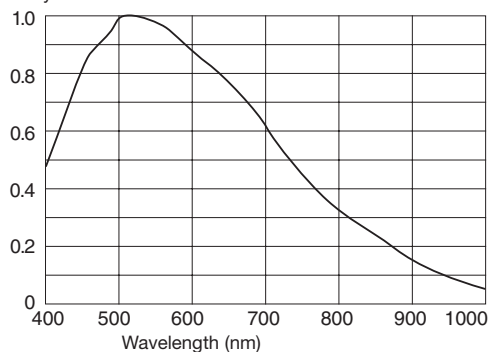
\* EXview HAD CCD II is a trademark of Sony Corporation.

## B/W model

### • XCG-5005E

(Lens characteristics and light source characteristics excluded.)

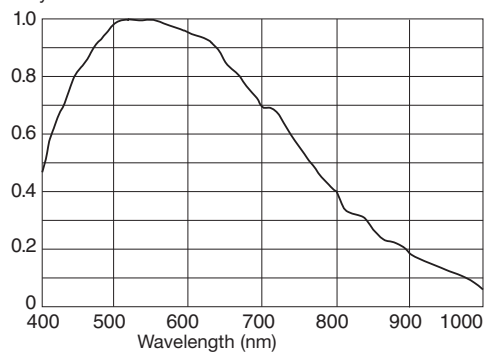
Relative sensitivity



### • XCG-SX99E

(Lens characteristics and light source characteristics excluded.)

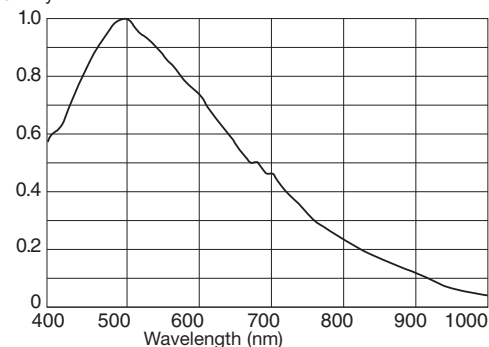
Relative sensitivity



### • XCG-U100E

(Lens characteristics and light source characteristics excluded.)

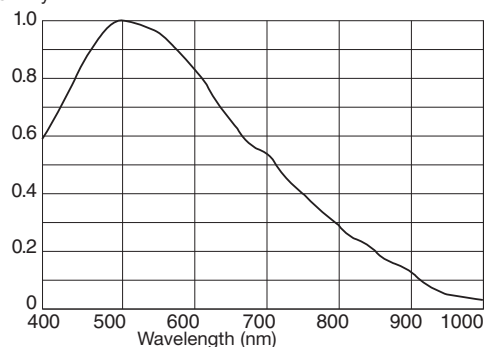
Relative sensitivity



### • XCG-V60E

(Lens characteristics and light source characteristics excluded.)

Relative sensitivity

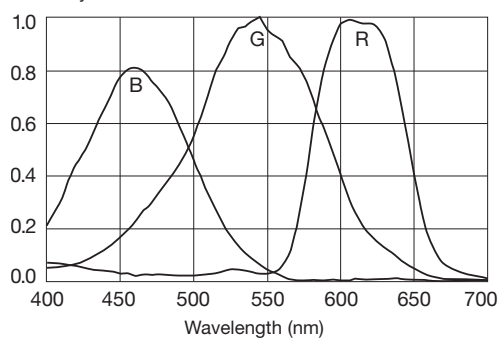


## Color model

### • XCG-5005CR

(Lens characteristics and light source characteristics excluded.)

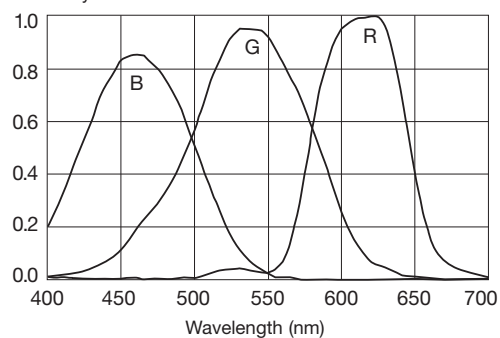
Relative sensitivity



### • XCG-U100CR

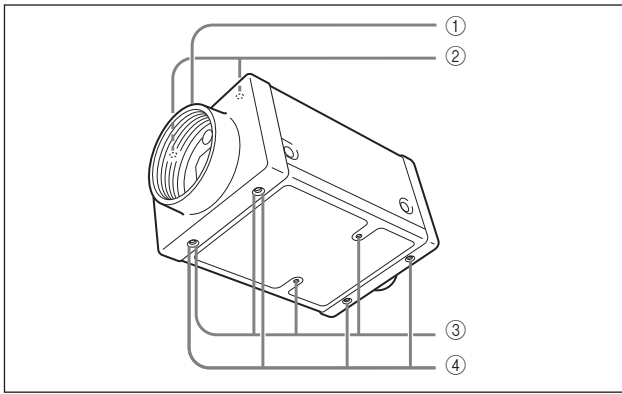
(Lens characteristics and light source characteristics excluded.)

Relative sensitivity



Digital Video Camera XCL  
 Analog Video Camera XC (Non-TV Format)  
 XC (TV Format)  
 Accessories  
 Color Camera Module FCB-HD FCB-SD  
 micro

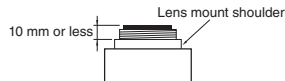
## Location and Function of Parts and Controls



### ① Lens mount (C-mount)

#### Note

The lens must not project more than 10 mm from the lens mount.



### ② Guide screw holes (at the top)

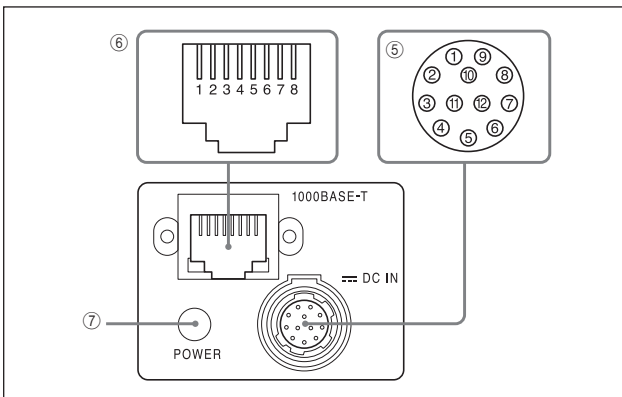
### ③ Guide screw holes/Tripod screw holes (at the bottom)

When using a tripod, use these four screw holes to attach a VCT-ST70I tripod adaptor.

### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module into these holes secures the optical axis alignment.

## Rear Panel/Pin Assignments



### ⑤ DC IN (DC power input) connector (12-pin)

You can connect a camera cable CCXC-12P05N etc. to input the +12 V DC power supply. The pin configuration of this connector is as follows. For details on the pin arrangement, see the following table.

Pin No.	Signal	Pin No.	Digital signal
1	Ground	7	GPI input (ISO +)
2	+12 V DC	8	Ground
3	Ground	9	NC
4	Multi-function output* (TTL)	10	NC
5	Multi-function output* (ISO -)	11	Trigger input
6	Multi-function output* (ISO +)	12	GPI input (ISO -)

#### \* About multi-function output

You can select from the following signals based on settings. Exposure output/strobe control outputs/GPO (fixed value Hi or Low)

See the Users Guide for pin 4 TTL output level and pin 11 trigger input level specifications.

### ⑥ RJ45 connector

You can connect a LAN cable to this connector to control the camera module from a host device to output image to a host device.

Pin No.	Signal	Pin No.	Signal
1	TP1 +	5	TP3 -
2	TP1 -	6	TP2 -
3	TP2 +	7	TP4 +
4	TP3 +	8	TP4 -

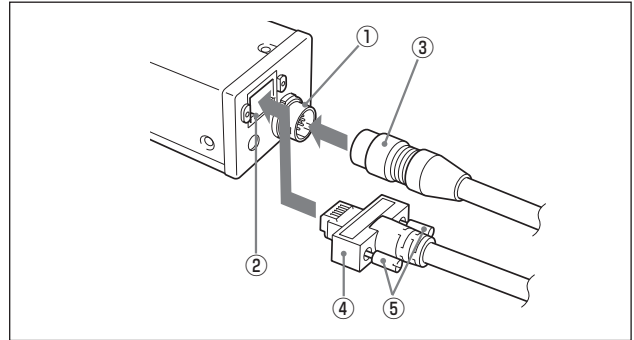
### ⑦ POWER LED

Flashes or lights based on the internal status of the camera.

Flashing: Obtaining IP address.

Lit: IP address obtained.

## Connecting the Cables



Connect the camera cable to the DC IN connector and the LAN cable to the RJ45 connector respectively. When you connect the LAN cable, turn the two fastening screws on the connector to secure the cable tightly.

- ① DC IN connector    ② RJ45 connector    ③ Camera cable  
④ LAN cable        ⑤ Fastening screws

## Triggering

The camera can be triggered by hardware or software triggering events.

### Hardware Triggering

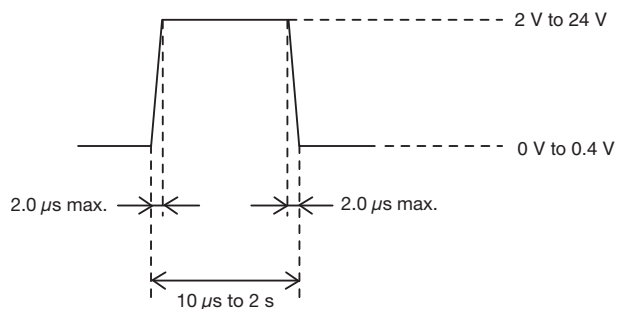
Hardware triggering is performed by applying a signal to an input on the 12-pin connector. Exposure occurs according to the predetermined timing of the trigger signal, which serves as the drive signal for acquiring video images. An image is acquired whenever the drive signal is valid. This function is used for shooting simultaneous video with multiple cameras.

### Software Triggering

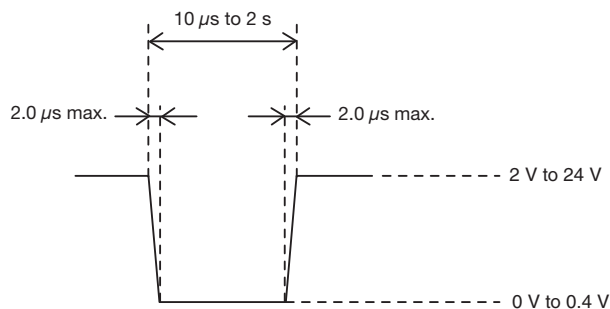
Software triggering is performed by an internal drive signal generated within the camera in response to network commands. Exposure occurs according to this trigger signal. This drive signal is useful for triggering when hardware triggering is not suitable.

## Trigger Input Specifications

When trigger input polarity is positive



When trigger input polarity is negative



The voltage values described in the above diagram are the values when the terminating impedance is 10 kΩ or more.

### Note

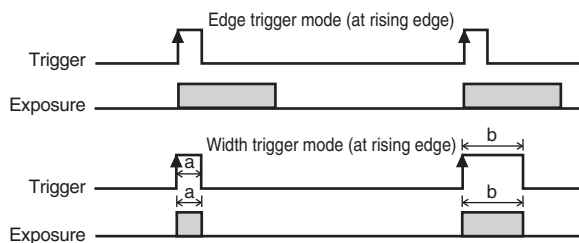
When inputting a trigger signal to the camera using the DC-700/DC-700CE, use DC 5 V or less at the logical high level.

## Special Trigger Modes

The three special trigger modes are Normal, Bulk and Sequential triggering.

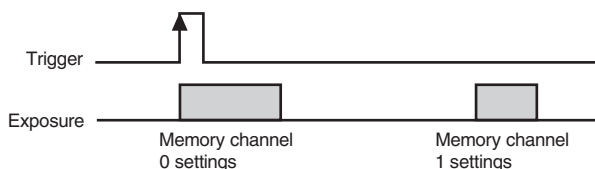
### Normal trigger mode

The Normal mode outputs images continuously according to internal continuous drive. When trigger drive is enabled, the camera is driven by either hardware or software triggering. In this mode, the following two drive methods are available according to the trigger mode: Edge Trigger Mode (exposure begins at the rising edge of trigger pulses with duration based on the shutter settings) or Width Trigger Mode (exposure duration is the same as the duration set for the trigger pulse width).



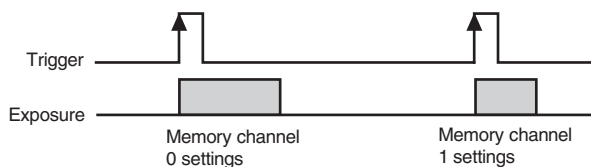
### Bulk trigger mode

Different camera setting configurations are stored in memory channels beforehand, with the different settings applied to acquire multiple video images at each trigger event. In the following diagram, two images are acquired in one cycle.



### Sequential trigger mode

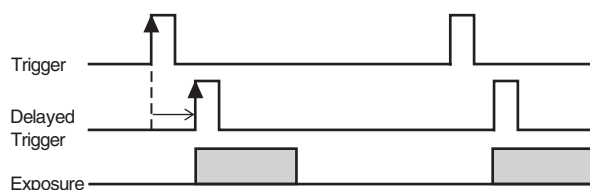
Different camera setting configurations are stored in memory channels beforehand, with the different settings applied in sequence to acquire a different image with each trigger event. In the following diagram, two images with different exposure settings are acquired in one cycle.



## Trigger Delay

This function applies a trigger delay within the camera. Use it to synchronize trigger timing when the trigger signal is offset from the desired object exposure timing.

Setting range is 0 μs to 4,000,000 μs, in 1 μs units.



## Multi-Function Outputs/GPIs (general-purpose inputs)

The multi-function output settings determine the function of the camera's output connector pins for GPO (general-purpose signal output), exposure signal output or strobe control signal output. These signal ports are used to control external devices. GPI ports are also provided for input signals. The camera has two multi-function output ports and one GPI port.

### Exposure output

Signal output is valid during image sensor exposure. You can also configure the polarity.

### Strobe control outputs

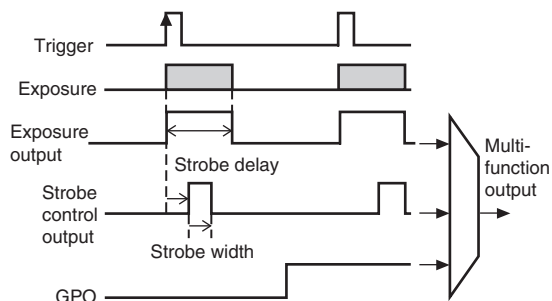
Make precise adjustments to strobe control and control for other external devices connected to the camera by controlling the timing and width of signals. You can also configure the polarity. Setting ranges are:

Strobe delay: 0 μs to 4,000 μs (in 1 μs units)

Strobe width: 0 μs to 4,000 μs (in 1 μs units)

### GPO

Outputs can be High or Low active.



### Network Functions

The camera provides the following network functions.

- Payload Size
- Packet Size
- Inter Packet Delay
- DHCP Enable
- Persistent IP Enable
- Persistent IP Address
- Persistent IP Subnet Mask

## Gain

The camera provides both manual and automatic gain control.

### Manual gain control

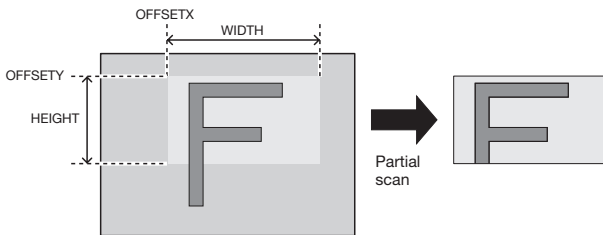
Variable gain control in models XCG-U100CR can be set from 0 to 18 dB in 0.0358 dB increments, or from 0 to 502 in 0.0358 dB steps. In addition to the above, the XCG-5005CR provides independent left and right controls (GainL and GainR). When left and right gain should be the same, set only the left level (GainL).

### Auto gain control

The camera provides the auto gain control function to automatically control image brightness according to a user-specified detection frame and image average level (variable from 0 to 16383 in 14 bit). The variable range is the same as for manual gain control. Also, the auto gain control detection frame showing each area's image average level can be displayed and adjusted. The detection frame is defined by Offset X and Y, Width and Height percentage values (relative to the [100%] width and height of the output video image).

## Partial Scan

The partial scan function outputs a user-defined region (Area Of Interest) within the overall image area. The cut-out region for partial scan is defined by Offset X and Offset Y (which indicate the start point for cutting), and Width and Height (which indicate the area). Contiguous blocks of minimum areas can be selected to define regions. However, the defined region must be a square or right rectangle. T- and L-shaped regions are invalid.



### Note

Be aware that the frame rate increases for vertical cut-outs, while the frame rate remains unchanged for horizontal cut-outs.

## Frame Rate Control

The camera provides the following two methods for frame rate control during internal continuous drive operation.

### Auto Frame Rate setting

The fastest frame rate is configured automatically based on the current shutter setting and partial scan setting. This is the default frame rate control setting for the camera.

To increase the frame rate, enable the partial scan function. Depending on whether the exposure time is longer than the frame period, the frame rate will be reduced proportionally. Therefore, shorten the shutter time as necessary.

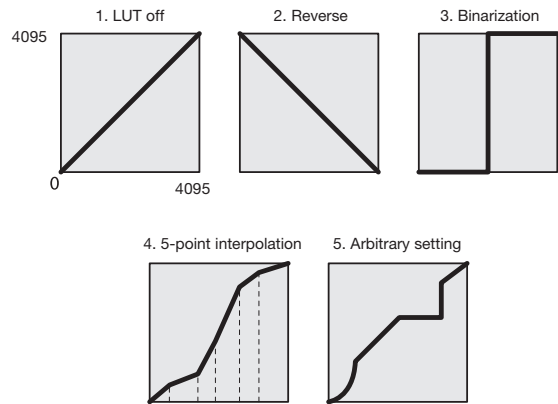
### Frame Rate setting

Configure the frame rate manually. However, you cannot increase the frame rate beyond the fastest setting. In addition, if the exposure time is longer than the configured frame period, the frame rate will be reduced in proportion to the exposure time. When you want to minimize network traffic, use this setting to lower the frame rate while maintaining the same shutter setting.

The camera has a frame rate display function for verifying the frame rate obtained using the above settings. By using this function to confirm that an anticipated frame rate has been obtained, you can verify frame correspondence with hardware triggering. For width-mode hardware triggering, set the hardware trigger period to the displayed frame rate, and set the hardware trigger width to the displayed internal shutter value. For edge-mode hardware triggering, set only the trigger period to the displayed frame rate.

## Look-Up Table (LUT)

The camera's look-up table consists of 4,096 values, with 12-bit input and output. The look-up table allows setting an arbitrary gamma curve or binarization. Also, a gamma curve coefficient can be specified for the standard black level. For levels below the standard black level, set the gamma value to 1 to prevent burnt-out highlights in the black level.



## Digital Clamp (XCG-5005E/5005CR)

The XCG-5005E and XCG-5005CR provide the digital clamp function to correct black level difference between left and right images. The digital clamp has the following three modes.

### One-Shot Clamp

This mode corrects left-right black level difference once upon executing the command.

### Auto Clamp

This mode automatically corrects left-right black level difference.

### OFF

This mode allows you to manually correct left-right black level difference.

If the above One-Shot/Auto Clamp modes cannot adequately correct left-right black level difference, user adjustment is available from the OFF mode.

## Pixel Gain (XCG-5005CR/U100CR)

The camera provides a pixel gain function.

Gain values are from 1X to 16X (1024 to 16383, in 0.0009765625X increments).

### Note

When using pixel gain, discontinuity may occur in the spacing between output levels. This occurs due to the lack of an image signal output that is equivalent to the output steps. This is not a malfunction.

## White Balance (XCG-5005CR/U100CR)

The camera provides a white balance function.

### One-Push White Balance

This mode adjusts the R- and B-level corresponding to the G-level for a user-specified detection frame once upon executing the command. The variable range is the same as for pixel gain.

Also, the white balance detection frame showing each area's image average level can be displayed and adjusted. The detection frame is defined by Offset X and Y, Width and Height percentage values (relative to the [100%] width and height of the output video image).

**XCD-U100 (B/W)**  
**XCD-U100CR (RAW Color)**  
**XCD-SX90 (B/W)**  
**XCD-SX90CR (RAW Color)**  
**XCD-V60 (B/W)**  
**XCD-V60CR (RAW Color)**



IEEE-1394b Digital Output	Progressive Scan	Square Pixels	1.8-type CCD	1/3 Type CCD	C Lens Mount	UXGA Output	SXGA Output	VGA Output
Partial Scan	Long Exposure	Normal Shutter	External Trigger Shutter	Bulk Trigger	Sequential Trigger	One-Push White Balance	Fixed White Balance	Manual White Balance
ATW White Balance	One Shot	Memory Shot	S800 1394b	Image Filter	LUT	Auto Shutter	Nega Posi Reversal	RAW Color

**B/W**

\*1 XCD-U100/U100CR    \*2 XCD-SX90/SX90CR  
 \*2 XCD-SX90/SX90CR    \*3 XCD-V60/V60CR  
 \*3 XCD-V60/V60CR

Connection Diagram P47

**Outline**

The six models of the XCD-series digital camera modules (Black and white models and RAW color models) employing the IEEE1394b-2002 standard are equipped with quality digital camera features.

Although it is compact, the camera allows high-speed image transfer and daisy chain connection with two IEEE1394b connectors. The camera also has versatile features such as hardware preprocessing in the camera that reduces the load of image processing in a PC, bus synchronization, and broadcast delivery of commands.

The XCD-series digital output cameras conforming to the IIDC 1.31 protocol take full advantages of IEEE1394 capabilities.

**Features**

- High image quality, high-speed image output
  - XCD-U100/U100CR: 1/1.8-type PS IT CCD, UXGA, 15 fps
  - XCD-SX90/SX90CR: 1/3-type PS IT CCD, SXGA, 30 fps
  - XCD-V60/V60CR: 1/3-type PS IT CCD, VGA, 90 fps
- Daisy chain connection
 

The camera is equipped with two IEEE1394b connectors that support connection of multiple cameras. As the power can be supplied from a 12-pin connector (EIAJ), the camera achieves daisy chain connection without limitation of power supply capacity so that a simple image processing system with multiple cameras can be developed.
- Hardware preprocessing
 

The camera is equipped with hardware LUT (Lookup Table). The black and white models are also equipped with 3 x 3 image matrix operation.
- Bus synchronization
 

The cameras connected to the same bus automatically operate in synchronization with the 1394 bus, without using an external sync signal. The exposure timing on multiple cameras is synchronized correctly via the IEEE1394b cable only.

■ Broadcast delivery of commands

The camera settings for all the cameras connected to the same bus can be changed at the same time. For example, the gain or shutter speed is set to the same value on all the cameras, or exposure starts on all the cameras simultaneously using a software trigger.

■ Memory channel

The memory channel allows storage of up to 15 sets of camera settings such as gain and shutter.

■ Bulk trigger mode

The Bulk trigger mode allows output of multiple images with a shot of a trigger signal. Each image is shot with the camera settings stored in the memory channel. Up to 15 image settings are possible.

■ Memory shot

The image exposed from the sensor is stored in the camera's built-in memory. The stored image can be read out using a command from the host PC when required.

		XCD-U100 XCD-U100CR	XCD-SX90 XCD-SX90CR	XCD-V60 XCD-V60CR
Standard image size (H x V)		1,600 x 1,200 (UXGA)	1,280 x 960 (SXGA)	640 x 480 (VGA)
Video data output	Mono, Raw: 8 bits	8 frames	13 frames	54 frames
	Mono, Raw: 16 bits	4 frames	6 frames	27 frames

■ Partial scan

Partial scan clips a required angle of view (area) from the entire screen to be read out. As a part of the image is read out, the unit takes advantage of reduced image data and high-speed transfer. The minimum clipping unit is 32 pixels x 24 lines.

■ Binning

Binning increases the sensitivity and frame rate based on mixing the pixel data.

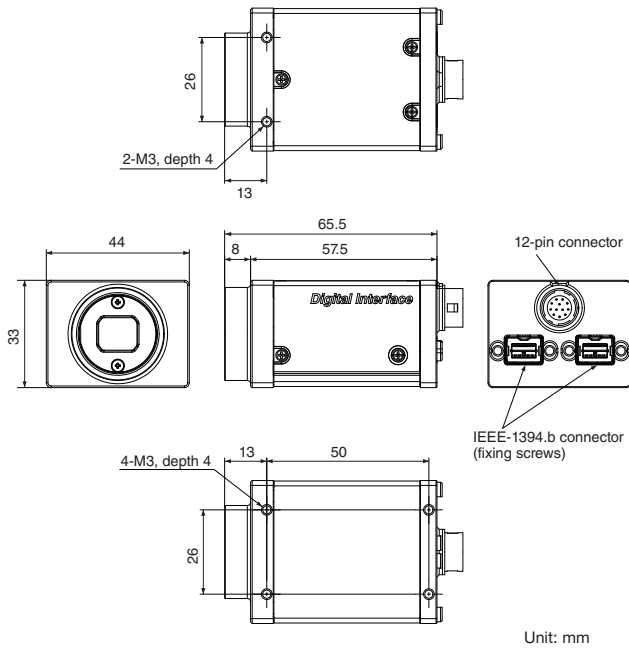
■ 9-pin connector with fixing screws

■ Low power consumption, vibration-resistant structure, and compact size

■ IIDC Ver. 1.31 protocol compliant



## Dimensions



Unit: mm

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-ST70I

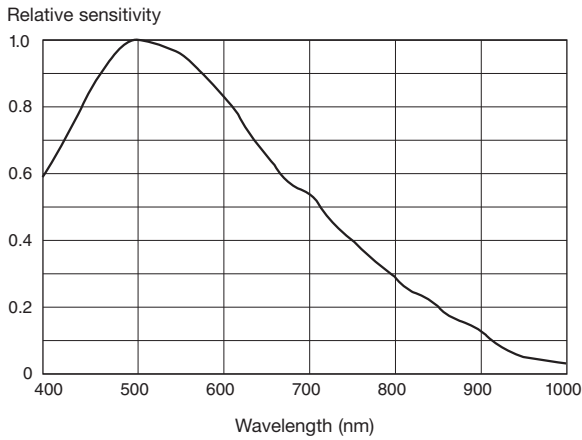
## Specifications

	XCD-U100	XCD-U100CR	XCD-SX90	XCD-SX90CR	XCD-V60	XCD-V60CR
<b>Camera</b>						
Image type	B/W	Color	B/W	Color	B/W	Color
Image size	UXGA		SXGA		VGA	
Image sensor	1/1.8-type PS IT CCD		1/3-type PS IT CCD			
Number of effective pixels (H × V)	1,628 × 1,236		1,296 × 964		659 × 494	
Cell size (H × V)	4.4 μm × 4.4 μm		3.75 μm × 3.75 μm		7.4 μm × 7.4 μm	
Standard output pixels (H × V)	1,600 × 1,200		1,280 × 960		640 × 480	
Color filter	–	Color mosaic	–	Color mosaic	–	Color mosaic
Frame rate	15 fps		30 fps		90 fps	
Minimum illumination	2 lx (Iris: F1.4, Gain: 24 dB, Shutter: 1/15 s)	20 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/15 s)	2 lx (Iris: F1.4, Gain: 24 dB, Shutter: 1/30 s)	20 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/30 s)	2 lx (Iris: F1.4, Gain: 24 dB, Shutter: 1/60 s)	20 lx (Iris: F1.4, Gain: 18 dB, Shutter: 1/60 s)
Sensitivity	F8 (400 lx, Gain: 0 dB)	F8 (2000 lx, Gain: 0 dB)	F8 (400 lx, Gain: 0 dB)	F8 (2000 lx, Gain: 0 dB)	F8 (400 lx, Gain: 0 dB)	F8 (2000 lx, Gain: 0 dB)
SNR	1 step (Lens close, Gain: 0 dB, 8 bits)	2 step (Lens close, Gain: 0 dB, 8 bits)	1 step (Lens close, Gain: 0 dB, 8 bits)	2 step (Lens close, Gain: 0 dB, 8 bits)	1 step (Lens close, Gain: 0 dB, 8 bits)	2 step (Lens close, Gain: 0 dB, 8 bits)
Gain	Auto/Manual: 0 dB to 24 dB	Auto/Manual: 0 dB to 18 dB	Auto/Manual: 0 dB to 24 dB	Auto/Manual: 0 dB to 18 dB	Auto/Manual: 0 dB to 24 dB	Auto/Manual: 0 dB to +18 dB
Shutter speed	16 sec to 1/100,000 sec					
White balance	–	Auto, One push, Manual	–	Auto, One push, Manual	–	Auto, One push, Manual
<b>Camera Features</b>						
Readout modes	Normal, Binning (1 × 2, 2 × 2), Partial scan	Normal, Partial scan	Normal, Binning (1 × 2, 2 × 2), Partial scan	Normal, Partial scan	Normal, Binning (1 × 2, 2 × 2), Partial scan	Normal, Partial scan
Readout features	Partial scan, Binning, LUT, 3 × 3 filter, Gray scale	Partial scan, LUT, Pattern of bayer arrangement, AWB, color bar	Partial scan, Binning, LUT, 3 × 3 filter, Gray scale	Partial scan, LUT, Pattern of bayer arrangement, AWB, color bar	Partial scan, Binning, LUT, 3 × 3 filter, Gray scale	Partial scan, LUT, Pattern of bayer arrangement, AWB, color bar
Synchronization	Hardware trigger, Software trigger					
Trigger modes	Edge Detection, Exposure time setting by trigger width, Bulk trigger mode/Sequential trigger mode					
Partial scanning	Minimum unit: 32 × 24 Trimming position selectable by the unit of 4 × 4 (at format 7/mode: 0)					
User Set/Memory channel	15 channels					
User memory	256 bytes					
Image buffer	16 Mbytes					
Other features	Daisy chain, Broadcast delivery of command, 1394 Bus synchronization	Bayer pattern, Daisy chain, Broadcast delivery of command, 1394 Bus synchronization	Daisy chain, Broadcast delivery of command, 1394 Bus synchronization	Bayer pattern, Daisy chain, Broadcast delivery of command, 1394 Bus synchronization	Daisy chain, Broadcast delivery of command, 1394 Bus synchronization	Bayer pattern, Daisy chain, Broadcast delivery of command, 1394 Bus synchronization
<b>Interface</b>						
Video data output	digital Mono, 8, 10-bit (default setting 8 bits)	digital Raw, 8, 10-bit (default setting Raw 8 bits)	digital Mono, 8, 10-bit (default setting 8 bits)	digital Raw, 8, 10-bit (default setting Raw 8 bits)	digital Mono, 8, 10-bit (default setting 8 bits)	digital Raw, 8, 10-bit (default setting Raw 8 bits)
Digital interface	IEEE 1394b-2002 (800, 400, 200, 100 Mbps, x2), bilingual					
Camera specification	IIDC Version 1.31 compliant					
Output data clock	ISO IN (x2), ISO OUT (x2)					
<b>General</b>						
Lens mount	C-mount					
Flange focal length	17.526 mm					
Power requirements	DC 8 V to 30 V (from IEEE1394b 9 pin cable or 12 pin connector: 12 pin: Priority)					
Power consumption	3.0 W (12 V)		2.8 W (12 V)			
Operating temperature	–5°C to +45°C					
Performance guarantee temperature	0°C to 40°C					
Storage temperature	–30°C to +60°C					
Operating humidity	20% to 80% (no condensation)					
Storage humidity	20% to 95% (no condensation)					
Vibration resistance	10 G (20 Hz to 200 Hz)					
Shock resistance	70 G					
Dimensions (W × H × D)	44 × 33 × 57.5 mm (excluding protrusions)					
Mass	Approx. 140 g					
MTBF	56,270 hours (Approx. 6.4 years)		58,260 hours (Approx. 6.7 years)		57,170 hours (Approx. 6.5 years)	
Regulations	UL60950-1+CSA C22.2 No.60950.1, FCC/ICES-003: Class A, CE: EN61326, AS/NZ: EN55022, VCCI Class A, KC: KN22/KN24: Class A					
Supplied accessories	Lens mount cap (1), Operating Instructions (1)					

## B/W model

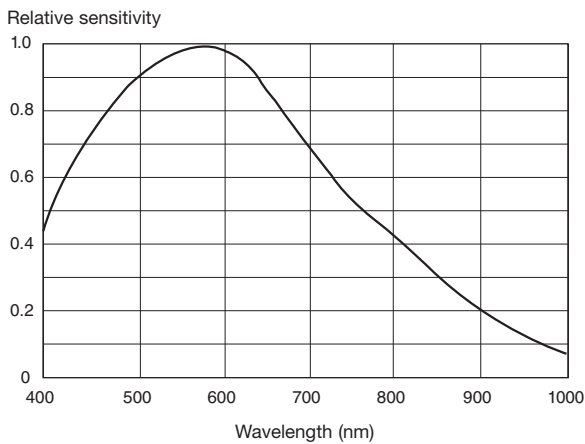
### • XCD-V60

Spectral sensitivity (relative response) parameters  
(without lens and light source parameters)



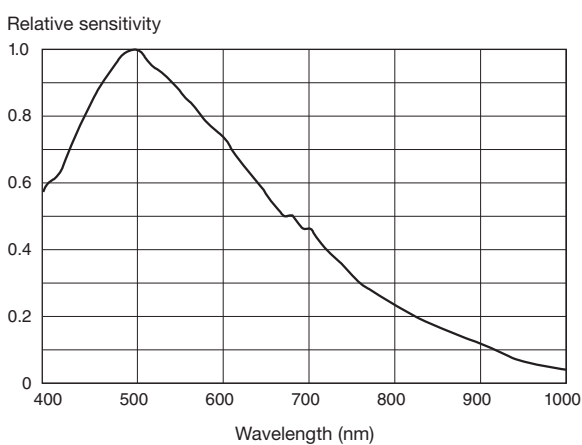
### • XCD-SX90

Spectral sensitivity (relative response) parameters  
(without lens and light source parameters)



### • XCD-U100

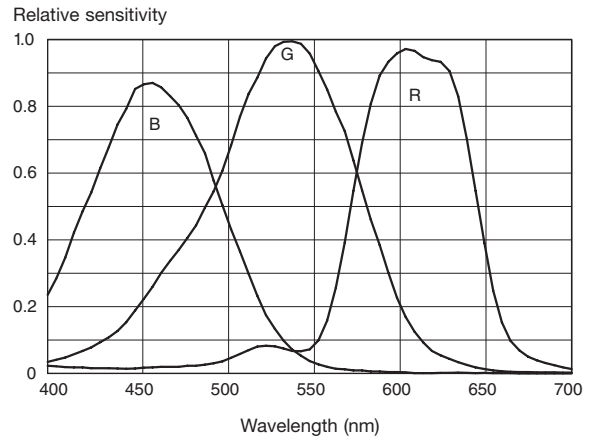
Spectral sensitivity (relative response) parameters  
(without lens and light source parameters)



## Color model

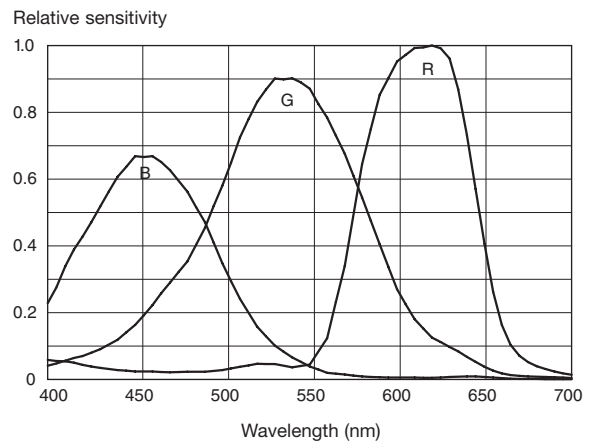
### • XCD-V60CR

Spectral sensitivity (relative response) parameters  
(without lens and light source parameters)



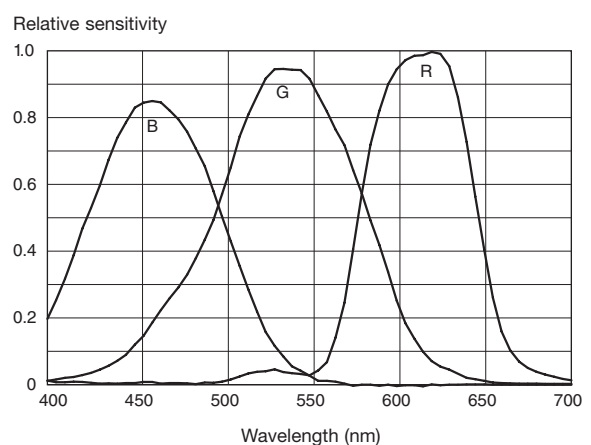
### • XCD-SX90CR

Spectral sensitivity (relative response) parameters  
(without lens and light source parameters)

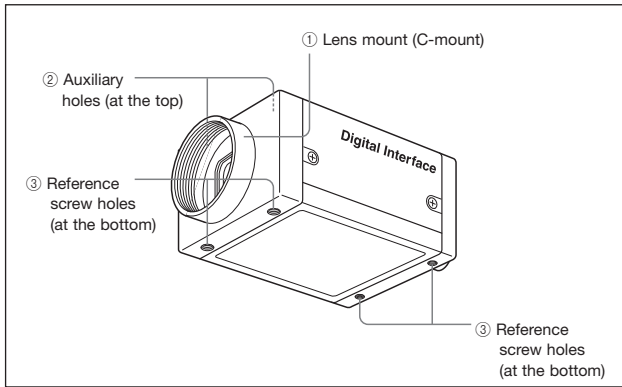


### • XCD-U100CR

Spectral sensitivity (relative response) parameters  
(without lens and light source parameters)



## Location and Function of Parts and Controls

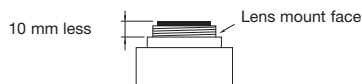


### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

The lens must not project more than 10 mm from the lens mount.



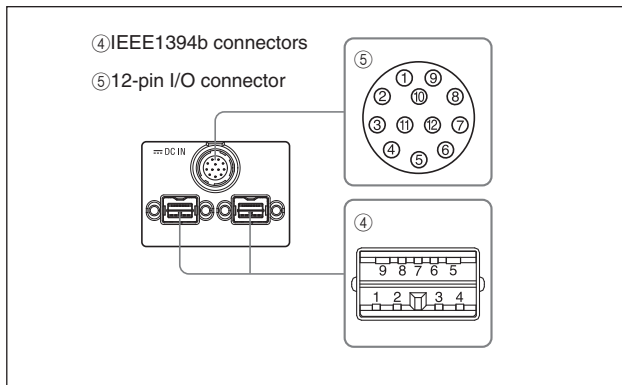
### ② Auxiliary screw holes (at the top)

### ③ Reference screw holes/Tripod screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module into these holes secures the optical axis alignment.

Four screw reference holes ③ can be used as the tripod adaptor screw holes, too. Screw the VCT-ST70I tripod adaptor into the four screw holes when you use a tripod.

## Rear and Connector Pin Assignments



### ④ IEEE1394b connectors

Connect an IEEE1394b camera cable (not supplied) to this connector.

Pin No.	Signal	Pin No.	Signal
1	TPB-	6	VG
2	TPB+	7	NC
3	TPA-	8	VP
4	TPA+	9	TPBG
5	TPAG		

### ⑤ 12-pin I/O connector

When power from the IEEE1394b connector is insufficient, power is supplied through this connector.

Connect a camera cable such as the CCXC-12P05N to this connector.

Pin No.	Signal	Pin No.	Signal
1	Power GND	7	GPIO IN 2
2	Power IN	8	GPIO OUT 2-
3	ISO GND	9	GPIO OUT 2+
4	Strobe OUT	10	GPIO IN 1
5	GPIO OUT 1-	11	Trigger IN
6	GPIO OUT 1+	12	ISO GND

## GAIN

Both Manual and Auto Gain settings are available with this camera. The variable range extends from 0 dB to 24 dB for the black and white models or from 0 dB to 18 dB for the color models. The camera is designed so that the gain can be subdivided and set by 0.0359 dB. At the factory default setting, the gain is set to 0 dB. When Auto Gain is selected, the gain is adjusted automatically, based on the brightness of the subject. At this time, the reference level (target point) is set in the AutoExposure register.

## Shutter

This camera allows both Manual and Auto Shutter settings. The variable range extends from 10 microseconds to 16.0 seconds; relative values are indicated by a 12-bit integer, and absolute values are indicated using a 32-bit floating point value.

The relationship between the parameter and the exposure time is given by the following formulas, where:

P = Parameter (003h to 47Eh)

E = Exposure time (s)

If P= 3

E = 0.00001

If 4 <= P <= 1000

$$E = \frac{P^2}{1000000}$$

If 1000 <= P <= 1150

$$E = (P - 1000) \times 0.1 + 1$$

### Setting examples

3 (003h) : 10 μs (1/100000)

32 (020h) : 1 ms (1/1000)

100 (064h) : 10 ms (1/100)

1000 (3E8h) : 1 s

1010 (3F2h) : 2 s

1150 (47Eh) : 16 s

When Auto Shutter is selected, the exposure time is adjusted automatically, based on the brightness of the subject. At this time, the reference level (target point) is set in the AutoExposure register.

### For long exposure times

When the exposure time is longer than the frame period, the camera enters the long exposure time mode, and the actual frame rate is reduced in accordance with the exposure time.

## Trigger

Trigger shutter is useful for capturing images in response to a trigger that starts the exposure to match a preset timing. It can also be used to capture an image using multiple cameras with the same timing. When a trigger shutter is used, the required trigger is input via the 12-pin connector on the rear panel. The input signal is a 5 V to 24 V negative pulse.

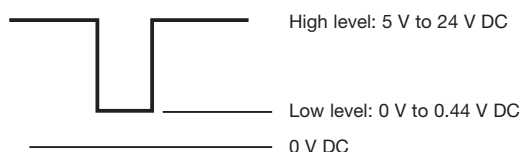
As the input connector is pulled inside of the camera, the camera can receive a trigger only by short-circuiting the input pin and ISO (GND) pin.

### Note

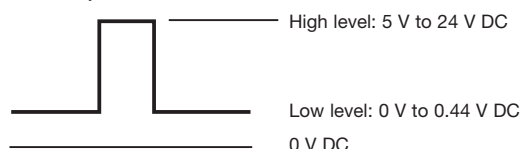
To connect to ground, use a device having a minimum pulse width of 10 microseconds and an input current of 0.5 mA or more. When using DC-700, use a 5-volt negative polarity pulse for the input signal.

This camera supports four trigger modes: 0, 1, 14 and 15.

### When set to negative (default setting)



### When set to positive \*1



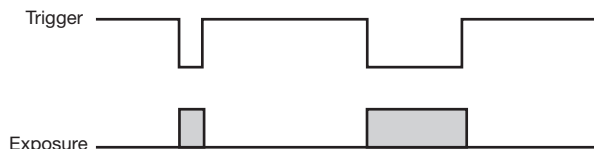
### Trigger mode 0

Trigger mode 0 starts exposure by detecting the falling edge of a trigger signal. The exposure time is determined by the shutter parameter.



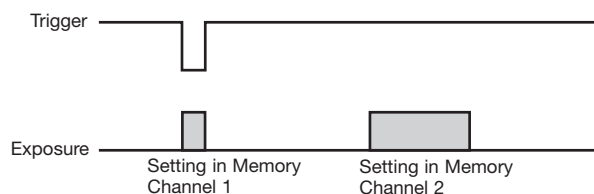
### Trigger mode 1

Trigger mode 1 controls the exposure time using the width of the trigger signal pulse. When trigger mode 1 is used, there is actually no limit to the exposure time.



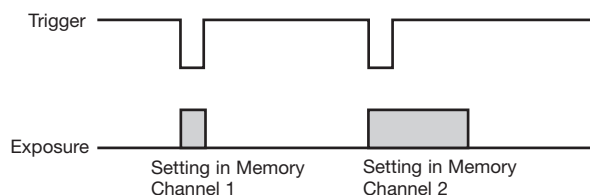
### Trigger mode 14 (Bulk trigger mode)

Trigger mode 14 allows shooting of multiple images with different camera settings using only one trigger signal. The camera settings should be prestored in memory channels.



### Trigger mode 15 (Sequential trigger mode)

Trigger mode 15 allows shooting of images by loading the camera settings prestored in memory channels in sequence each time a trigger is input.



As this camera is equipped with 15 memory channels, a repeat pattern of up to 15 image shootings can be set for trigger mode 14 or 15.

The number of the repeat patterns to be set in one cycle can be determined by the parameter of the trigger mode.

Memory channel 0 is not used for the Bulk trigger mode and the Sequential trigger mode.

The following features are loaded from the memory to be set for shooting:

- Brightness • Sharpness • Saturation • White balance • Hue
- Gamma • Shutter • Gain • Pan/Tilt • Optical Filter

Note that the Auto mode of White Balance, Shutter and Gain cannot be set.

Also note that Pan/Tilt is set only when the current video mode is the same as the video mode selected when the setting has been stored in the memory channel.

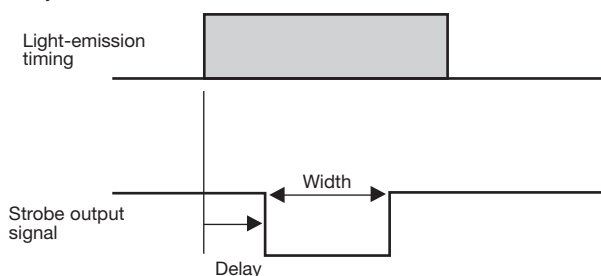
This camera can also be used with a software trigger that issues the trigger signal via software command. Trigger modes 0, 1, 14 and 15 can be used with software triggers.

## Strobe Control

A strobe control signal is assigned in the 12-pin connector.

This allows direct command of light-emission from the strobe connected to the camera and controls the light-emission timing and the signal width.

The output terminal is of the open-collector type and should be pulled at the strobe side. A strobe that emits light by short-circuiting the input to ground can be connected to the camera directly.



### Note

Use the following conditions:  
 Recommended pull-up resistor: 4.7 k $\Omega$   
 Recommended pull-up voltage: 5 V

The camera is equipped with a protective resistor of 220  $\Omega$ . If the above conditions prove difficult in use, check the output voltage and determine the external pull-up resistor. The camera is capable of outputting a signal of about 10 microsecond width, although the rise time depends on the pull-up resistor.

\*1

The trigger input signal has been improved so as to be able to accept a 5 V to 24 V positive polarity pulse via the camera function control. Please contact our sales representative for details including the corresponding serial number. The low-level and high-level pulse definitions are the same.

When using DC-700, use a 5-volt positive polarity pulse for the input signal.

## Saturation (Color models only)

This feature controls the color density.

## White Balance (Color models only)

This feature controls the white balance by setting the R and B levels relative to the G level.

The camera also supports the Auto white balance by which the camera automatically adjusts the white balance.

## Gamma

The camera use the gamma function to select the lookup table.

0 : Linear      2 : Equivalent of Gamma = 0.70  
1 : Reverse    3 : User setting

To set an arbitrary gamma curve, restore the setting values in the lookup table (EEPROM) of the camera.

## Optical Filter

Color models only: Changing Bayer Patterns

For black and white models only, simple image processing using the 3 × 3 image filter is possible on hardware.

- 0: Filter OFF
- 1: Sharpness enabled
- 2: Horizontal edge detection (Type 1)
- 3: Vertical edge detection (Type 1)
- 4: Horizontal edge detection (Type 2)
- 5: Vertical edge detection (Type 2)
- 6: Edge emphasis (Type 1)
- 7: Edge emphasis (Type 2)
- 8: User setting

### Note

Sharpness is disabled when the 3 × 3 image filter is set to 0, or 2 to 8.

Color models

You can change the Bayer patterns by moving the starting position from which to output pixel data by one position up, down, right, or left. Patterns of Bayer arrangement are as follows:

Pattern 0

G	B
R	G

Pattern 1

B	G
G	R

Pattern 2

R	G
G	B

Pattern 3

G	R
B	G

## Memory Shot

The camera is equipped with Memory Shot that temporarily stores an image in the frame memory inside the camera and transfers it later.

When multiple cameras are connected in the same bus, all the cameras may not output images at the same time due to the restriction of 800 Mbps band. Memory Shot may resolve this inconvenience.

When exposure starts, each camera stores an image in the frame memory without allocating the isochronous resource.

When outputting, each PC outputs the image from the camera allocating the isochronous resource.

The number of images to be stored depends on the video mode.

## Broadcast Command

The normal1394 communication method specifies the node number at the host side so that only a specified camera responds to the command.

If the node number is set to 63, all the cameras connected to the same bus can receive the command simultaneously, i.e., only one command issued from the host can control multiple cameras at the same time.

All the commands including the video mode setting and the feature control are capable of broadcasting except the block writing command.

When setting different types of cameras using a broadcast command, be careful not to issue a command that the cameras do not support.

## 1394 Bus Synchronization

Timing used to start exposure is synchronized with the 1394 bus time cycle register.

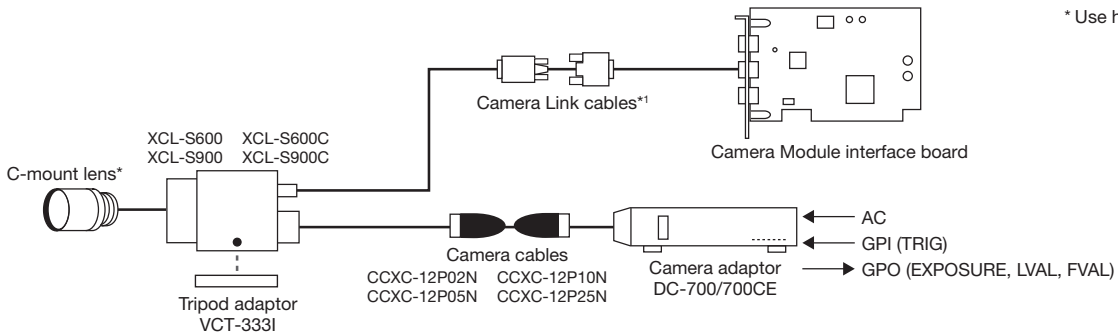
If cameras are connected to the same bus, they are automatically synchronized in a 1394 bus operation. As 800 Mbps band restriction can affect the synchronization, you must set the video mode in which the cameras can transmit a video signal at the same time.

1394 synchronization does not work in long exposure mode and Partial scan mode. In a long exposure, the exposure time is set longer than the image transmission cycle.

1394 bus synchronization includes up to 1H cycle jitter. Hardware external synchronization will ensure greater accuracy.

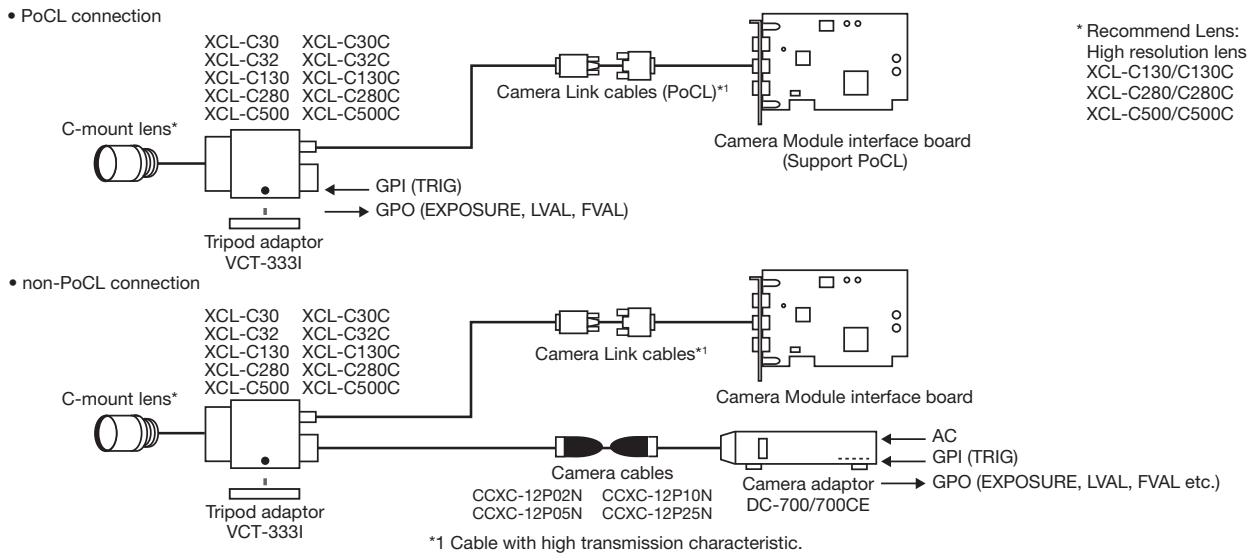
# Connection Diagram

## XCL-S Series

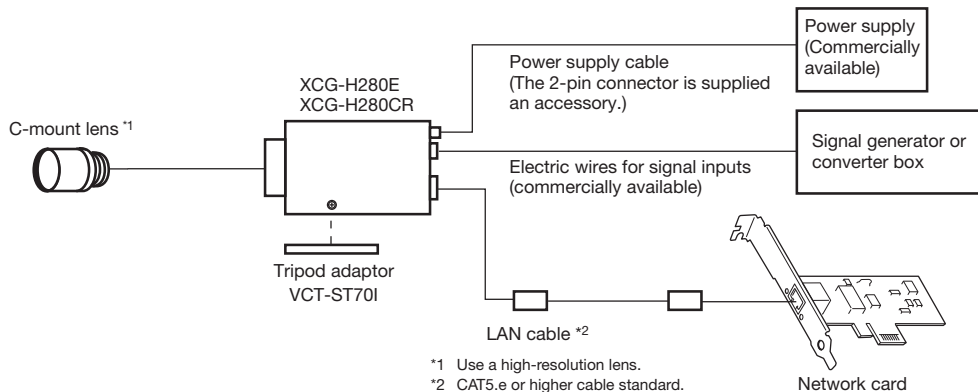


\*1 Cable with high transmission characteristic.

## XCL-C Series

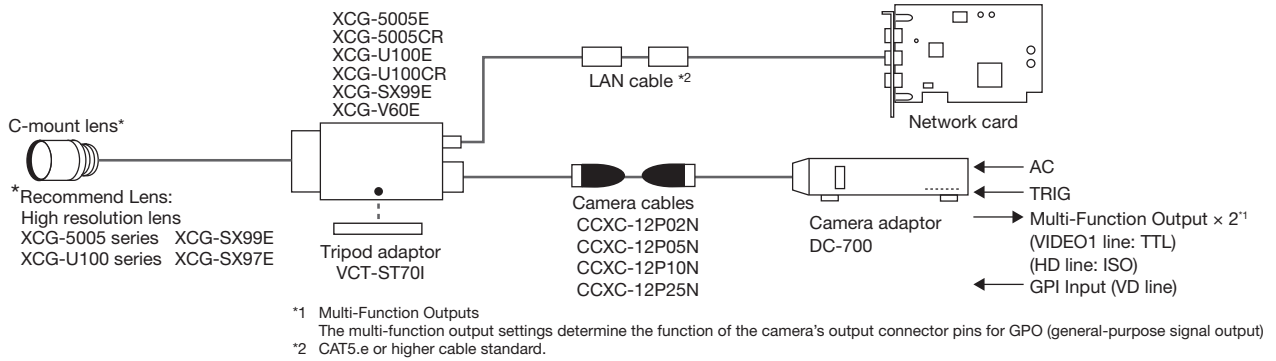


## XCG-H280E/XCG-H280CR

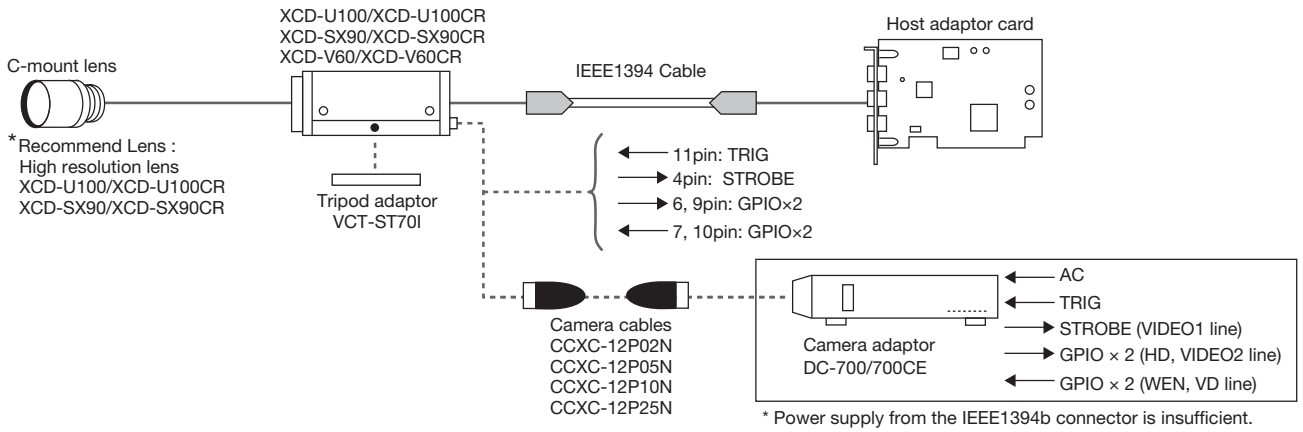


# Connection Diagram

## XCG Series



## XCD Series



# XC-HR90



Connection Diagram P72



## Outline

The XC-HR90 is an analog interface camera with high-speed, high-quality picture output of approximately 1.25 megapixels (SXGA) at a standard frame rate of 30 fps, with a compact size that makes it ideal for use in combination with industrial equipment. Other features include a partial scan function that enables faster image read-out, and settings that can be made via the rear panel or remotely via RS-232C serial interface.

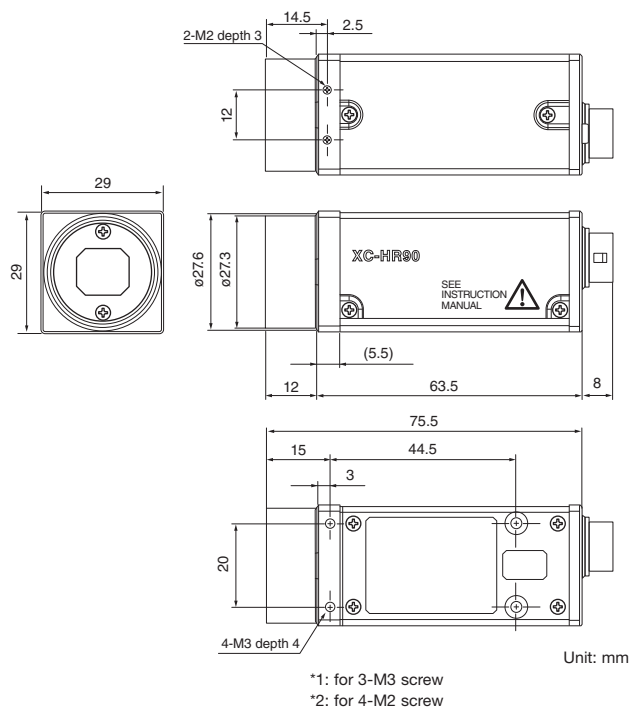
## Features

- 1/3-type high-resolution PS IT CCD monochrome camera module
- Full pixel read-out, SXGA size (Effective lines: 1,280 (H) × 960 (V))  
Image output: 30 fps, 15 fps (selectable)
- Vertical frequency  
49.302 MHz (30 fps)  
24.651 MHz (15 fps)
- Analog output
- Partial scan
- Binning
- External control possible (RS-232C)

## Accessories

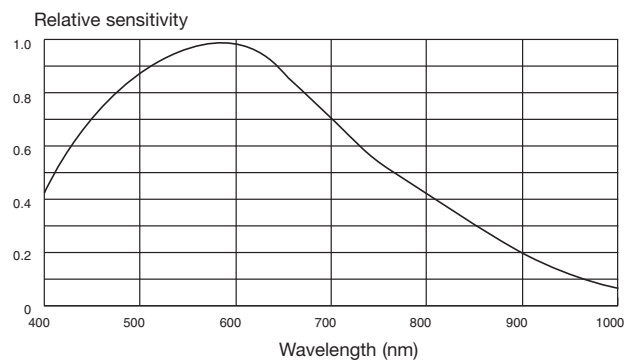
- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-551

## Dimensions



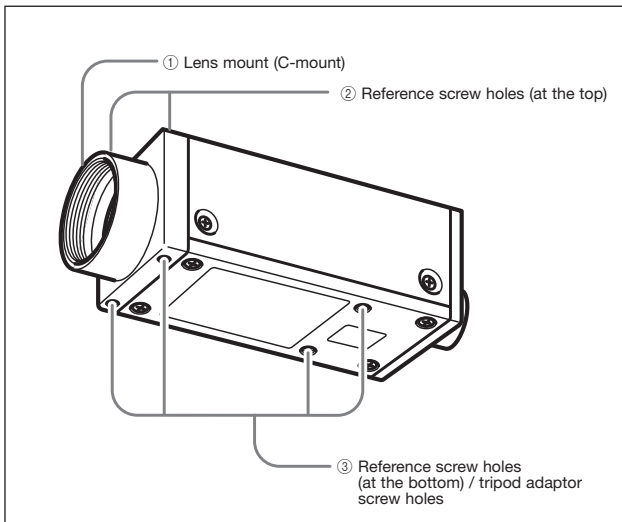
## Spectral Sensitivity Characteristics

### XC-HR90 (Typical Values)





## Location and Function of Parts and Controls

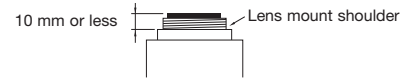


### ① Lens mount (C-mount)

Attach any C-mount lens or optical equipment suitable for high-resolution images (SXGA-compatible).

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Reference screw holes (at the top)

### ③ Reference screw holes/tripod screw holes (at the bottom)

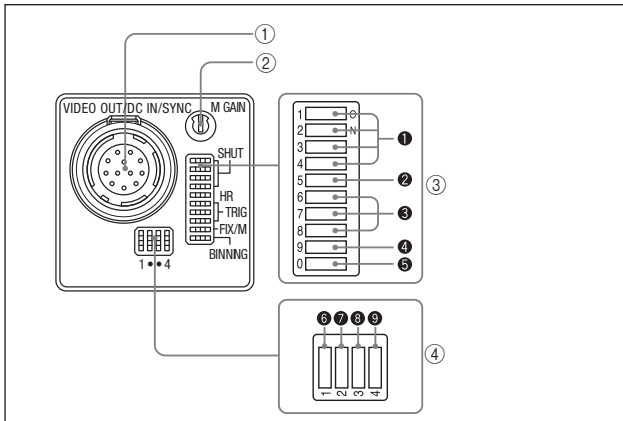
These precision screw holes are for locking the camera module. Using these holes to lock the camera module secures the optical axis alignment.

The reference screw holes can also be used as tripod adaptor screw holes. To install on a tripod, attach the VCT-551 tripod adaptor using these four screw holes.

## Specifications

<b>XC-HR90</b>	
Image size	SXGA
Image device	1/3-type PS IT CCD
Effective picture elements (H × V)	1,296 × 966
Effective lines (H × V)	1,280 × 960
Cell size (H × V)	3.75 μm × 3.75 μm
Lens mount	C-mount
Sync system	Internal/External (Automatically switched according to input signal)
External sync signal input	HD/VD (HD/VD level: 2.5 V to 5 Vp-p, 75 Ω)
Allwable frequency deviation of external synchronization	±1% (in horizontal synchronous frequency)
H Jitter	Less than 20 nsec
Scanning system	Non-interlace Progressive scan
Video output mode	Binning: 2-line combined/Normal: 1-line sequential output
Video output	1.0 Vp-p, sync negative, 75 Ω, unbalanced
Horizontal frequency	30 fps: 29.7 kHz (Normal mode) 26.79 kHz (Binning mode) 15 fps: 14.85 kHz (Normal mode) 14.85 kHz (Binning mode)
Vertical frequency	30 fps: 30 Hz (Normal mode) 54.1 Hz (Binning mode) 15 fps: 15 Hz (Normal mode) 30 Hz (Binning mode)
Horizontal resolution	960 TV lines
Sensitivity	400 lx F5.6 (γ=1, FIX GAIN 0 dB)
Minimum illumination	1 lx (F1.4, γ=1, GAIN 18 dB)
S/N ratio	56 dB (0 dB GAIN)
Gain	Manual (0 dB to 18 dB)/FIX (0 dB) (adjustable on rear panel or via RS-232C)
Gamma	1 (fixed)
White clip	820 mV ±70 mV (F1.8, FIX GAIN 0 dB)
Shutter	Normal shutter, Restart/Reset, External trigger shutter (Mode 1/Mode 2)
Normal shutter speed (sec)	1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000
External trigger shutter speed (sec)	DIP switch settings: 1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000 Trigger pulse width settings: 1/4 to 1/50,000
External trigger	Polarity: +, Width: 2 ms to 250 ms, Input impedance: 10 kΩ or more (H: 2.5 V to 5.0 V, L: 0 V to 0.6 V)
Partial scan	Readout of center 480 lines at 56 fps, Readout of center 240 lines at 95.8 fps (settable using DIP switches) Readout of 60 effective lines selectable from 16 vertical divisions at max. 204.8 fps (settable via RS-232C)
Power requirements	DC 12 V (10.5 V to 15.0 V)
Power consumption	2.8 W
Dimensions (W × H × D)	29 × 29 × 63.5 mm (excluding protrusions)
Mass	Approx. 80 g
Operating temperature	-5°C to +45°C
Storage temperature	-30°C to +60°C
Performance guarantee temperature	0°C to 40°C
Operating humidity	20% to 80% (no condensation)
Storage humidity	20% to 95% (no condensation)
Vibration resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction-x, y, z)
Shock resistance	70 G
MTBF	73,880 hours (Approx. 8.4 years)
Regulatory compliance	UL60065, FCC/ICES-003: Class A, CE: EN61326, AS/NZ: EN61326, VCCI: Class A, KC: KN22/KN24: Class A
Supplied accessories	Lens mount cap (1), Operating instructions (1)

## Rear Panel



### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 230 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

### ① VIDEO OUT/DC IN/SYNC (video output/DC power/sync input signal) connector (12-pin connector)

Connect a CCXC-12P05N camera cable to this connector to obtain power from the +12 V DC power supply and also to enable video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

### ② M Gain (Manual Gain) control knob

If you have selected MANUAL (manual adjustment) with DIP switch 4, this knob adjusts the gain.

### ③ Shutter speed/Mode setting DIP switch

#### ① Shutter speed (bits 1 to 4)

Set an appropriate shutter speed (factory setting: OFF).

#### ② Partial scan mode switch (5)

The factory setting of this switch is partial scan OFF.

#### ③ Restart reset/External trigger shutter mode switch (bits 6 to 8)

By inputting an external restart/reset signal, you can capture the information of single screens at arbitrary timing. By inputting an external trigger signal, you can capture imaging information on fast-moving objects at a precise moment in time. The factory settings for these switches are for normal operation (restart/reset and external trigger shutter OFF).

#### ④ Gain switch (bit 9)

This switch selects FIX (fixed) or MANUAL (manual adjustment) (factory setting: FIX (left side)).

#### ⑤ Binning mode switch (bit 0)

Switches the video signal output mode between binning OFF and binning ON (factory setting: OFF).

#### ④ Mode setting DIP switch

#### ⑥ 75 Ω termination switch

Turn this to OFF (switch down position) when not terminating the external sync signal. The factory setting of this switch is ON (switch up position).

#### ⑦ HD/VD signal input/output switch

Set the switch to the down position (INT) to output HD/VD signals from the camera module, and set it to the up position (EXT) to input HD/VD signals from an external unit. The factory setting for this switch is the up position (EXT).

### Note

Even when the switch is in the up position (EXT), the camera operates in internal synchronization mode unless an external HD signal is input. In this case, however, the camera module will not output internal sync signals.

#### ⑧ 30 fps/15 fps switch

30 fps: switch down position

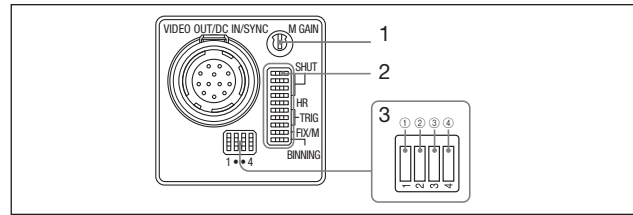
15 fps: switch up position

#### ⑨ RS-232C ON/OFF switch

ON : switch up position

OFF : switch down position

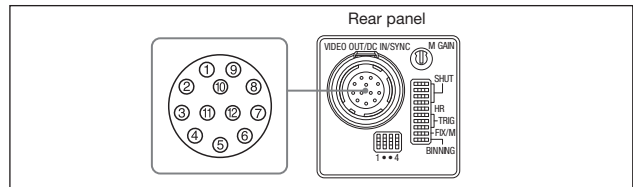
## Factory Mode Settings of Rear Panel



No.	Switch	Factory setting mode
1	M GAIN control knob	- *
2	Shutter speed and mode setting DIP switches	All OFF (left)
Mode setting DIP switches		
①	75 Ω termination switch	ON (switch up position)
②	HD/VD signal input/output switch	HD/VD signal input (switch up position)
③	30 fps/15 fps switch	30 fps (switch down position)
④	RS-232C ON/OFF switch	OFF (switch down position)

\* This unit is shipped from the factory with the gain switch (DIP switch 9) being set to "FIX," so the M GAIN control knob is not operative unless the switch setting is changed. When the gain switch (DIP switch 9) is set to MANUAL, you can rotate this knob to adjust gain over the range 0 to 18 dB.

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output 1 (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output 1 (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	(RS-232C (Rx)) <sup>-1</sup>	(RS-232C (Rx)) <sup>-1</sup>	(RS-232C (Rx)) <sup>-1</sup>	(RS-232C (Rx)) <sup>-1</sup>
9	(RS-232C (Tx)) <sup>-1</sup>	(RS-232C (Tx)) <sup>-1</sup>	(RS-232C (Tx)) <sup>-1</sup>	(RS-232C (Tx)) <sup>-1</sup>
10	-	-	-	WEN output (Signal)
11	-	-	-	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	VD input (Ground) <sup>-2</sup>

<sup>-1</sup> When communicating with RS-232C. <sup>-2</sup> Common ground for pins 7, 10, 11.

## About the Camera Control Method

This camera can be controlled via a host device (such as a personal computer). The table below shows the functions that can be controlled. The camera can be controlled by sending commands that correspond to the control items, with parameters for the desired settings, if necessary, from the host device.

Control function	Description
Operating mode	Normal/Restart reset/Trigger mode 1/Trigger mode 2
Shutter speed	Normal
	30 fps mode: OFF (1/30) sec to 1/1,000,000 sec
	15 fps mode: OFF (1/15) sec to 1/5,000 sec
	Trigger
	Internal setting: OFF (same as above) to 1/100,000 sec
	Setting by trigger pulse width
Gain	0 dB to 18 dB
Binning function	OFF/ON
Partial scan function	OFF/ON: Area settings can be made for 16 zones
HD/VD signal input/output	External sync signal input/Internal sync signal output
75 Ω termination	ON/OFF
Frame rate	30 fps/15 fps

Make sure to supply power to the camera module and confirm that the camera module is operating before inputting an external sync or trigger signal. Inputting an external signal before supplying the power may cause the camera module to malfunction.

Note: When using the external sync in combination with control from a host device (such as a personal computer), make sure the frequency is within the specified range. The camera cannot be controlled when the input is outside the specified frequency range.

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal Shutter	Other modes*
8 <input type="checkbox"/>	8 <input type="checkbox"/>

\* "Other modes" refers to restart/reset mode and external trigger shutter mode.

### • Normal shutter speed settings

#### 30fps

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/20000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/50000	1/100000	1/100	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	

The shutter will be off when the DIP switch is set as below.

OFF	OFF
1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>
OFF	OFF
1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>
OFF	
1 <input type="checkbox"/>	
2 <input type="checkbox"/>	
3 <input type="checkbox"/>	
4 <input type="checkbox"/>	

#### 15fps

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/25000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/50000	1/100		
1 <input type="checkbox"/>	1 <input type="checkbox"/>		
2 <input type="checkbox"/>	2 <input type="checkbox"/>		
3 <input type="checkbox"/>	3 <input type="checkbox"/>		
4 <input type="checkbox"/>	4 <input type="checkbox"/>		

The shutter will be off when the DIP switch is set as below.

OFF	OFF
1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>
OFF	OFF
1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>
OFF	OFF
1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>

(Unit: seconds)

## External Trigger Shutter

Inputting an external trigger pulse enables the camera to capture fast-moving objects clearly with precise timing.

Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

Mode 1	Mode 2
6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>

#### Note

High-rate scan mode cannot be used while in external trigger shutter mode 2.

There are two modes for the timing in which video signals are obtained.

#### • Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- The video signal is synchronized with the external VD signal when an external HD\*/VD signal is input.
- The video signal is synchronized with an internal VD signal when no external HD\*/VD signal is input.

\* External or internal synchronization is selected automatically depending on the presence or absence of external HD input.

#### • Mode 2 (Reset mode)

In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

There are two ways to set the shutter speed.

#### • Using trigger pulse width

Set all DIP switches (1 to 4 on the rear panel) to OFF.

You can obtain an arbitrary shutter speed by setting the trigger pulse width to the range of 2  $\mu$ sec to 250 msec.

Exposure time = Trigger pulse width + 5  $\mu$ sec

Mode 1 (Non-reset mode)

1 <input type="checkbox"/>
2 <input type="checkbox"/>
3 <input type="checkbox"/>
4 <input type="checkbox"/>

Mode 2 (Reset mode)

1 <input type="checkbox"/>
2 <input type="checkbox"/>
3 <input type="checkbox"/>
4 <input type="checkbox"/>

#### Note

An incorrect video signal will be output if you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely.

#### • Using the DIP switches on the rear panel

For shutter speeds, see the following table.

Mode 1 (Non-reset mode)/Mode 2 (Reset mode)

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/25000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/50000	1/100000	1/100	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	

(Unit: seconds)

## Restart/Reset

### To Set Restart/Reset Mode

The information on one screen can be extracted at any time by externally inputting restart/reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure below.

To use restart/reset mode and Partial scan mode simultaneously, set the Partial scan mode switch (5) to ON (right side).

Restart reset

R/R
6 <input type="checkbox"/>
7 <input type="checkbox"/>
8 <input type="checkbox"/>

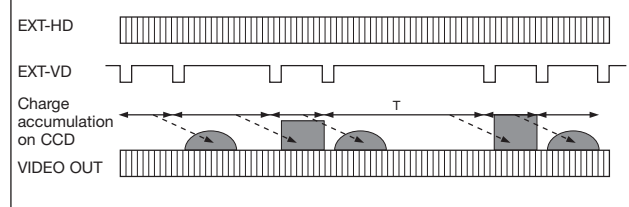
Partial scan

OFF	ON
5 <input type="checkbox"/>	5 <input type="checkbox"/>

## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.

### Example of input timing chart



# XC-HR70



Connection Diagram P72



## Outline

The XC-HR70 is an ultra-compact monochrome camera module ideal for high-resolution image capturing applications. A 1/3 type progressive scan CCD incorporated in the XC-HR70 allows the output of XGA resolution (1024 × 768) images at a rate of 30 frames/sec. In addition, the XC-HR70 has a “high rate scanning” function to enable the output of up to 120 frames/sec. for high-speed image capturing. The compact and light-weight body of the XC-HR70 makes it easy to install in space-restricted areas. With high-speed capturing capability offered in a compact body, the XC-HR70 is the ideal camera module for demanding applications such as the inspection of semiconductor production lines and high-speed assembly lines.

## Features

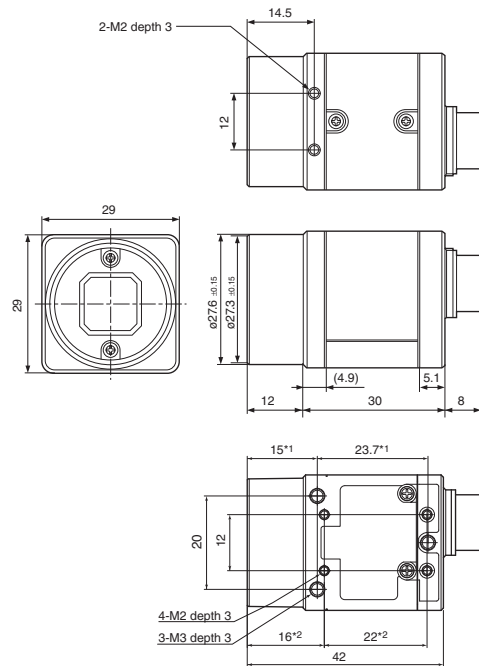
- 1/3-type PS IT CCD with square pixels
  - XGA resolution (1,024 (H) × 768 (V) pixels) image capturing at a speed of 30 fps.
  - Square pixel/Full pixel read-out
- Compact and light weight  
29 (W) x 29 (H) x 30 (D) mm, Approx. 50 g
- Partial scan (at restart/reset ON, Binning OFF)  
Up to 120 fps (Effective line: 152 lines)
- Various mode settings are selectable by changing the setting of a rear panel
- External trigger shutter
  - Restart/Reset
  - Mode 1 (non-reset mode)
  - Mode 2 (Reset mode)
- High Shock and Vibration Resistance
- C-mount

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

Camera body of all XC-HR models



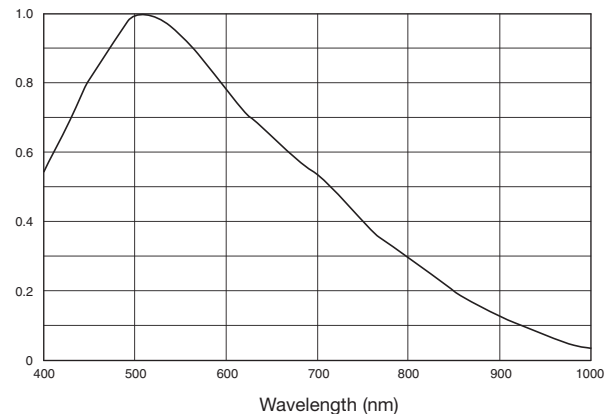
\*1: for 3-M3 screw  
\*2: for 4-M2 screw

Unit: mm

## Spectral Sensitivity Characteristics

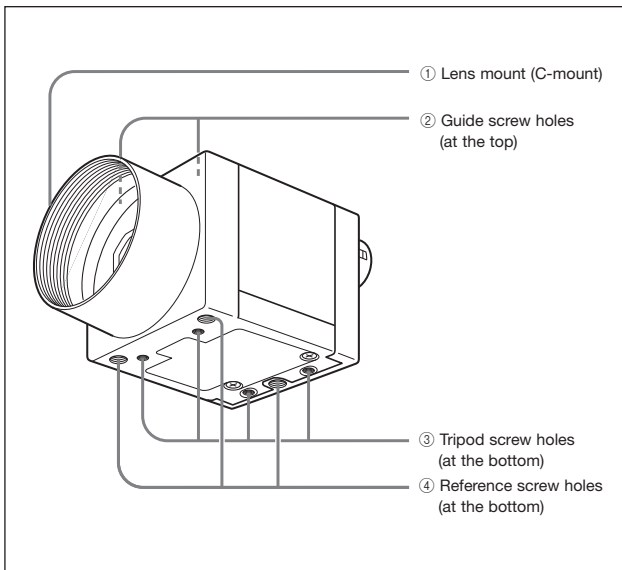
### XC-HR70 (Typical Values)

Relative sensitivity



(Lens characteristics and light source characteristics excluded.)

## Location and Function of Parts and Controls

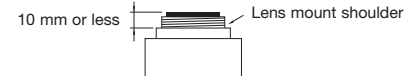


### ① Lens mount (C-mount)

Attach any C-mount lens, suitable for XGA-compatible resolution or other optical equipment.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Guide screw holes (at the top)

These screw holes help to lock the camera module.

### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-333I tripod adaptor using these holes on the bottom of the camera.

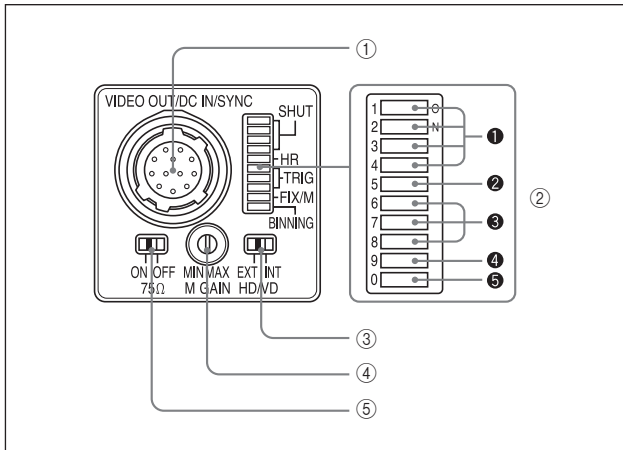
### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

## Specifications

<b>XC-HR70</b>	
Image size	XGA
Image device	1/3-type PS IT CCD
Effective picture elements (H × V)	1,034 × 779
Effective lines (H × V)	1,024 × 768
Cell size (H × V)	4.65 μm × 4.65 μm
Lens mount	C-mount
Sync system	Internal/External (Automatically switched according to input signal)
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p, 75 Ω)
Allwable frequency deviation of external synchronization	±1% (in horizontal synchronous frequency)
H Jitter	Less than 20 nsec
Scanning system	Non-interlace Progressive scan
Video output mode	Binning: 2-line combined output 58.4 fps/Normal: 1-line sequential output 29.2 fps
Video output	1.0 Vp-p, sync negative, 75 Ω, unbalanced
Horizontal frequency	23.23 kHz
Vertical frequency	29.2 Hz (normal mode), 58.4 Hz (binning mode)
Horizontal resolution	800 TV lines
Sensitivity	400 lx F5.6 (γ=1, FIX GAIN (0 dB))
Minimum illumination	1 lx (F1.8, γ=1, GAIN 18 dB)
S/N ratio	56 dB (0 dB GAIN)
Gain	Manual (0 dB to 18 dB)/Fix (0 dB) (adjustable on the rear panel)
Gamma	1 (fixed)
White clip	820 mV ±70 mV (F1.8, FIX GAIN (0 dB))
Shutter	Normal shutter, Restart/Reset, External trigger shutter (Mode 1/Mode 2)
Normal shutter speed (sec)	1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/20,000
External trigger shutter speed (sec)	DIP switch settings: 1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000 Trigger pulse width settings: 1/4 to 1/100,000
External trigger	Polarity: +, Width: 2 μs to 250 ms, Input impedance: 10 kΩ or more (H: 2 V to 5.0 V, L: 0 V to 0.6 V)
Partial scan	R/R mode Binning off: max 120 fps (effective line: 152 lines) Binning on: max 180 fps (effective line: 89 lines)
	External trigger shutter mode (MODE 1) Binning off: max 120 fps (effective line: 153 lines) Binning on: max 180 fps (effective line: 90 lines)
Power requirements	DC 12 V (10.5 V to 15.0 V)
Power consumption	2.0 W
Dimensions (W × H × D)	29 × 29 × 30 mm (excluding protrusions)
Mass	Approx. 50 g
Operating temperature	-5°C to +45°C
Storage temperature	-30°C to +60°C
Performance guarantee temperature	0°C to 40°C
Operating humidity	20% to 80% (no condensation)
Storage humidity	20% to 95% (no condensation)
Vibration resistance	10 G (20 Hz to 200 Hz) 20 minutes for each direction-x, y, z
Shock resistance	70 G
MTBF	88,044 hours (Approx. 10.1 years)
Regulatory compliance	UL6500, FCC/ICES-003: Class A, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A
Supplied accessories	Lens mount cap (1), Operating instructions (1)

## Rear Panel



### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

### ① VIDEO OUT/DC IN/SYNC (video output/DC power/sync input signal) connector (12-pin connector)

Connect a CCXC-12P05N camera cable to this connector to obtain power from the +12 V DC power supply and also to enable video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

### ② Shutter speed/Mode setting DIP switch

#### ① Shutter speed (bits 1 to 4)

Set an appropriate shutter speed (factory setting: OFF).

#### ② Partial scan mode switch (bit 5)

The factory setting of this switch is Partial scan OFF. If you turn this switch ON to use Partial scan mode, you also need to make the external VD pulse rate and width settings.

#### ③ Restart reset/External trigger shutter mode switch (bits 6 to 8)

By inputting an external restart/reset signal, you can capture the information of single screens at arbitrary timing. By inputting an external trigger signal, you can capture imaging information on fast-moving objects at a precise moment in time. The factory settings for these switches are for normal operation (restart/reset and external trigger shutter OFF).

#### ④ Gain switch (bit 9)

This switch selects FIX (fixed) or MANUAL (manual adjustment) (factory setting: FIX (left side)).

#### ⑤ Binning mode switch (bit 0)

Switches the video signal output mode between binning OFF and binning ON (factory setting: OFF).

### ③ HD/VD signal input/output switch

Set the switch to INT to output HD/VD signals from the camera module.

Set the switch to EXT to input HD/VD signals from an external unit (factory setting: EXT).

### Note

Even when the switch is set to EXT, the camera module operates in internal synchronization mode when no external HD signal is input. In this case, however, the camera module will not output internal sync signals.

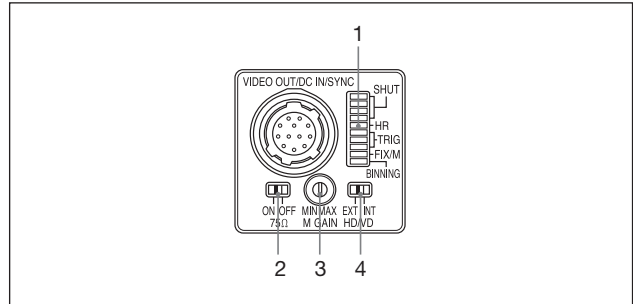
### ④ M Gain (Manual Gain) control knob

If you have selected MANUAL (manual adjustment) with DIP switch 4, this knob adjusts the gain.

### ⑤ 75 Ω termination switch

Turn this to OFF when not terminating the external sync signal (factory setting: ON).

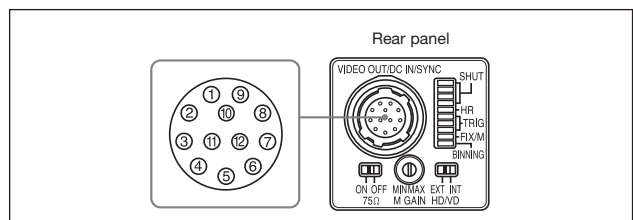
## Factory Mode Settings of Rear Panel



Number	Switch name	Factory mode setting
1	Shutter speed and mode setting DIP switches	All bits are OFF (left).
2	75 Ω termination switch	ON
3	M GAIN control knob	— *
4	HD/VD signal input/output switch	EXT

\* This unit is shipped from the factory with the gain switch (DIP switch 9) being set to "FIX," so the M GAIN control knob is not operative unless the switch setting is changed. When the gain switch (DIP switch 9) is set to MANUAL, you can rotate this knob to adjust gain over the range 0 dB to 18 dB.

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output 1 (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output 1 (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	WEN output (Signal)
11	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	Reset (Ground)*

\* Common ground for pins 7, 10, and 11

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

\* The electronic shutter cannot be used in restart/reset mode. Partial scan can be used in restart/reset mode and in external trigger shutter mode 1.

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal Shutter	Other modes*
8 <input type="checkbox"/>	8 <input type="checkbox"/>

\* "Other modes" refers to restart/reset mode and external trigger shutter mode.

### • Normal shutter speed settings

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/20000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/100			
1 <input type="checkbox"/>			
2 <input type="checkbox"/>			
3 <input type="checkbox"/>			
4 <input type="checkbox"/>			

(Unit: seconds)

## External Trigger Shutter

Inputting an external trigger pulse enables the camera to capture fast-moving objects clearly with precise timing. Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

Mode 1	Mode 2	Partial scannig
6 <input type="checkbox"/>	6 <input type="checkbox"/>	OFF <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	ON <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	5 <input type="checkbox"/>

(Partial mode is compatible with Mode 1 only.)

### Note

- After turning on the camera, since the first external trigger pulse is used for mode setting of the camera, the first frame image is invalid. This is the case for all modes when external trigger shutter is used.
- Partial scan mode cannot be used while in external trigger shutter mode 2.

There are two modes for the timing in which video signals are obtained.

### • Mode 1 (Non-reset mode)

- In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.
  - The video signal is synchronized with the external VD signal when an external HD\*/VD signal is input.
  - The video signal is synchronized with an internal VD signal when no external HD\*/VD signal is input.

\* External or internal synchronization is selected automatically depending on the presence or absence of external HD input.

### • Mode 2 (Reset mode)

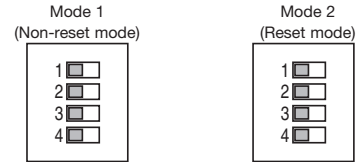
In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

There are two ways to set the shutter speed.

### • Using trigger pulse width

Set all DIP switches (1 to 4 on the rear panel) to OFF. You can obtain an arbitrary shutter speed by setting the trigger pulse width to the range of 2  $\mu$ sec to 250 msec. Exposure time = Trigger pulse width + 5  $\mu$ sec



### Note

An incorrect video signal will be output if you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely.

- Using the DIP switches on the rear panel  
For shutter speeds, see the following table.

Mode 1 (Non-reset mode)/Mode 2 (Reset mode)			
1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/25000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/50000	1/100000	1/100	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	

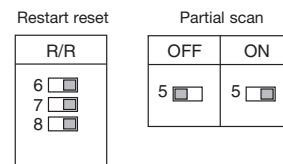
(Unit: seconds)

## Restart/Reset

### To Set Restart/Reset Mode

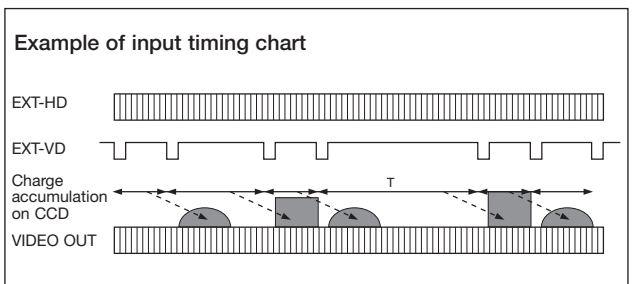
The information on one screen can be extracted at any time by externally inputting restart/reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure below.

To use restart/reset mode and Partial scan mode simultaneously, set the Partial scan mode switch (5) to ON (right side).



## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.



# XC-HR50 XC-HR57

Non-TV Output	Progressive Scan	<sup>*1</sup> 1/3 Type CCD	<sup>*2</sup> 1/2 Type CCD	Square Pixels	C Lens Mount	VS Output
VGA Output	1/60 Sec 1% Non-Interlace	Partial Scan	HD/VD External Sync	Restart/Reset	Long Exposure	Normal Shutter
Mode 1 (Non-Reset Mode) External Trigger Shutter	Mode 2 (Non-Reset Mode) External Trigger Shutter					

\*1 :XC-HR50  
\*2 :XC-HR57

Connection Diagram P72



## Outline

The XC-HR50 and XC-HR57 are monochrome camera modules with full pixel read-out. The XC-HR50 incorporates a 1/3-type double scan CCD, and the XC-HR57 incorporates a 1/2-type double scan CCD. Both cameras have VGA resolution (648 (H) × 494 (V)) output at 60 frames/sec, making them ideal for high-speed image capturing. Relying on high-density mounting technology, these cameras are the same size as other Sony cameras in the XC-HR series and XC-E series, which increases their mechanical compatibility. These compact (29 (W) × 29 (H) × 30 (D) mm) double-speed progressive scan cameras are also lightweight and have a short tact time.

## Features

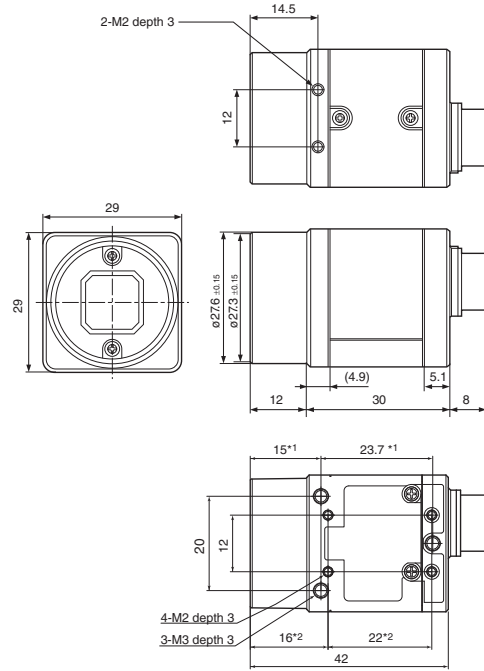
- XC-HR50: 1/3-type PS IT CCD  
XC-HR57: 1/2-type PS IT CCD
  - Double Scan CCD
  - The CCD has square pixels eliminating the need for aspect ratio conversion.
  - VGA resolution (648 (H) × 494 (V) pixels) image capturing at a speed of 60 fps.
- Compact and lightweight  
29 (W) × 29 (H) × 30 (D) mm, Approx. 50 g
- Partial scan (at restart/reset ON, Binning OFF) Up to 240 fps. (Effective line: 102 lines)
- Various mode settings are selectable by changing the setting of a rear panel
- External trigger shutter
  - Restart/Reset
  - Mode 1 (non-reset mode)
  - Mode 2 (Reset mode)
- High Shock and Vibration Resistance
- C-mount

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

Camera body of all XC-HR models



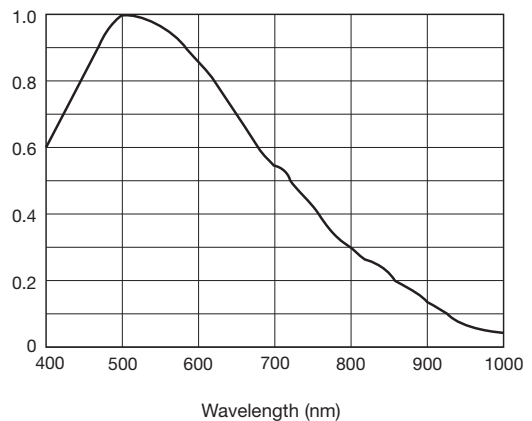
\*1: for 3-M3 screw  
\*2: for 4-M2 screw

Unit: mm

## Spectral Sensitivity Characteristics

### XC-HR50/HR57 (Typical Values)

Relative sensitivity

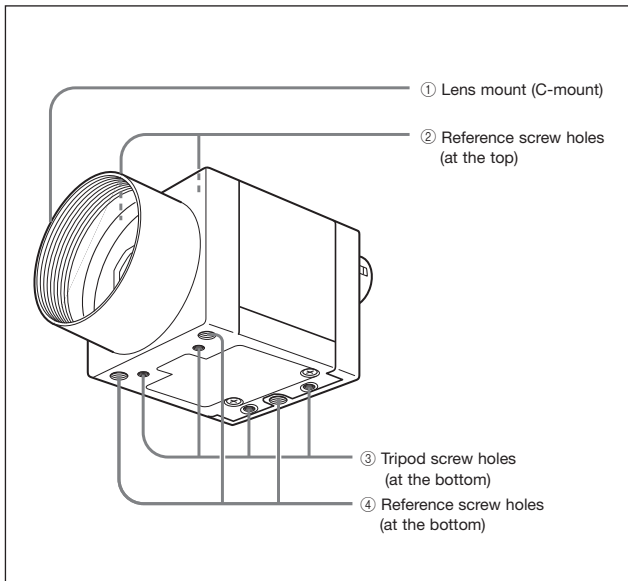


(Lens characteristics and light source characteristics excluded.)

Digital Video Camera XCL XCG XCD XCA  
 Analog Video Camera XC (Non-TV Format) XC (TV Format)  
 Accessories  
 Color Camera Module FCB-HD FCB-SD  
 micro



## Location and Function of Parts and Controls

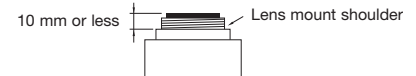


### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Reference screw holes (at the top)

These screw holes help to lock the camera module.

### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-333I tripod adaptor using these holes on the bottom of the camera.

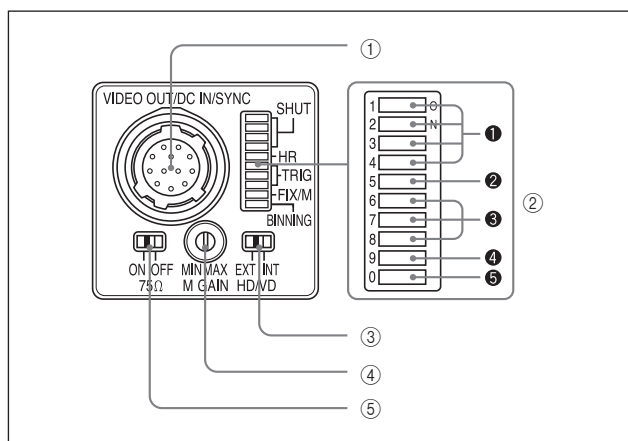
### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

## Specifications

	XC-HR50	XC-HR57
Image size	VGA	
Image device	1/3-type PS IT CCD	1/2-type PS IT CCD
Effective picture elements (H × V)	659 × 494	
Effective lines (H × V)	648 × 494	
Cell size (H × V)	7.4 μm × 7.4 μm	9.9 μm × 9.9 μm
Lens mount	C-mount	
Sync system	Internal/External (Automatically switched according to input signal)	
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p, 75 Ω)	
Allwable frequency deviation of external synchronization	±1% (in horizontal sync frequency)	
H Jitter	Less than 20 nsec	
Scanning system	Non-interlace Progressive scan	
Video output mode	Binning: 2-line combined output 120 fps/Normal: 1-line sequential output 60 fps	
Video output	1.0 Vp-p, sync negative, 75 Ω, unbalanced	
Horizontal frequency	31.468 kHz	
Vertical frequency	59.94 MHz (normal mode), 119.88 Hz (binning mode)	
Horizontal resolution	500 TV lines	
Sensitivity	400 lx F5.6 (γ=1, FIX GAIN (0 dB))	
Minimum illumination	1 lx (F1.4, γ=1, GAIN 18 dB)	
S/N ratio	58 dB (0 dB GAIN)	
Gain	Manual (0 dB to 18 dB)/Fix (0 dB) (adjustable on the rear panel)	
Gamma	1 (fixed)	
White clip	820 mV ±70 mV (F1.4, FIX GAIN (0 dB))	
Shutter	Normal shutter, Restart/Reset, External trigger shutter (Mode 1/Mode 2)	
Normal shutter speed (sec)	1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/15,000, 1/30,000	
External trigger shutter speed (sec)	DIP switch settings: 1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000 Trigger pulse width settings: 1/4 to 1/100,000	
External trigger	Polarity: +, Width: 2 μs to 250 ms, Input impedance: 10 kΩ or more	
Partial scan	R/R mode Binning off: max 240 fps (effective line: 102 lines) Binning on: max 362 fps (effective line: 59 lines)	
	External trigger shutter mode (MODE 1) Binning off: max 240 fps (effective line: 100 lines) Binning on: max 240 fps (effective line: 105 lines)	
Power requirements	DC 12 V (10.5 V to 15.0 V)	
Power consumption	1.8 W	
Dimensions (W × H × D)	29 × 29 × 30 mm (excluding protrusions)	
Mass	Approx. 50 g	
Operating temperature	-5°C to +45°C	
Storage temperature	-30°C to +60°C	
Performance guarantee temperature	0°C to 40°C	
Operating humidity	20% to 80% (no condensation)	
Storage humidity	20% to 95% (no condensation)	
Vibration resistance	10 G (20 Hz to 200 Hz) 20 minutes for each direction-x, y, z	
Shock resistance	70 G	
MTBF	88,044 hours (Approx. 10.1 years)	
Regulatory compliance	UL6500, FCC/ICES-003: Class A, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A	
Supplied accessories	Lens mount cap (1), Operating instructions (1)	

## Rear Panel



### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

### ① VIDEO OUT/DC IN/SYNC (video output/DC power/sync input signal) connector (12-pin connector)

Connect a CCXC-12P05N camera cable to this connector to obtain power from the +12 V DC power supply and also to enable video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

### ② Shutter speed/Mode setting DIP switch

#### ① Shutter speed (bits 1 to 4)

Set an appropriate shutter speed (factory setting: OFF).

#### ② Partial scan mode switch (bit 5)

The factory setting of this switch is Partial scan OFF. If you turn this switch ON to use Partial scan mode, you also need to make the external VD pulse rate and width settings.

#### ③ Restart reset/External trigger shutter mode switch (bits 6 to 8)

By inputting an external restart/reset signal, you can capture the information of single screens at arbitrary timing. By inputting an external trigger signal, you can capture fast-moving objects at precise locations. The factory settings for these switches are for normal operation (restart/reset and external trigger shutter OFF).

#### ④ Gain switch (bit 9)

This switch selects FIX (fixed) or MANUAL (manual adjustment) (factory setting: FIX (left side)).

#### ⑤ Binning mode switch (bit 0)

Switches the video signal output mode between binning OFF and binning ON (factory setting: OFF).

### ③ HD/VD signal input/output switch

Set the switch to INT to output HD/VD signals from the camera module.

Set the switch to EXT to input HD/VD signals from an external unit (factory setting: EXT).

### Note

Even when the switch is set to EXT, the camera module operates in internal synchronization mode when no external HD signal is input. In this case, however, the camera module will not output internal sync signals.

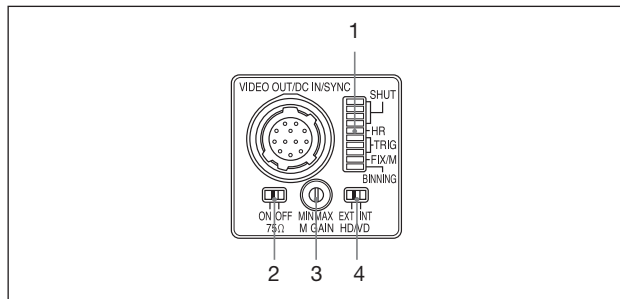
### ④ M Gain (Manual Gain) control knob

If you have selected MANUAL (manual adjustment) with DIP switch 4, this knob adjusts the gain.

### ⑤ 75 Ω termination switch

Turn this to OFF when not terminating the external sync signal (factory setting: ON).

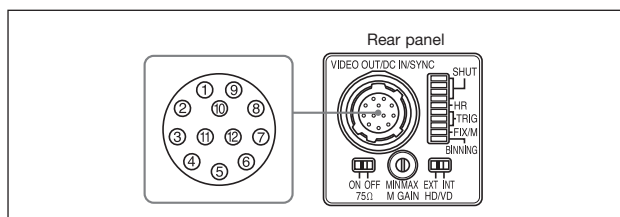
## Factory Mode Settings of Rear Panel



Number	Switch name	Factory mode setting
1	Shutter speed and mode setting DIP switches	All bits are OFF (left).
2	75 Ω termination switch	ON
3	M GAIN control knob	—*
4	HD/VD signal input/output switch	EXT

\* This unit is shipped from the factory with the gain switch (DIP switch 9) being set to "FIX", so the M GAIN control knob is not operative unless the switch setting is changed. When the gain switch (DIP switch 9) is set to MANUAL, you can rotate this knob to adjust gain over the range 0 dB to 18 dB.

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output 1 (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output 1 (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	WEN output (Signal)
11	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	Reset (Ground)*

\* Common ground for pins 7, 10, and 11

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

\* The electronic shutter cannot be used in restart/reset mode. Partial scan can be used in restart/reset mode and in external trigger shutter mode 1.

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal Shutter	Other modes*
8	8

\* "Other modes" refers to restart/reset mode and external trigger shutter mode.

### • Normal shutter speed settings

1/125	1/250	1/500	1/1000
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
1/2000	1/4000	1/10000	1/15000
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
1/30000	1/100		
1 2 3 4	1 2 3 4		

(Unit: seconds)

## External Trigger Shutter

Mode 1	Mode 2
6 7 8	6 7 8

Partial scanning

OFF	ON
5	5

(Partial mode is compatible with Mode 1 only.)

Inputting an external trigger pulse enables the camera to capture first-moving objects clearly.

Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

### Note

- After turning on the camera, since the first external trigger pulse is used for mode setting of the camera, the first frame image is invalid. This is the case for all modes when external trigger shutter is used.
- Partial scan mode cannot be used while in external trigger shutter mode 2.

There are two modes for the timing in which video signals are obtained.

### • Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- The video signal is synchronized with the external VD signal when an external HD\*/VD signal is input.
- The video signal is synchronized with an internal VD signal when no external HD\*/VD signal is input.

\* External or internal synchronization is selected automatically depending on the presence or absence of external HD input.

### • Mode 2 (Reset mode)

In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

There are two ways to set the shutter speed.

### • Using trigger pulse width

Set all DIP switches (1 to 4 on the rear panel) to OFF.

You can obtain an arbitrary shutter speed by setting the trigger pulse width to the range of 2  $\mu$ sec to 250 msec.

Exposure time = Trigger pulse width + 6  $\mu$ sec

Mode 1  
(Non-reset mode)

1
2
3
4

Mode 2  
(Reset mode)

1
2
3
4

### Note

An incorrect video signal will be output if you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely.

### • Using the DIP switches on the rear panel

For shutter speeds, see the following table.

Mode 1 (Non-reset mode)/Mode 2 (Reset mode)

1/125	1/250	1/500	1/1000
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
1/2000	1/4000	1/10000	1/25000
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
1/50000	1/100000	1/100	
1 2 3 4	1 2 3 4	1 2 3 4	

(Unit: seconds)

## Restart/Reset

### To Set Restart/Reset Mode

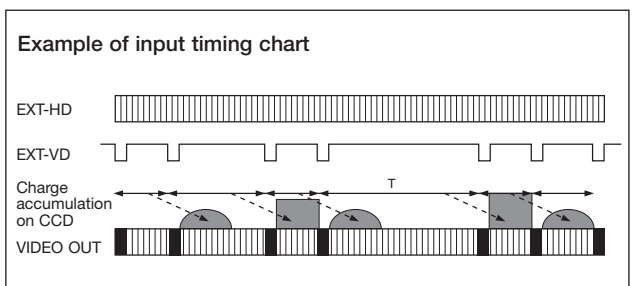
This mode allows you to capture the information on single screens at any time by externally inputting restart/reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure below.

To use restart/reset mode and Partial scan mode simultaneously, set the Partial scan mode switch (5) to ON (right side).

Restart reset	High-rate scan	
R/R	OFF	ON
6 7 8	5	5

## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.



# XC-HR58



Connection Diagram P72



## Outline

The XC-HR58 is a monochrome camera module that incorporates 1/2-type double scan CCD with full pixel readout. With SVGA resolution (767 × 580) output at 50 frames/sec, this camera is ideal for high-speed image capturing. Relying on high-density mounting technology, this camera is the same size as other Sony cameras in the XC-HR series and XC-E series, which increases its mechanical compatibility. This compact (29 (W) × 29 (H) × 30 (D) mm) double-speed progressive scan camera is also lightweight and has a short tact time.

## Features

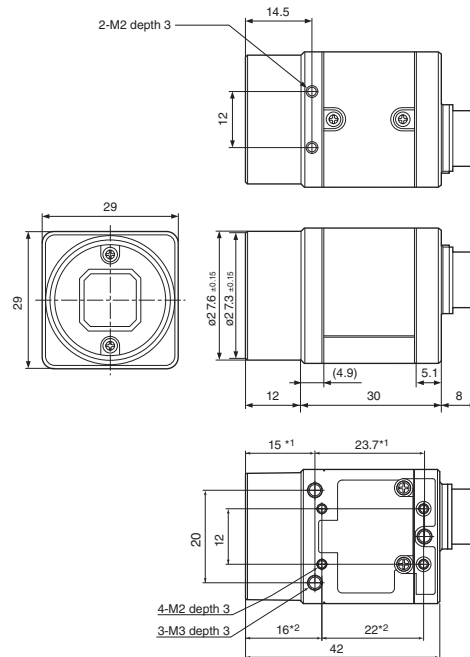
- 1/2-type PS IT CCD
  - Double Scan CCD
  - The CCD has square pixels eliminating the need for aspect ratio conversion.
  - SXGA class resolution (767 (H) × 580 (V) pixels) image capturing at a speed of 50 frames/sec.
- Partial scan (at restart/reset ON, Binning OFF)  
Up to 200 fps. (Effective line: 90 lines)
- Compact and lightweight  
29 (W) × 29 (H) × 30 (D) mm, Approx. 50 g
- External trigger shutter
  - Restart/Reset
  - Mode 1 (non-reset mode)
  - Mode 2 (Reset mode)
- C-mount
- High Shock and Vibration Resistance

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

Camera body of all XC-HR models

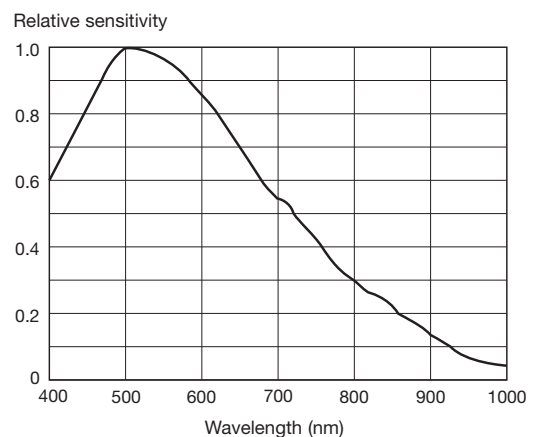


\*1: for 3-M3 screw  
\*2: for 4-M2 screw

Unit: mm

## Spectral Sensitivity Characteristics

- **XC-HR58**  
(Typical Values)



(Lens characteristics and light source characteristics excluded.)

Digital Video Camera  
XCL  
XCG  
XCD

Analog Video Camera  
XC (Non-TV Format)  
XC (TV Format)

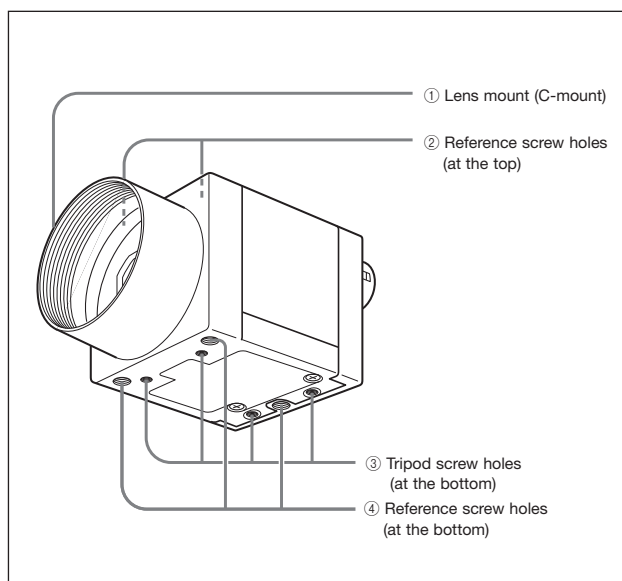
Accessories

micro

Color Camera Module  
FCB-HD

FCB-SD

## Location and Function of Parts and Controls

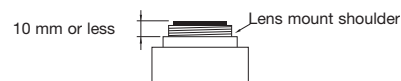


### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Reference screw holes (at the top)

These screw holes help to lock the camera module.

### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-333I tripod adaptor using these holes on the bottom of the camera.

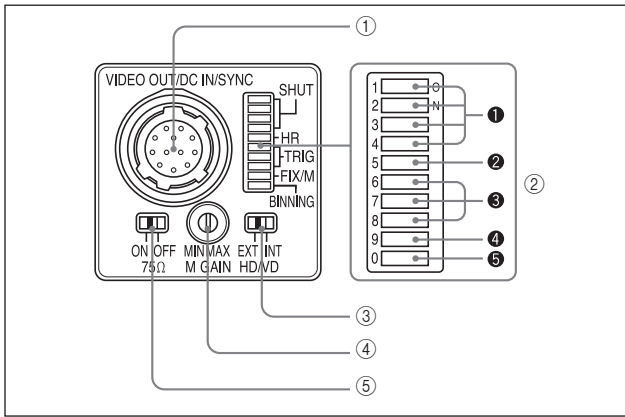
### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

## Specifications

<b>XC-HR58</b>	
Image size	SVGA
Image device	1/2-type PS IT CCD
Effective picture elements (H × V)	782 × 582
Effective lines (H × V)	767 × 580
Cell size (H × V)	8.3 μm × 8.3 μm
Lens mount	C-mount
Sync system	Internal/External (Automatically switched according to input signal)
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p, 75 Ω)
Allwable frequency deviation of external synchronization	±1% (in horizontal sync frequency)
H Jitter	Less than 20 nsec
Scanning system	Non-interlace Progressive scan
Video output mode	Binning: 2-line combined output 100 fps/Normal: 1-line sequential output 50 fps
Video output	1.0 Vp-p, sync negative, 75 Ω, unbalanced
Horizontal frequency	31.250 kHz ±1%
Vertical frequency	50 Hz (normal mode), 100 Hz (binning mode)
Horizontal resolution	600 TV lines
Sensitivity	400 lx F5.6 (γ=1, FIX GAIN (0 dB))
Minimum illumination	1 lx (F1.4, γ=1, GAIN 18 dB)
S/N ratio	56 dB (0 dB GAIN)
Gain	Manual (0 dB to 18 dB)/Fix (0 dB) (adjustable on the rear panel)
Gamma	1 (fixed)
White clip	820 mV ±70 mV (F1.4, FIX GAIN (0 dB))
Shutter	Normal shutter, Restart/Reset, External trigger shutter (Mode 1/Mode 2)
Normal shutter speed (sec)	1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/15,000, 1/30,000
External trigger shutter speed (sec)	DIP switch settings: 1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000 Trigger pulse width settings: 1/4 to 1/100,000
External trigger	Polarity: +, Width: 2 μs to 250 ms, Input impedance: 10 kΩ or more (H: 2 V to 5.0 V, L: 0 V to 0.6 V)
Partial scan	R/R mode Binning off: max 200 fps (effective line: 90 lines) Binning on: max 300 fps (effective line: 52 lines)
	External trigger shutter mode (MODE 1) Binning off: max 200 fps (effective line: 88 lines) Binning on: max 300 fps (effective line: 53 lines)
Power requirements	DC 12 V (10.5 V to 15.0 V)
Power consumption	2.0 W
Dimensions (W × H × D)	29 × 29 × 30 mm (excluding protrusions)
Mass	Approx. 50 g
Operating temperature	-5°C to +45°C
Storage temperature	-30°C to +60°C
Performance guarantee temperature	0°C to 40°C
Operating humidity	20% to 80% (no condensation)
Storage humidity	20% to 95% (no condensation)
Vibration resistance	10 G (20 Hz to 200 Hz) 20 minutes for each direction-x, y, z
Shock resistance	70 G
MTBF	88,044 hours (Approx. 10.1 years)
Regulatory compliance	UL6500, FCC/ICES-003: Class A, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A
Supplied accessories	Lens mount cap (1), Operating instructions (1)

## Rear Panel



### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

### ① VIDEO OUT/DC IN/SYNC (video output/DC power/sync input signal) connector (12-pin connector)

Connect a CCXC-12P05N camera cable to this connector to obtain power from the +12 V DC power supply and also to enable video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

### ② Shutter speed/Mode setting DIP switch

#### ① Shutter speed (bits 1 to 4)

Set an appropriate shutter speed (factory setting: OFF).

#### ② Partial scan mode switch (bit 5)

The factory setting of this switch is Partial scan OFF. If you turn this switch ON to use Partial scan mode, you also need to make the external VD pulse rate and width settings.

#### ③ Restart reset/External trigger shutter mode switch (bits 6 to 8)

By inputting an external restart/reset signal, you can capture the information of single screens at arbitrary timing. By inputting an external trigger signal, you can capture imaging information on fast-moving objects at a precise moment in time. The factory settings for these switches are for normal operation (restart/reset and external trigger shutter OFF).

#### ④ Gain switch (bit 9)

This switch selects FIX (fixed) or MANUAL (manual adjustment) (factory setting: FIX (left side)).

#### ⑤ Binning mode switch (bit 0)

Switches the video signal output mode between binning OFF and binning ON (factory setting: OFF).

### ③ HD/VD signal input/output switch

Set the switch to INT to output HD/VD signals from the camera module.

Set the switch to EXT to input HD/VD signals from an external unit (factory setting: EXT).

### Note

Even when the switch is set to EXT, the camera module operates in internal synchronization mode when no external HD signal is input. In this case, however, the camera module will not output internal sync signals.

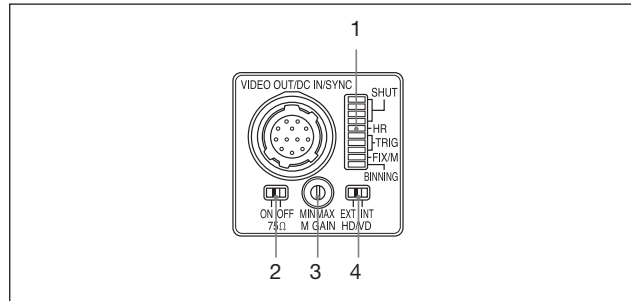
### ④ M Gain (Manual Gain) control knob

If you have selected MANUAL (manual adjustment) with DIP switch 4, this knob adjusts the gain.

### ⑤ 75 Ω termination switch

Turn this to OFF when not terminating the external sync signal (factory setting: ON).

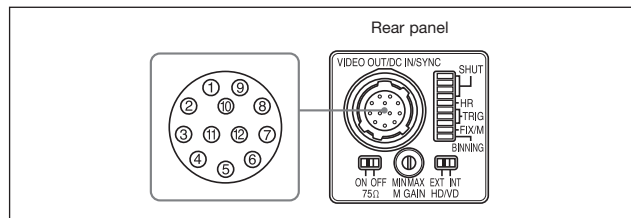
## Factory Mode Settings of Rear Panel



Number	Switch name	Factory mode setting
1	Shutter speed and mode setting DIP switches	All bits are OFF (left).
2	75 Ω termination switch	ON
3	M GAIN control knob	— *
4	HD/VD signal input/output switch	EXT

\* This unit is shipped from the factory with the gain switch (DIP switch 9) being set to "FIX," so the M GAIN control knob is not operative unless the switch setting is changed. When the gain switch (DIP switch 9) is set to MANUAL, you can rotate this knob to adjust gain over the range 0 dB to 18 dB.

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output 1 (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output 1 (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	WEN output (Signal)
11	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	Reset (Ground)*

\* Common ground for pins 7, 10, and 11

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

\* The electronic shutter cannot be used in restart/reset mode. Partial scan can be used in restart/reset mode and in external trigger shutter mode 1.

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal Shutter	Other modes*
8 <input type="checkbox"/>	8 <input type="checkbox"/>

\* "Other modes" refers to restart/reset mode and external trigger shutter mode.

### Normal shutter speed settings

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/15000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/30000	1/100		
1 <input type="checkbox"/>	1 <input type="checkbox"/>		
2 <input type="checkbox"/>	2 <input type="checkbox"/>		
3 <input type="checkbox"/>	3 <input type="checkbox"/>		
4 <input type="checkbox"/>	4 <input type="checkbox"/>		

(Unit: seconds)

## External Trigger Shutter

Inputting an external trigger pulse enables the camera to capture fast-moving objects clearly with precise timing.

Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

Mode 1	Mode 2	Partial scannig
6 <input type="checkbox"/>	6 <input type="checkbox"/>	OFF <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	ON <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	5 <input type="checkbox"/>

(Partial mode is compatible with Mode 1 only.)

### Note

- After turning on the camera, since the first external trigger pulse is used for mode setting of the camera, the first frame image is invalid. This is the case for all modes when external trigger shutter is used.
- Partial scan mode cannot be used while in external trigger shutter mode 2.

There are two modes for the timing in which video signals are obtained.

### Mode 1 (Non-reset mode)

- In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.
  - The video signal is synchronized with the external VD signal when an external HD\*/VD signal is input.
  - The video signal is synchronized with an internal VD signal when no external HD\*/VD signal is input.

\* External or internal synchronization is selected automatically depending on the presence or absence of external HD input.

### Mode 2 (Reset mode)

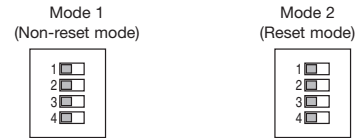
In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

There are two ways to set the shutter speed.

### Using trigger pulse width

- Set all DIP switches (1 to 4 on the rear panel) to OFF. You can obtain an arbitrary shutter speed by setting the trigger pulse width to the range of 2  $\mu$ sec. to 250 msec. Exposure time = Trigger pulse width + 5  $\mu$ sec.



### Note

An incorrect video signal will be output if you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely.

### Using the DIP switches on the rear panel

For shutter speeds, see the following table.

Mode 1 (Non-reset mode)/Mode 2 (Reset mode)

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/25000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
1/50000	1/100000	1/100	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	

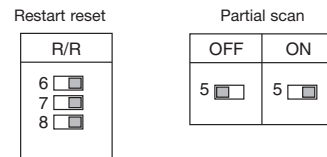
(Unit: seconds)

## Restart/Reset

### To Set Restart/Reset Mode

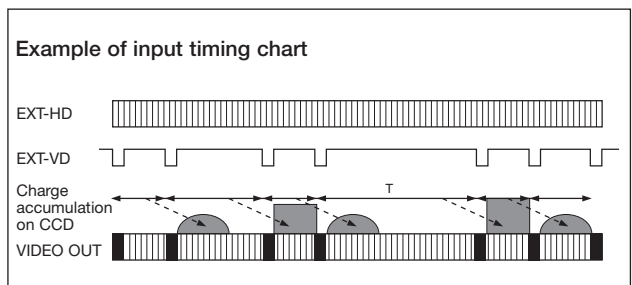
The information on one screen can be extracted at any time by externally inputting restart/reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure below.

To use restart/reset mode and Partial scan mode simultaneously, set the Partial scan mode switch (5) to ON (right side).



## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.



# XC-56

<b>Non-TV Output</b>	<b>Progressive Scan</b>	<b>1/3 Type CCD</b>	<b>Square Pixels</b>	<b>C Lens Mount</b>	<b>VS Output</b>	<b>*VGA Output</b>
<b>1/30 Sec 1/18 Non-interface</b>	<b>Partial Scan</b>	<b>HD/VD External Sync</b>	<b>Restart Reset</b>	<b>Long Exposure</b>	<b>Normal Shutter</b>	<b>Mode 1 (Non-Reset Mode) External Trigger Shutter</b>
<b>Mode 2 (Non-Reset Mode) External Trigger Shutter</b>						

\* When the image input board is connected

Connection Diagram P73



## Outline

The XC-56 is a monochrome camera module that incorporates a 1/3-type progressive scan CCD. The XC-56 has VGA-class resolution (647 (H) × 493 (V)) output at 30 frames/sec. and 60 frames/sec. by the binning function. The body dimensions are 29 (W) × 29 (H) × 30 (D), which are same as those of XC-HR series. The pin assignment is compatible to the current XC-55.

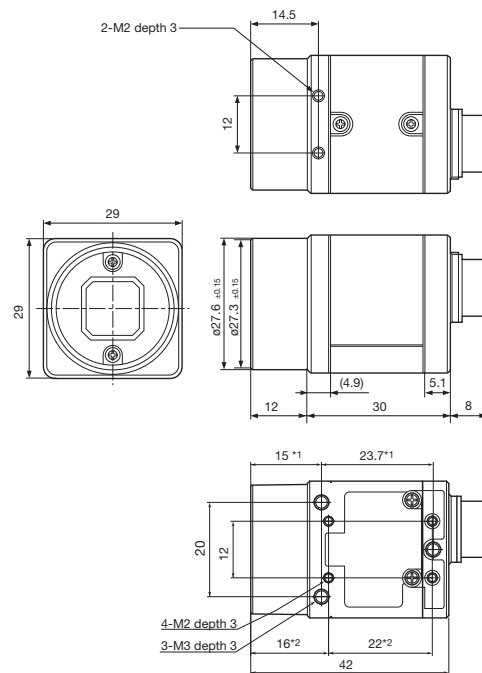
## Features

- 1/3-type PS IT CCD
- Square pixel/Full pixel read-out
- VGA-class resolution image output, 30 fps
- Partial scan
- External trigger shutter
  - Restart/Reset
  - Mode 1 (Non-reset mode)
  - Mode 2 (Reset mode)
- Various mode settings are selectable by changing the setting of a rear panel

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

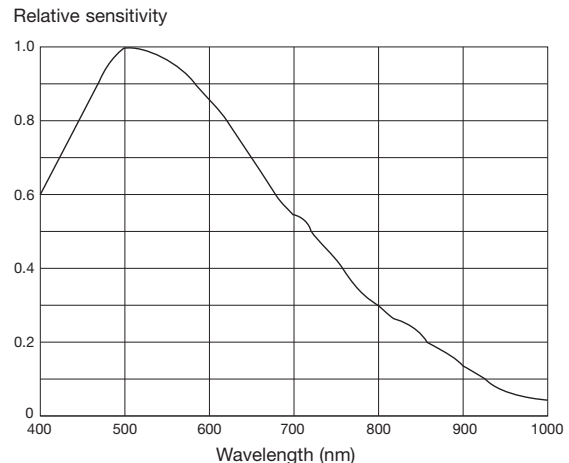


\*1: for 3-M3 screw  
\*2: for 4-M2 screw

Unit: mm

## Spectral Sensitivity Characteristics

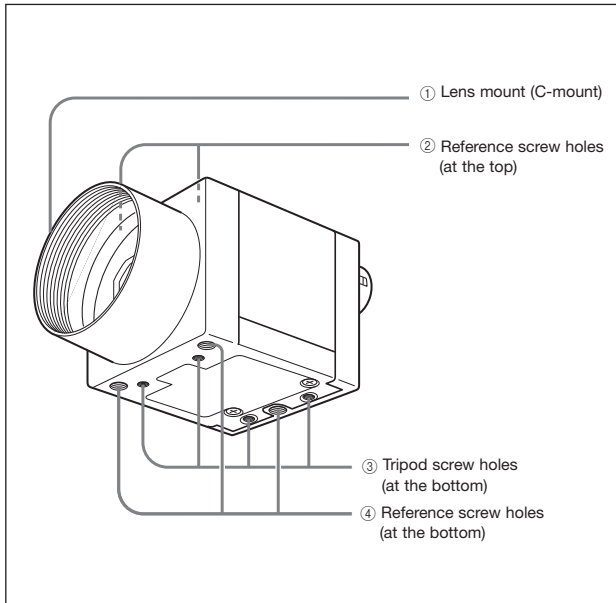
### • XC-HR56



(Lens characteristics and light source characteristics excluded.)



## Location and Function of Parts and Controls

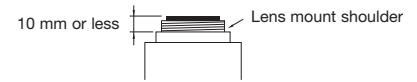


### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Reference screw holes (at the top)

These screw holes help to lock the camera module.

### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-3331 tripod adaptor using these holes on the bottom of the camera.

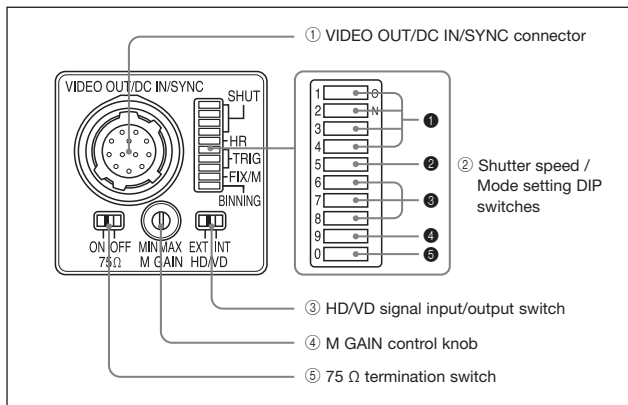
### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

## Specifications

	<b>XC-56</b>
Image size	VGA
Image device	1/3-type PS IT CCD
Effective picture elements (H × V)	659 × 494
Effective lines (H × V)	647 × 493
Cell size (H × V)	7.4 μm × 7.4 μm
Lens mount	C-mount
Flange focal length	17.526 mm
Sync system	Internal/External (automatically switched according to input signal)
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p, 75 Ω)
Allowable frequency deviation of external synchronization	±1% (in horizontal synchronous frequency)
H Jitter	Less than 20 nsec
Scanning system	525 line/236 line (Normal mode/Binning mode)
Video output mode	Normal: 1 line sequential output 29.97 fps/Binning: 2 line sequential output 59.94 fps
Video output	1.0 Vp-p, sync negative, 75 Ω unbalanced
Horizontal frequency	15.734 kHz
Vertical frequency	29.97 Hz (Normal mode) 59.94 Hz (Binning mode)
Horizontal resolution	500 TV lines
Sensitivity	400 lx F8 (γ=1, FIX GAIN 0 dB)
Minimum illumination	0.5 lx (F1.4, γ=1, GAIN 18 dB)
S/N ratio	58 dB (GAIN 0 dB)
Gain	Fixed/Manual (adjustable on the rear panel)
Gamma	1 (fixed)
White clip	820 mV ± 70 mV
Shutter	Normal shutter, Restart/Reset, External trigger shutter (Mode 1/Mode 2)
Normal shutter speed (sec)	1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/8,000, 1/15,000
External trigger shutter (sec)	DIP switch settings: 1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000 Trigger pulse width settings: 1/4 to 1/100,000
External trigger	Polarity: +, Width: 2 μs to 250 ms, Input impedance: 10 kΩ or more (H: 2 V to 5.0 V, L: 0 V to 0.6 V)
Partial scan	R/R mode Binning off: max: 120 fps (Effective line: 102) Binning on: max: 180 fps (Effective line: 59)
	External trigger (mode 1) Binning off: max: 120 fps (Effective line: 102) Binning on: max: 180 fps (Effective line: 59)
Pin assignment	Correspondence to EIAJ compliant 12 PIN connector pin assignment Unavailable (No.8 pin: Trigger input (G), No.9 pin: Trigger input, No.10 pin: GRD, No.11 pin: +12 V) Pins No.10 and 11 are not connected inside the camera
Power requirements	DC 12 V (10.5 V to 15.0 V)
Power consumption	1.5 W
Dimensions (W × H × D)	29 × 29 × 30 mm (excluding protrusions)
Mass	Approx. 50 g
Operating temperature	-5°C to +45°C
Storage temperature	-30°C to +60°C
Performance guarantee temperature	0°C to 40°C
Operating humidity	20% to 80% (no condensation)
Storage humidity	20% to 95% (no condensation)
Vibration resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction-x, y, z)
Shock resistance	70 G
MTBF	88,044 hours (Approx. 10.1 years)
Regulatory compliance	UL6500, FCC/ICES-003: Class A, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A
Supplied accessories	Lens mount cap (1), Operating instructions (1), Lens

## Rear Panel



### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

### ① VIDEO OUT/DC IN/SYNC (video output/DC power/sync input signal) connector (12-pin connector)

Connect a CCXC-12P05N camera cable to this connector to obtain power from the +12 V DC power supply and also to enable video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

### ② Shutter speed/Mode setting DIP switch

#### ① Shutter speed (bits 1 to 4)

Set an appropriate shutter speed (factory setting: OFF).

#### ② Partial scan mode switch (5)

The factory setting of this switch is Partial scan OFF. If you turn this switch ON to use Partial scan mode, you also need to make pulse rate settings.

#### ③ Restart reset/External trigger shutter mode switch (bits 6 to 8)

By inputting an external restart/reset signal, you can capture the information of single screens at arbitrary timing. By inputting an external trigger signal, you can capture fast-moving objects at precise locations. The factory settings for these switches are for normal operation.

#### ④ Gain switch (bit 9)

This switch selects FIX (fixed) or MANUAL (manual adjustment) (factory setting: FIX (left side)).

#### ⑤ Binning mode switch (bit 0)

Switches the video signal output mode between binning OFF and binning ON (factory setting: OFF).

### ③ HD/VD signal input/output switch

Set the switch to INT to output HD/VD signals from the camera module. Set the switch to EXT to input HD/VD signals from an external unit (factory setting: EXT).

### Note

Even when the switch is set to EXT, the camera module operates in internal synchronization mode unless an external HD signal is input. In this case, however, the camera module will not output internal sync signals.

### ④ M GAIN (Manual Gain) control knob

If you have selected MANUAL (manual adjustment) with DIP switch 4, this knob adjusts the gain. The dimensions of the groove on the knob are 0.5 (W) × 1.9 (L) × 0.45 (D) mm.

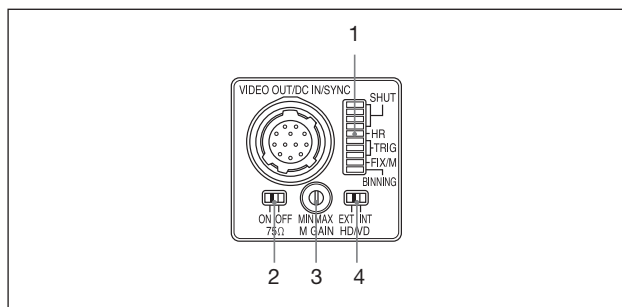
Use a screwdriver that is appropriate for these dimensions.

The knob can be rotated 260 degrees. Do not rotate the knob over the stopper on the limit point.

### ⑤ 75 Ω termination switch

Turn this to OFF when not terminating the external sync signal (factory setting: ON).

## Factory Mode Settings of Rear Panel



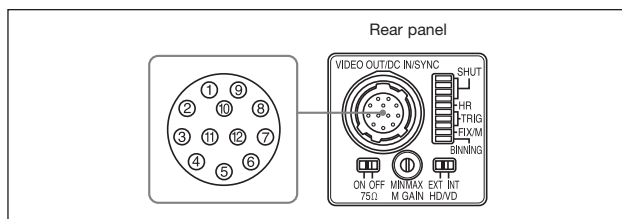
Number	Switch name	Factory mode setting
1	Shutter speed and mode setting DIP switches	All bits are OFF (left).
2	75 Ω termination switch	ON
3	M GAIN control knob	— *
4	HD/VD signal input/output switch	EXT

\* This unit is shipped from the factory with the gain switch (DIP switch 9) being set to "FIX," so the M GAIN control knob is not operative unless the switch setting is changed. When the gain switch (DIP switch 9) is set to MANUAL, you can rotate this knob to adjust gain over the range 0 dB to 18 dB.

### Gain function comparison chart

Model	Gain mode	Factory setting	Regulation gain setting (Standard gain setting)	Factory setting of control knob
XC-55 XC-55BB	A/F/M	F (0 dB)	M (This value has been set using the control knob)	←
XC-56	F/M	F (0 dB)	F (This value was set by the internal circuitry)	MIN (a little lower than F (0 dB))

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	Trigger pulse input (Signal)
10	—	—	—	—
11	—	—	—	—
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	VD input (Ground)*

\* Common ground for pins 7, 10, and 11

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

\*1 The electronic shutter cannot be used in restart/reset mode.

\*2 Partial scan can be used in restart/reset mode and in external trigger shutter mode 1.

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal Shutter	Other modes*
8 <input type="checkbox"/>	8 <input type="checkbox"/>

\* "Other modes" refers to restart/reset mode and external trigger shutter mode.

### • Normal shutter speed settings

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/2000	1/4000	1/8000	1/15000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/100			
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			

(Unit: seconds)

## External Trigger Shutter

Inputting an external trigger pulse enables the camera to capture first-moving objects clearly. Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

Mode 1	Mode 2	Partial scannig
6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/>	6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/>	OFF ON 5 <input type="checkbox"/> 5 <input type="checkbox"/>

(Partial mode is compatible with Mode 1 only.)

### Note

- After turning on the camera, since the first external trigger pulse is used for mode setting of the camera, the first frame image is invalid. This is the case for all modes when external trigger shutter is used.
- Partial scan mode cannot be used while in external trigger shutter mode 2.

There are two modes for the timing in which video signals are obtained.

### • Mode 1 (Non-reset mode)

- In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.
- The video signal is synchronized with the external VD signal when an external HD\*VD signal is input.
  - The video signal is synchronized with an internal VD signal when no external HD\*VD signal is input.

\* External or internal synchronization is selected automatically depending on the presence or absence of external HD input.

### • Mode 2 (Reset mode)

In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

There are two ways to set the shutter speed.

### • Using trigger pulse width

Set all DIP switches (1 to 4 on the rear panel) to OFF. You can obtain an arbitrary shutter speed by setting the trigger pulse width to the range of 2  $\mu$ sec to 250 msec. Exposure time = Trigger pulse width + 8  $\mu$ sec

Mode 1 (Non-reset mode)	Mode 2 (Reset mode)
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>

### Note

An incorrect video signal will be output if you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely.

### • Using the DIP switches on the rear panel

For shutter speeds, see the following table.

Mode 1 (Non-reset mode)/Mode 2 (Reset mode)			
1/125	1/250	1/500	1/1000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/25000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/50000	1/100000	1/100	
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	

(Unit: seconds)

## Restart/Reset

### To Set Restart/Reset Mode

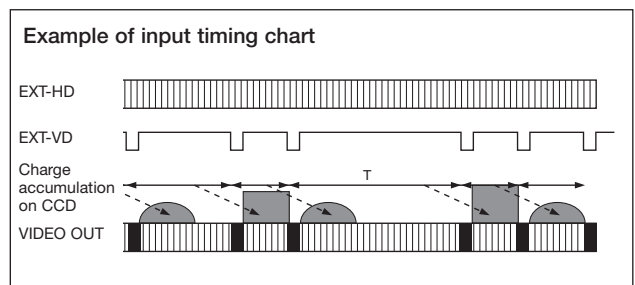
This mode allows you to capture the information on single screens at any time by externally inputting restart/reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure below.

To use restart/reset mode and Partial scan mode simultaneously, set the Partial scan mode switch (5) to ON (right side).

Restart reset	Partial scan
R/R	OFF ON
6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/>	5 <input type="checkbox"/> 5 <input type="checkbox"/>

## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.



# XC-56BB

- Non-TV Output**
- Progressive Scan**
- 1/3 Type CCD**
- Square Pixels**
- NF Lens Mount**
- VS Output**
- VGA Output**
- 1/30 Sec (1M: Non-Interface)**
- Partial Scan**
- HD/VD External Sync**
- Restart Reset**
- Long Exposure**
- Normal Shutter**
- Mode 1 (Non-Reset Mode) External Trigger Shutter**
- Mode 2 (Non-Reset Mode) External Trigger Shutter**
- Remote Head**

\* When the image input board is connected

Connection Diagram P73



## Outline

The XC-56BB is a small-sized head-detachable monochrome camera module that incorporates a 1/3-type progressive scan CCD. The XC-56BB has the same camera function as those of XC-56. The XC-56BB has VGA-class resolution output at 30 fps. The XC-56BB is a compact model succeeding to the XC-55BB with the dimensions of 22 (W) × 22 (H) × 30 (D) for the camera head and 29 (W) × 29 (W) × 67 (D) for the control part.

## Features

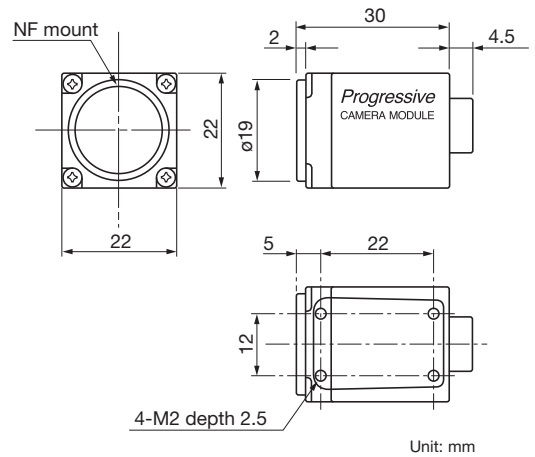
- 1/3-type PS IT CCD
- Square pixel/ Full pixel read-out
- VGA-class resolution image output, 30 fps.
- Partial scan
- External trigger shutter
  - Restart/Reset
  - Mode 1 (Non-reset mode)
  - Mode 2 (Reset mode)
- Cable Length: 2 m
- NF Mount (C Mount changable)

## Accessories

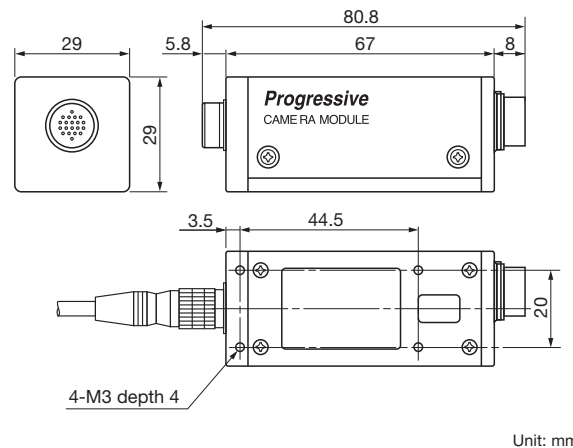
- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P25N (25 m)
- C-mount adaptor
  - LO-999CMT
- Tripod adaptor
  - VCT-333I (for CHU)
  - VCT-551 (for CCU)

## Dimensions

### • CHU

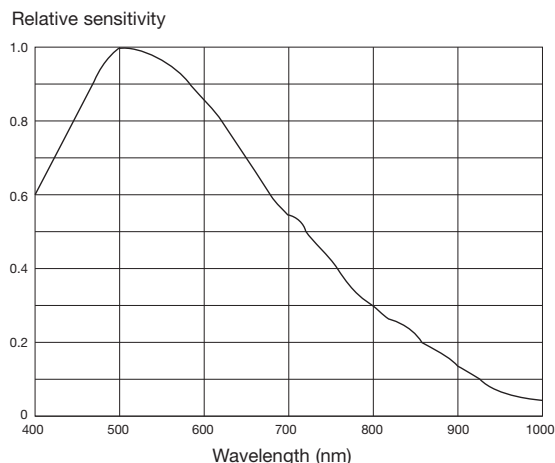


### • CCU



## Spectral Sensitivity Characteristics

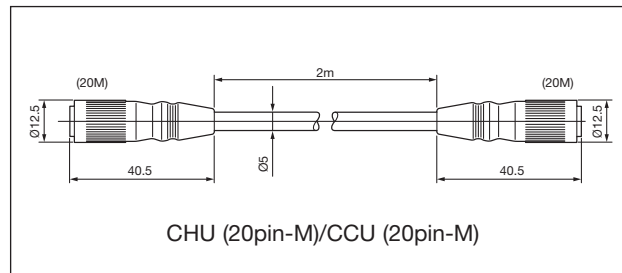
### • XC-56BB



(Lens characteristics and light source characteristics excluded.)

## Supplied Accessories

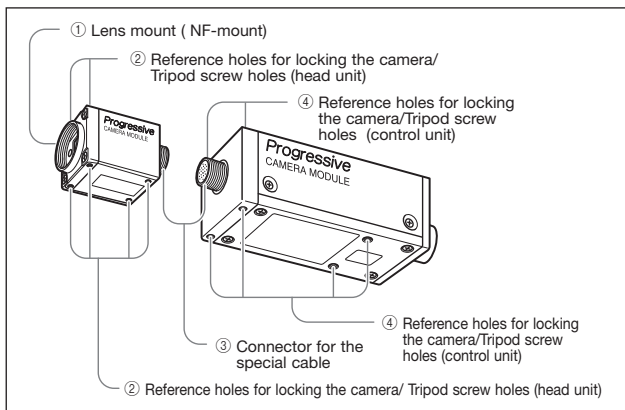
### Dedicated cable CCU and CHU



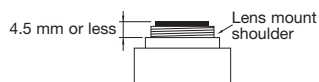
## Specifications

XC-56BB	
Image size	VGA
Image device	1/3-type Progressive Scan IT CCD
Effective picture elements (H × V)	659 × 494
Effective lines (H × V)	647 × 493
Cell size (H × V)	7.4 μm × 7.4 μm
Lens mount	NF-mount
Flange focal length	12.0 mm
Sync system	Internal/External (Automatically switched according to input signal)
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p, 75 Ω)
Allowable frequency deviation of external synchronization	±1% (in horizontal synchronous frequency)
H Jitter	Less than 20 nsec
Scanning system	525 line/263 line (Normal mode/Binning mode)
Video output mode	Normal: 1 line sequential output 29.97 fps/Binning: 2 line sequential output 59.94 fps
Video output	1.0 Vp-p, sync negative, 75 Ω unbalanced
Horizontal frequency	15.734 kHz
Vertical frequency	29.97 Hz (Normal mode)/59.94 Hz (Binning mode)
Horizontal resolution	500 TV lines
Sensitivity	400 lx F8 (γ=1, FIX GAIN (0 dB))
Minimum illumination	0.5 lx (F1.4, γ=1 GAIN 18 dB)
S/N ratio	58 dB
Gain	Fixed/Manual (adjustable on the rear panel)
Gamma	1 (fixed)
White clip	820 mV ± 70 mV
Shutter	Normal shutter, Restart/Reset, External trigger shutter (Mode 1/Mode 2)
Normal shutter speed (sec)	1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/8,000, 1/15,000
External trigger shutter (sec)	DIP switch settings: 1/100, 1/125, 1/250, 1/500, 1/1,000, 1/2,000, 1/4,000, 1/10,000, 1/25,000, 1/50,000, 1/100,000 Trigger pulse width settings: 1/4 to 1/100,000
External trigger	Polarity: +, Width: 2 μs to 250 ms, Input impedance: 10 kΩ or more (H: 2 V to 5.0 V, L: 0 V to 0.6 V)
Partial scan	R/R mode Binning off: max: 120 fps (Effective line: 102) Binning on: max: 180 fps (Effective line: 59)
	External trigger Binning off: max: 120 fps (Effective line: 100) Binning on: max: 120 fps (Effective line: 105)
Pin assignment	Correspondence to EIAJ compliant 12PIN connector pin assignment Unavailable (No.8 pin: Trigger input (G), No.9 pin: Trigger input, No.10 pin: GRD, No.11pin: +12 V) Pins No.10 and 11 are not connected inside the camera
Power requirements	DC 12 V (10.5 V to 15.0 V)
Power consumption	2.2 W
Dimensions (W × H × D)	CHU: 22 × 22 × 30 mm CCU: 29 × 29 × 67 mm (excluding protrusions)
Mass	CHU: Approx. 40 g CCU: Approx. 100 g
Operating temperature	-5°C to +45°C
Storage temperature	-30°C to +6°C
Performance guarantee temperature	0°C to 40°C
Operating humidity	20% to 80% (no condensation)
Storage humidity	20% to 95% (no condensation)
Vibration resistance	10 G (20 Hz to 200 Hz) 20 minutes for each direction - x, y, z
Shock resistance	70 G
MTBF	73,800 hours (Approx. 8.4 years)
Regulatory compliance	UL6500, FCC/ICES-003: Class B, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A
Supplied accessories	Lens mount cap (1), Operating instructions (1), Dedicated cable (1), Ferrite core (1)

## Location and Function of Parts and Controls



### 1 Lens mount (NF-mount)



If you install a C-mount lens on the Camera, you will need the C-mount adaptor LO-999CMT.

#### Note

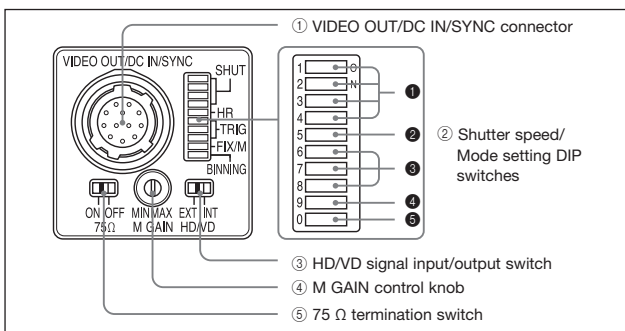
For installing a C-mount lens on the XC56BB

- If you install a C-mount lens on the XC56BB, you will need the C-mount adaptor LO-999CMT (sold separately). Be sure that the lens does not project more than 4.1 mm from the lens mount.
  - For setting the camera when using C-mount adaptor, fix the lens mount (C-mount) instead of fixing the camera head in order to avoid applying unnecessary forces to the camera head.
  - Avoid using C-mount adaptor in the places where vibrations or shocks are applied often. Doing so will damage the equipment or loosen the connection.
- 2 Reference holes for locking the camera/Tripod screw holes (head unit)  
You can attach a tripod to the reference holes (4) on the bottom. You will need a tripod adaptor VCT-333I to install the tripod. There are two more reference holes on the front of the top surface.

#### Note

- The XC-56BB head unit (CHU) must have the same serial number as the control unit (CCU).
  - Do not connect or disconnect the supplied cable while the power is turned on, otherwise the camera may be damaged.
- 3 Connector for the special cable  
Connect the head unit and the control unit with the supplied cable.
- 4 Reference holes for locking the camera/Tripod screw holes (control unit)  
High-precision screw holes for locking the camera onto the lens mounted surface. Locking the camera minimizes optical axis deviation. For details, see the Application Guide. You can attach a tripod to the reference holes on the bottom of the head unit. You will need a tripod adaptor VCT-55I to install the tripod. There are two more reference holes on the front of the top surface.

## Rear Panel



#### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

### 1 VIDEO OUT/DC IN/SYNC (video output/DC power/sync input signal) connector (12-pin connector)

Connect a CCXC-12P05N camera cable to this connector to obtain power from the +12 V DC power supply and also to enable video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

### 2 Shutter speed/Mode setting DIP switch

#### 1 Shutter speed (bits 1-4)

Set an appropriate shutter speed (factory setting: OFF).

#### 2 Partial scan mode switch (bit 5)

The factory setting of this switch is Partial scan OFF. If you turn this switch ON to use high-rate scan mode, you also need to make pulse rate settings.

#### 3 Restart reset/External trigger shutter mode switch (bits 6 to 8)

By inputting an external restart/reset signal, you can capture the information of single screens at arbitrary timing. By inputting an external trigger signal, you can capture fast-moving objects at precise locations. The factory settings for these switches are for normal operation.

#### 4 Gain switch (bit 9)

This switch selects FIX (fixed) or MANUAL (manual adjustment) (factory setting: FIX (left side)).

#### 5 Binning mode switch (bit 0)

Switches the video signal output mode between binning OFF and binning ON (factory setting: OFF).

### 3 HD/VD signal input/output switch

Set the switch to INT to output HD/VD signals from the camera module. Set the switch to EXT to input HD/VD signals from an external unit (factory setting: EXT).

#### Note

Even when the switch is set to EXT, the camera module operates in internal synchronization mode unless an external HD signal is input. In this case, however, the camera module will not output internal sync signals.

### 4 M GAIN (Manual Gain) control knob

If you have selected MANUAL (manual adjustment) with DIP switch 4, this knob adjusts the gain. The dimensions of the groove on the knob are 0.5 (W) × 1.9 (L) × 0.45 (D) mm.

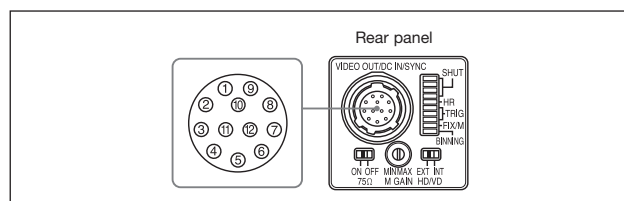
Use a screwdriver that is appropriate for these dimensions.

The knob can be rotated 260 degrees. Do not rotate the knob over the stopper on the limit point.

### 5 75 Ω termination switch

Turn this to OFF when not terminating the external sync signal (factory setting: ON).

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	Trigger pulse input (Signal)
11	—	—	—	—
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	VD input (Ground)*

\* Common ground for pins 7, 10, and 11

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

\*1 The electronic shutter cannot be used in restart/reset mode.

\*2 Partial scan can be used in restart/reset mode and in external trigger shutter mode 1.

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal Shutter	Other modes*
8 <input type="checkbox"/>	8 <input type="checkbox"/>

\* "Other modes" refers to restart/reset mode and external trigger shutter mode.

### Normal shutter speed settings

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/2000	1/4000	1/8000	1/15000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/100			
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>			

(Unit: seconds)

## External Trigger Shutter

Inputting an external trigger pulse enables the camera to capture first-moving objects clearly. Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

Mode 1	Mode 2	Partial scannig
6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/>	6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/>	OFF ON 5 <input type="checkbox"/> 5 <input type="checkbox"/>

(Partial mode is compatible with Mode 1 only.)

### Note

- After turning on the camera, since the first external trigger pulse is used for mode setting of the camera, the first frame image is invalid. This is the case for all modes when external trigger shutter is used.
- High-rate scan mode cannot be used while in external trigger shutter mode 2.

There are two modes for the timing in which video signals are obtained.

### Mode 1 (Non-reset mode)

- In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.
- The video signal is synchronized with the external VD signal when an external HD\*/VD signal is input.
  - The video signal is synchronized with an internal VD signal when no external HD\*/VD signal is input.

\* External or internal synchronization is selected automatically depending on the presence or absence of external HD input.

### Mode 2 (Reset mode)

In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

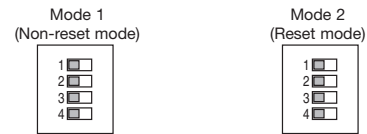
There are two ways to set the shutter speed.

### Using trigger pulse width

Set all DIP switches (1 to 4 on the rear panel) to OFF.

You can obtain an arbitrary shutter speed by setting the trigger pulse width to the range of 2  $\mu$ sec to 250 msec.

Exposure time = Trigger pulse width + 8  $\mu$ sec



### Note

An incorrect video signal will be output if you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely.

### Using the DIP switches on the rear panel

For shutter speeds, see the following table.

Mode 1 (Non-reset mode)/Mode 2 (Reset mode)

1/125	1/250	1/500	1/1000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/2000	1/4000	1/10000	1/25000
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
1/50000	1/100000	1/100	
1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	

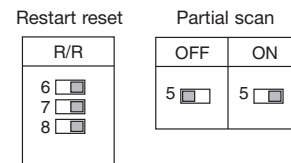
(Unit: seconds)

## Restart/Reset

### To Set Restart/Reset Mode

This mode allows you to capture the information on single screens at any time by externally inputting restart/reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure below.

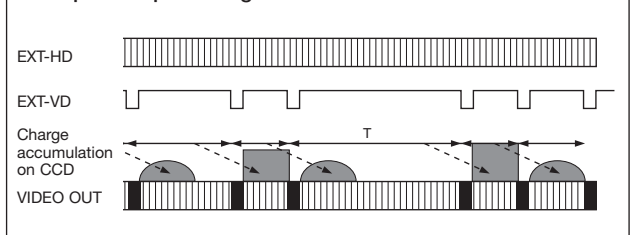
To use restart/reset mode and Partial scan mode simultaneously, set the Partial scan mode switch (5) to ON (right side).



## Long Exposure

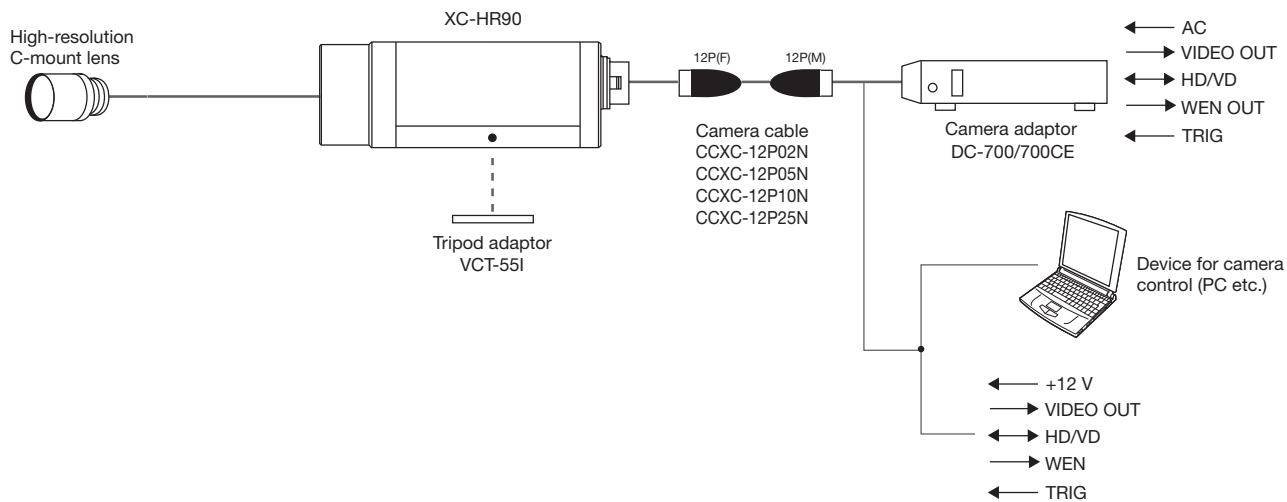
The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.

### Example of input timing chart

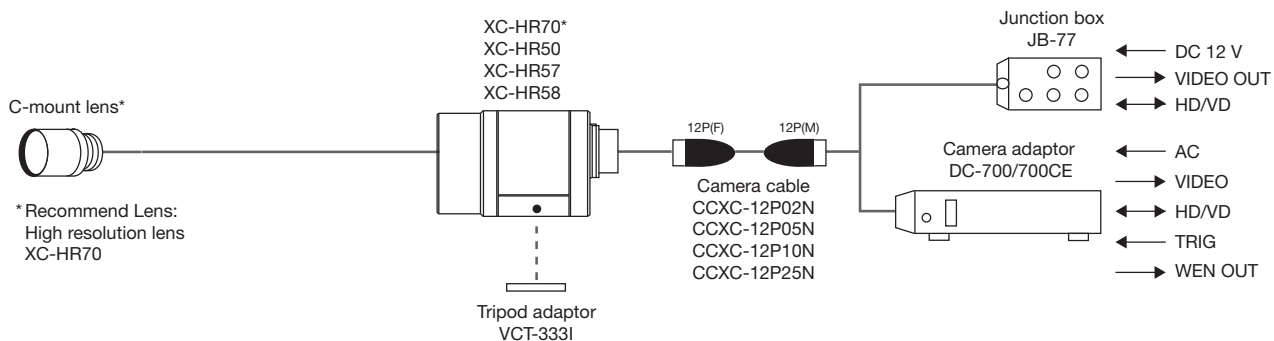


# Connection Diagram

## XC-HR90



## XC-HR70/XC-HR50/XC-HR57/XC-HR58



\* Recommend Lens:  
High resolution lens  
XC-HR70

○ : Usable    × : Not usable

XC-HR series (XC-HR70/HR50/HR57/HR58)	JB-77
Normal	○
Normal shutter	○
Restart/reset (R/R)	○
External trigger shutter	×
WEN OUT	×

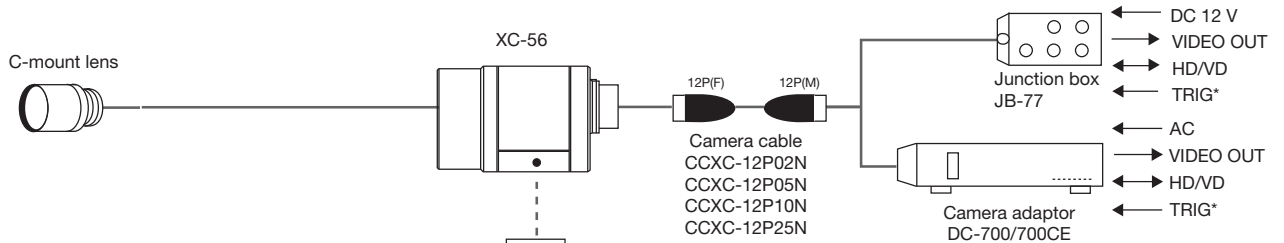
### Note

When using the JB-77, not all of the XC-HR series functions can be used. See the table this page.



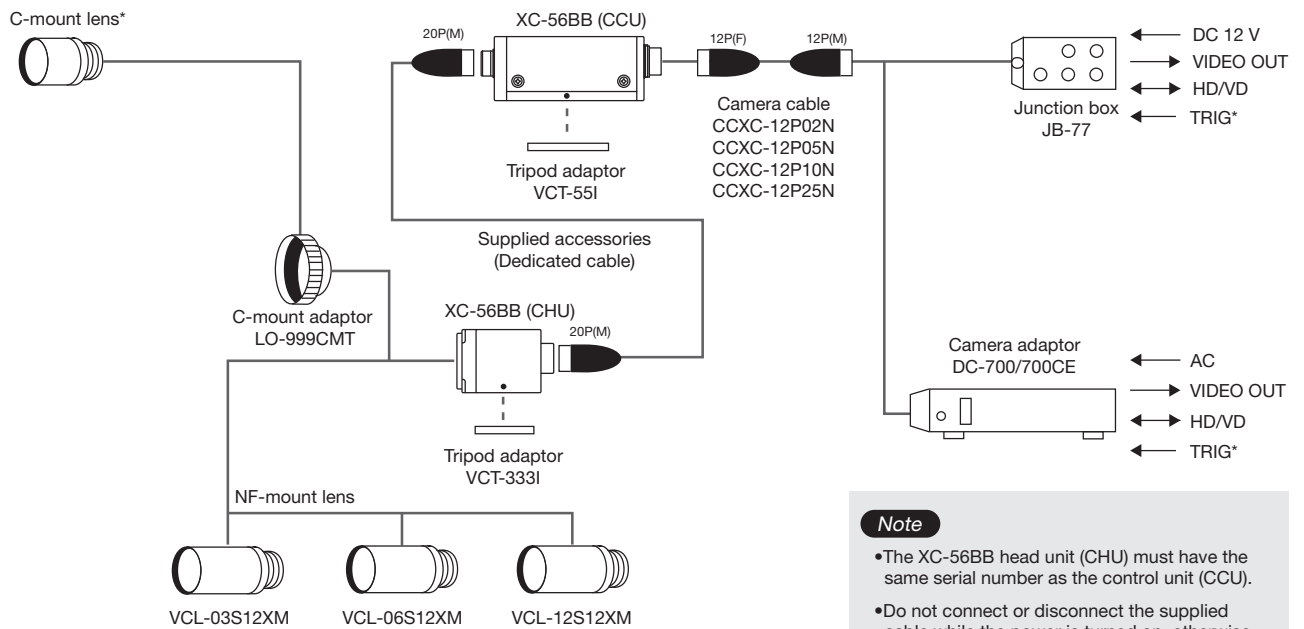
# Connection Diagram

## XC-56



To operate the camera by inputting a trigger signal,  
 \* Use Junction box JB-77 and commercial stabilized power supply, and input a trigger signal to CLOCK OUT connector of JB-77.  
 \* Input a trigger signal to Video connector 2 of Camera adaptor DC-700/700CE

## XC-56BB



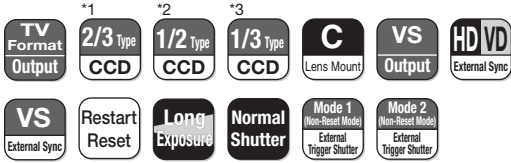
### Note

- The XC-56BB head unit (CHU) must have the same serial number as the control unit (CCU).
- Do not connect or disconnect the supplied cable while the power is turned on, otherwise the camera may be damaged.

\* To use the C-mount lens, attach the C-mount adaptor and connect to the camera.

To operate the camera by inputting a trigger signal,  
 \* Use Junction box JB-77 and commercial stabilized power supply, and input a trigger signal to CLOCK OUT connector of JB-77.  
 \* Input a trigger signal to Video connector 2 of Camera adaptor DC-700/700CE

# XC-ST70/ST70CE XC-ST50/ST50CE XC-ST51/ST51CE XC-ST30/ST30CE



\*1 : XC-ST70/ST70CE  
\*2 : XC-ST50/ST50CE/ST51/ST51CE  
\*3 : XC-ST30/ST30CE

Connection Diagram **P96**



## Outline

The XC-ST Series cameras incorporate the latest CCD and signal processing technologies into a compact black and white camera module. A new external trigger design allows the electronic shutter speed to be freely specified by the width of an external trigger pulse or by a switch setting on the rear panel of the camera. These cameras are also user-friendly, with all switch settings located on the rear panel. Moreover, the XC-ST Series have the exact same dimensions, simplifying space requirements and making it easy to interchange them if necessary. These features, along with high picture quality and high shock and vibration tolerance make the XC-ST Series cameras ideal for demanding machine vision applications.

## Features

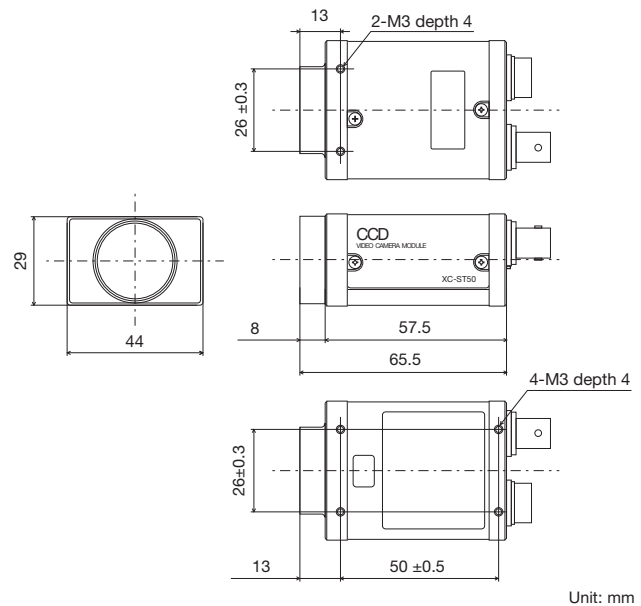
- XC-ST70/ST70CE: 2/3-type IT CCD
- XC-ST50/ST50CE: 1/2-type IT CCD
- XC-ST51/ST51CE: 1/2-type IT CCD (High sensitivity CCD)
- XC-ST30/ST30CE: 1/3-type IT CCD
- Dimensions: 44 (W) × 29 (H) × 57.5 (D) mm, Mass: Approx. 110 g
- High S/N ratio : 60 dB (XC-ST70/ST50/ST51) : 56 dB (XC-ST30)
- Electronic shutter  
XC-ST70/ST50/ST51/ST30: 1/100 sec to 1/10,000 sec  
XC-ST70CE/ST50CE/ST51CE/ST30CE: 1/120 sec to 1/8,000 sec
- External trigger shutter  
XC-ST70/ST50/ST51/ST30: 1/4 sec to 1/10,000 sec  
XC-ST70CE/ST50CE/ST51CE/ST30CE: 1/4 sec to 1/8,000 sec
- 2:1 Interlaced/Non-Interlaced (during external sync input)
- Frame/Field exposure
- Restart/Reset
- Sync system: Internal/External (HD/VD, VS)
- High Shock and Vibration Resistance

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-ST70I

## Dimensions

Camera body of all XC-ST models

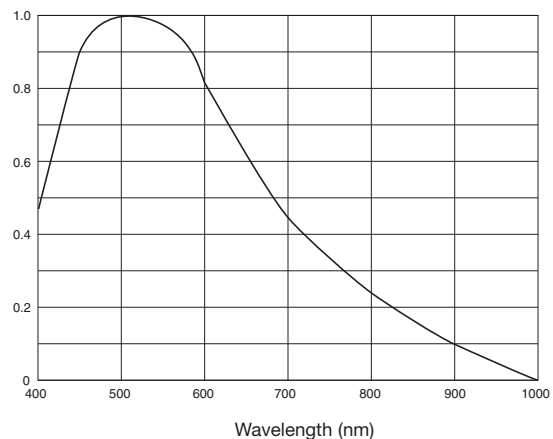


Unit: mm

## Spectral Sensitivity Characteristics

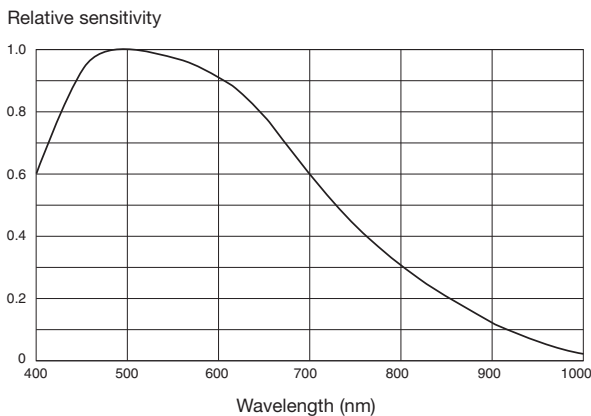
### • XC-ST70 (Typical Values)

Relative sensitivity



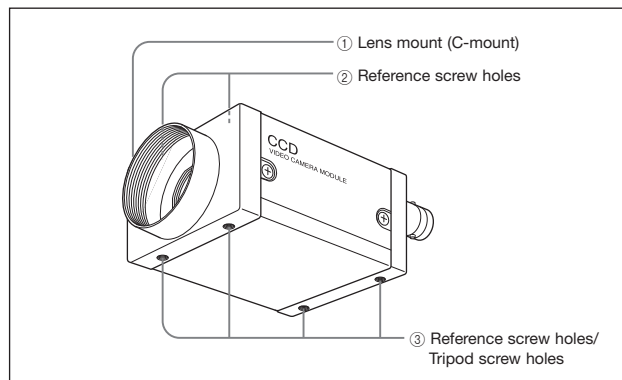
(Lens characteristics and light source characteristics excluded.)

• **XC-ST50/XC-ST51/XC-ST30**  
(Typical Values)



(Lens characteristics and light source characteristics excluded.)

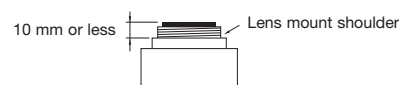
**Location and Function of Parts and Controls**



- ① **Lens mount (C-mount)**  
Attach any C-mount lens or other optical equipment.

**Note**

The lens must not project more than 10 mm from the lens mount.

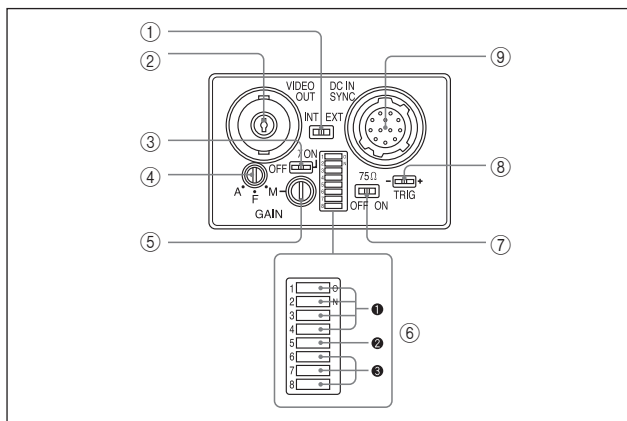


- ② **Reference holes (at the top)**  
These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.
- ③ **Reference screw holes/Tripod screw holes (at the bottom)**  
These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.  
You can install the camera on a tripod. To install on a tripod, you will need to install the VCT-ST70I tripod adaptor using the reference holes on the bottom of the camera.

**Specifications**

	XC-ST70	XC-ST50	XC-ST51	XC-ST30	XC-ST70CE	XC-ST50CE	XC-ST51CE	XC-ST30CE
Image device	2/3-type IT CCD	1/2-type IT CCD		1/3-type IT CCD	2/3-type IT CCD	1/2-type IT CCD		1/3-type IT CCD
Signal system	EIA				CCIR			
Effective picture elements (H × V)	768 × 494				752 × 582			
Effective lines (H × V)	752 × 485				736 × 575			
Cell size (H × V)	11.6 μm × 13.5 μm	8.4 μm × 9.8 μm		6.35 μm × 7.4 μm	11.6 μm × 11.2 μm	8.6 μm × 8.3 μm		6.5 μm × 6.25 μm
Horizontal frequency	15.734 kHz				15.625 kHz			
Vertical frequency	59.94 Hz				50 Hz			
Lens mount	C-mount							
Sync system	Internal/External (Automatically switched according to input signal)							
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p), VS							
External Sync frequency	±1% (in horizontal sync frequency)							
H Jitter	less than ± 20 nsec (external horizontal frequency)							
Scanning system	525 lines: 2:1 Interlaced (Automatic switching according to input signal)				625 lines: 2:1 Interlaced (Automatic switching according to input signal)			
Video output	1.0 Vp-p, negative, 75 Ω unbalanced							
Horizontal resolution	525 TV lines				625 TV lines			
Sensitivity	400 lx, F8 (γ= ON, 0 dB)	400 lx, F11 (γ= ON, 0 dB)		400 lx, F5.6 (γ= ON, 0 dB)	400 lx, F8 (γ= ON, 0 dB)	400 lx, F11 (γ= ON, 0 dB)		400 lx, F5.6 (γ= ON, 0 dB)
Minimum illumination	0.3 lx (F1.4, AGC ON)	0.2 lx (F1.4, AGC ON)		0.3 lx (F1.4, AGC ON)	0.3 lx (F1.4, AGC ON)	0.2 lx (F1.4, AGC ON)		0.3 lx (F1.4, AGC ON)
S/N ratio	60 dB				56 dB		58 dB	
Gain	AGC/Fixed/Manual (adjustable on the rear panel)							
Gamma	ON/OFF (adjustable on the rear panel)							
Normal shutter	1/100 sec to 1/10,000 sec				1/120 sec to 1/8,000 sec			
External trigger shutter	1/4 sec to 1/10,000 sec				1/4 sec to 1/8,000 sec			
Power requirements	DC 12 V (10.5 V to 15 V)							
Power consumption	2.1 W	2.0 W		1.9 W	2.1 W	2.0 W		1.9 W
Dimensions (W × H × D)	44 × 29 × 57.5 mm (excluding protrusions)							
Mass	Approx. 105 g		Approx. 110 g		Approx. 105 g		Approx. 110 g	
Operating temperature	-5°C to +45°C							
Storage temperature	-30°C to +60°C							
Performance guarantee temperature	0°C to 40°C							
Operating humidity	20% to 80% (no condensation)							
Storage humidity	20% to 95% (no condensation)							
Vibration resistance	10 G (20 Hz to 200 Hz				20 minutes for each direction-x, y, z)			
Shock resistance	70 G							
MTBF	70,600 hours (Approx. 8.1 years)							
Regulatory compliance	UL6500, FCC/ICES-003: Class B, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A							
Supplied accessories	Lens mount cap (1), Operating instructions (1)							

## Rear Panel



- ① HD/VD signal input/output switch**  
 Set the switch to INT to output HD/VD signals from the camera module. Set the switch to EXT to input HD/VD signals from an external unit. (Factory setting: EXT)
- ② VIDEO OUT (Video signal output) connector (BNC)**  
 You can use this connector for video signal output from the camera module.
- ③  $\gamma$  compensation ON/OFF switch**  
 Turn on this switch for g compensation. (Factory setting: OFF)
- ④ GAIN switch**  
 This switch selects AGC (A), fixed gain (F), or manual gain control (M). (Factory setting: F)
- ⑤ Manual gain control**  
 Adjust the gain using this control. GAIN switch 4 must have been set to M (Manual).
- ⑥ Shutter speed/Mode setting DIP switch**
  - ① Shutter speed (bits 1 to 4)**  
 Set an appropriate shutter speed. (Factory setting: Shutter off)
  - ② High-rate scan mode switch (bit 5)**  
 Factory setting: FRAME
  - ③ Restart reset/External trigger shutter mode switch (bits 6 to 8)**  
 Factory setting: Normal

### Note

- Do not use any other settings for Restart reset/External trigger shutter mode except those shown on the next page. Using other settings may cause the camera to malfunction.
- If you set the External trigger shutter mode, set 0 in bits 1 to 4.

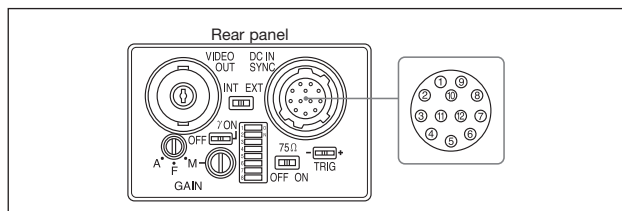
- ⑦ 75  $\Omega$  termination switch**  
 Turn off if you do not terminate. (Factory setting: ON)
- ⑧ TRIG polarity switch**  
 Select + or - according to the trigger pulse input from an external unit. (Factory setting: +)
- ⑨ DC IN/SYNC (DC power input/sync signal I/O) connector (12-pin)**  
 Connect a CCXC-12P05N camera cable to this connector the +12 V DC power supply and the video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals.

## Factory Mode Settings of Rear Panel

No.	Switch	Factory setting mode
①	HD/VD signal input/output switch	EXT
③	Gamma compensation ON/OFF switch	OFF
④	GAIN switch	F
⑤	Manual gain control	- 1)
⑥	Shutter speed/Mode setting DIP switches	Shutter speed (bits 1 - 4)
		Potential accumulation mode (bit 5)
		Restart reset/External trigger shutter mode switch (bits 6 - 8)
⑦	75 $\Omega$ termination switch	ON
⑧	TRIG polarity switch	+

1) This unit is shipped from the factory with the GAIN switch being set to F (fix), so the Manual gain control knob is not operative unless the switch setting is changed. When the GAIN switch is set to M (manual), you can rotate this knob to adjust gain over the range 0 to 18 dB.

## Connector Pin Assignments



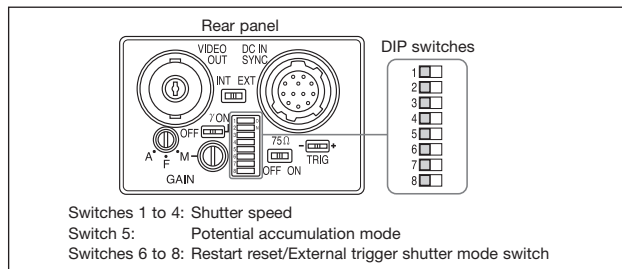
Pin No.	Camera sync output	External mode (VS)	External mode (VS)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output (Ground)	Video output (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output (Signal)	Video output (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	—	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	—	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	VS input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—	—
9	—	—	—	—	—
10	—	—	—	—	WEN output (Signal)
11	—	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	VS input (Ground)	Reset (Ground)	Reset (Ground)*

\* Common ground for pins 7, 10, and 11

## About the Electronic Shutter

There are two shutter types: normal shutter and external trigger shutter. Select them with the DIP switches on the rear panel.

### DIP Switches on the Rear Panel



Switches 1 to 4: Shutter speed  
 Switch 5: Potential accumulation mode  
 Switches 6 to 8: Restart reset/External trigger shutter mode switch

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

Normal shutter speed settings

Shutter OFF	1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
1/2000	1/4000	1/10000	Flickerless* 1/100 (EIA) 1/120 (CCIR)	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	

(Unit: second)

\* If you set the mode to flickerless, the positions of DIP switches 1 to 3 are optional.

### Note

The DIP switch 5 position is optional. (The field setting is recommended.) The field setting can obtain a sensitivity that is twice that of the frame setting.

## External Trigger Shutter

Inputting an external trigger pulse enables the camera to capture fast-moving objects clearly with precise timing.

Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2. When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

There are two modes for the timing in which video signals are obtained.

### • Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- The video signal is synchronized with the external VD signal when an external HD/VD signal is input.
- The video signal is synchronized with an internal VD signal when no external HD/VD signal is input.

### • Mode 2 (Reset mode)

In this mode, an internal VD is reset, then a video signal is output a certain period of time after trigger pulse input.

## To Set the External Trigger Shutter

There are two ways to set the shutter speed.

### • Using the DIP switches on the rear panel

For shutter speeds, see the following table.

Mode 1 (Non-reset mode)				Mode 2 (Reset mode)			
*1/100 (EIA) 1/120 (CCIR)	1/125	1/250	1/500	*1/100 (EIA) 1/120 (CCIR)	1/125	1/250	1/500
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
1/1000	1/2000	1/4000	**1/10000 (EIA) 1/8000 (CCIR)	1/1000	1/2000	1/4000	**1/10000 (EIA) 1/8000 (CCIR)
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>

(Unit: second)

(Unit: second)

\* The external trigger shutter speed is set to 1/100 sec for XC-ST70/ST50/ST30 (EIA) and 1/120 sec for XC-ST70CE/ST50CE/ST51CE/ST30CE (CCIR).

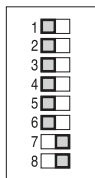
\*\* The external trigger shutter speed is set to 1/10,000 sec for XC-ST70/ST50/ST51/ST30 (EIA) and 1/8,000 sec for XC-ST70CE/ST50CE/ST51CE/ST30CE (CCIR).

### • Using trigger pulse width

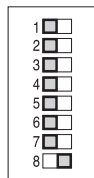
Set all DIP switches (1 to 4 on the rear panel) to 0.

You can obtain an arbitrary shutter speed\* by setting the trigger pulse width within the range of 2  $\mu$ s to 250 ms.

Mode 1 (Non-reset mode)



Mode 2 (Reset mode)



Exposure time = Trigger pulse width + 97  $\mu$ s (EIA)  
Trigger pulse width + 120  $\mu$ s (CCIR)

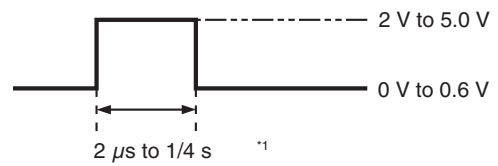
\* Variable range  
EIA: 1/4 sec to 1/10,000 sec  
CCIR: 1/4 sec to 1/8,000 sec

### Note

- The DIP switch 5 position is optional. (The field setting is recommended.) The field setting can obtain a sensitivity that is twice that of the frame setting.
- If you input another trigger pulse before the video signal output for the previous trigger pulse is completely output, an incorrect video signal will be output.

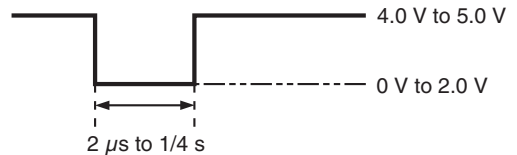
## Specifications of trigger pulse

- When using a trigger pulse like shown below, set the TRIG polarity selector switch on the rear panel to + :



\*1 If you set the trigger pulse with the DIP switches, use the 100  $\mu$ s to 1/4 sec pulse width.

- When using a trigger pulse like shown below, set the TRIG polarity selector switch on the rear panel to - :



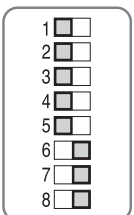
- Input impedance: 10 k $\Omega$  or more.
- The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

## Restart/Reset

### To Set Restart/Reset Mode

The information on one screen can be extracted at any time by externally inputting Restart/Reset signals (HD/VD). To enter this mode, set the trigger shutter switches (6 to 8) on the rear panel of the camera as shown in the figure. The Reset/Restart mode is especially effective for frame image output with long exposure or a strobe light.

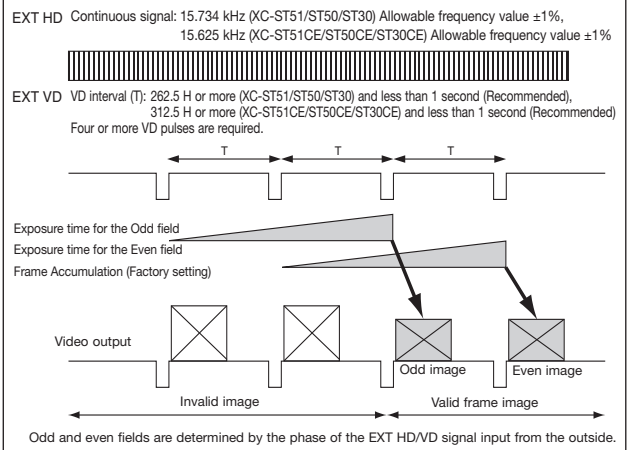
DIP switches



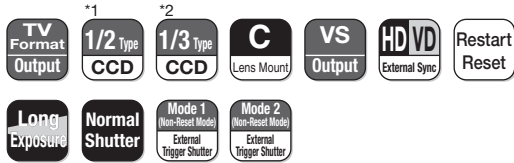
## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in highly sensitive image capture. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe the trail of a moving object. Extend the VD interval (T) between external VD pulses.

### Sample input timing chart 1



# XC-ES50/ES50CE XC-ES51/ES51CE XC-ES30/ES30CE



\*1 :XC-ES50/ES50CE/ES51/ES51CE  
\*2 :XC-ES30/ES30CE



Connection Diagram **P96**



## Outline

The XC-ES series is a small-sized lightweight monochrome camera module designed as an input device for image processing, realized through the newest high-density packaging. The downsized the main body allows to set the XC-ES series easily at the places where is difficult to set the existing devices.

## Features

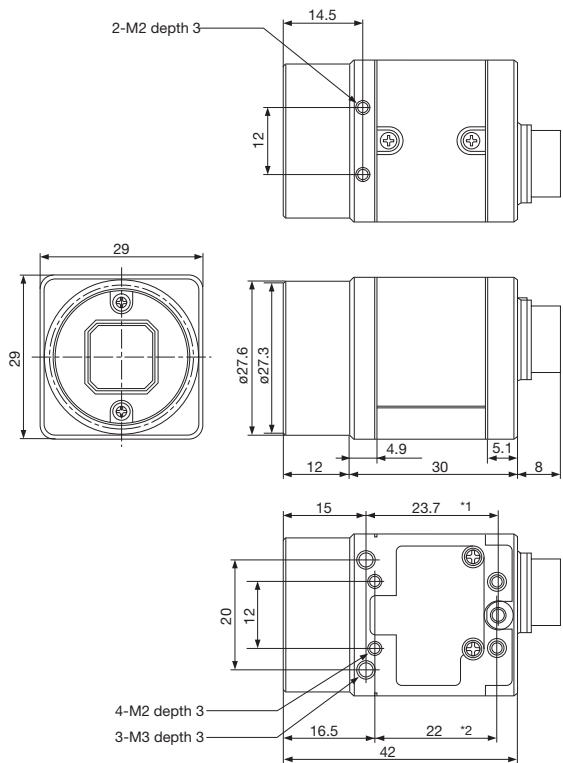
- XC-ES50/ES50CE: 1/2-type IT CCD
- XC-ES51/ES51CE: 1/2-type IT CCD (High sensitivity CCD)
- XC-ES30/ES30CE: 1/3-type IT CCD
- High S/N ratio: 60 dB
- External trigger shutter  
XC-ES50/ES51/ES30: 1/4 sec to 1/10,000 sec  
XC-ES50CE/ES51CE/ES30CE: 1/4 sec to 1/8,000 sec
- Electronic shutter  
XC-ES50/ES51/ES30: 1/100 sec to 1/10,000 sec  
XC-ES50CE/ES51CE/ES30CE: 1/120 sec to 1/8,000 sec
- 2:1 Interlaced/Non-Interlaced
- Frame/Field accumulation
- Restart/Reset
- Sync system: Internal/External (HD/VD)
- High Shock and Vibration Resistance

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

Camera body of all XC-E models



\*1: M3 screw size  
\*2: M2 screw size

Unit: mm

### Notice

From January 2005, the outside dimensions of XC-E series consoles will be changed to the same dimensions of XC-HR series consoles.

For the new outside dimensions, see page 90.

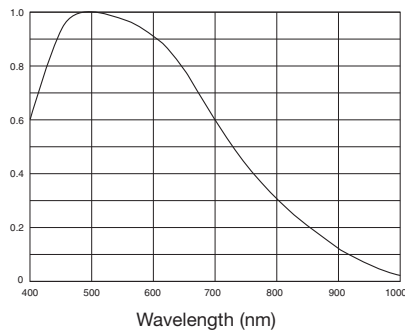
The outside dimensions will be changed from the following serial numbers.

- XC-ES50/XC-ES30: 250001
- XC-ES50CE/ES30CE: 550001
- XC-ES51:150001
- XC-ES51CE:450001

## Spectral Sensitivity Characteristics

### • XC-ES50/XC-ES51/XC-ES30 (Typical Values)

Relative sensitivity

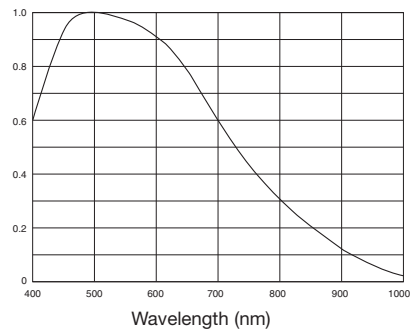


Wavelength (nm)

(Lens characteristics and light source characteristics excluded.)

### • XC-ES50CE/XC-ES51CE/XC-ES30CE (Typical Values)

Relative sensitivity

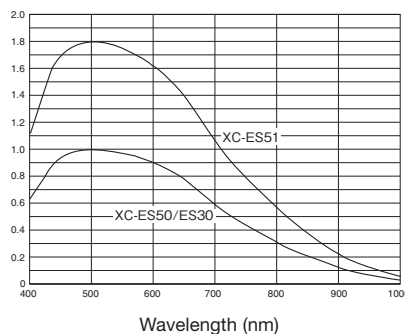


Wavelength (nm)

(Lens characteristics and light source characteristics excluded.)

### • XC-ES51, XC-ES50/XC-ES30 (Comparison sensitivity)

Relative sensitivity

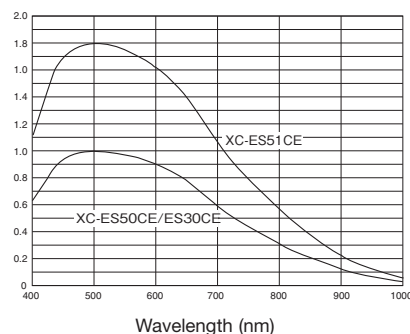


Wavelength (nm)

(Lens characteristics and light source characteristics excluded.)

### • XC-ES51CE, XC-ES50CE/XC-ES30CE (Comparison sensitivity)

Relative sensitivity



Wavelength (nm)

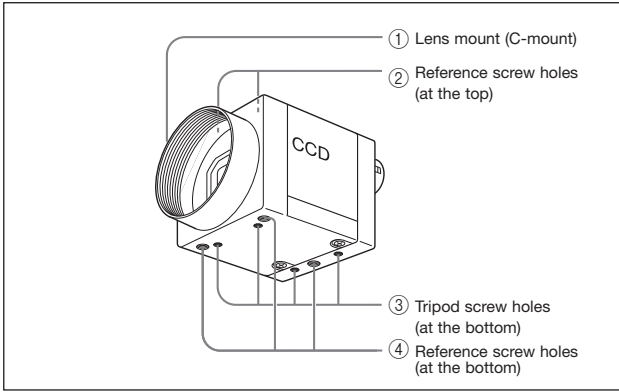
(Lens characteristics and light source characteristics excluded.)

## Specifications

	XC-ES50	XC-ES51	XC-ES30	XC-ES50CE	XC-ES51CE	XC-ES30CE
Image device	1/2-type IT CCD		1/3-type IT CCD	1/2-type IT CCD		1/3-type IT CCD
Signal system	EIA			CCIR		
Effective picture elements (H × V)	768 × 494			752 × 582		
Effective lines (H × V)	752 × 485			736 × 575		
Cell size (H × V)	8.4 μm × 9.8 μm		6.35 μm × 7.4 μm	8.6 μm × 8.3 μm		6.5 μm × 6.25 μm
Horizontal frequency	15.734 kHz			15.625 kHz		
Vertical frequency	59.94 Hz			50 Hz		
Lens mount	C-mount					
Sync system	Internal/External (Automatically switched according to input signal)					
External sync signal input	HD/VD (HD/VD level: 2 V to 5 Vp-p)					
External sync frequency	±1% (in horizontal sync frequency)					
H Jitter	less than ±20 nsec					
Scanning system	525 lines: 2:1 Interlaced (Automatic switching according to input signal)			625 lines: 2:1 Interlaced (Automatic switching according to input signal)		
Video output	1.0 Vp-p, negative, 75 Ω unbalanced					
Horizontal resolution	570 TV lines			560 TV lines		
Sensitivity	400 lx F5.6	400 lx F8	400 lx F4	400 lx F5.6	400 lx F8	400 lx F4
	(γ=ON, MIN GAIN)					
Minimum illumination*	0.3 lx	0.2 lx	0.3 lx	0.3 lx	0.2 lx	0.3 lx
S/N ratio	60 dB					
Gain	AGC/Manual (Adjustable on the rear panel)					
Gamma	ON/OFF (Adjustable on the rear panel)					
Normal shutter	1/100 sec to 1/10,000 sec			1/120 sec to 1/8,000 sec		
External trigger shutter	1/4 sec to 1/10,000 sec			1/4 sec to 1/8,000 sec		
Power requirements	DC 12 V (9 V to 16 V)					
Power consumption	1.6 W		1.4 W	1.6 W		1.4 W
Dimension (W × H × D)	29 × 29 × 30 mm (excluding protrusions)					
Mass	Approx. 50 g					
Operating temperature	-5°C to +45°C					
Storage temperature	-30°C to +60°C					
Performance guarantee temperature	0°C to 40°C					
Operating humidity	20% to 80% (no condensation)					
Storage humidity	20% to 95% (no condensation)					
Vibration resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction-x, y, z)					
Shock resistance	70 G					
MTBF	126,469 hours (Approx. 14.4 years)					
Regulatory compliance	UL1492, FCC/ICES-003: Class B, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A					
Supplied accessories	Lens mount cap (1), Operating instructions (1)					

\* F1.4, r=ON, MAX GAIN

## Location and Function of Parts and Controls

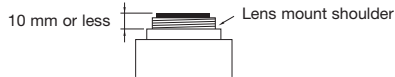


### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Reference screw holes (at the top)

These screw holes help to lock the camera module.

### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-3331 tripod adaptor using these holes on the bottom of the camera.

### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

### ① 12-pin multi-connector

DC IN/HD/VD (DC power/sync signal input) VIDEO OUT terminal.

### ② 75 Ω termination selector switch

### ③ HD/VD input-output selector switch

### ④ Shutter speed/mode setting DIP switch

### ⑤ Volume control switch

This switch can be changed in the range of Switch 0 dB to 18 dB when the GAIN switch is set to "M".

\* During factory setting, this switch is adjusted to the mechanical center.

#### Note

When setting DIP switch 5 to the frame integration, set the volume control switch 8 to the MAX side from the mechanical center (because of CCD characteristics).

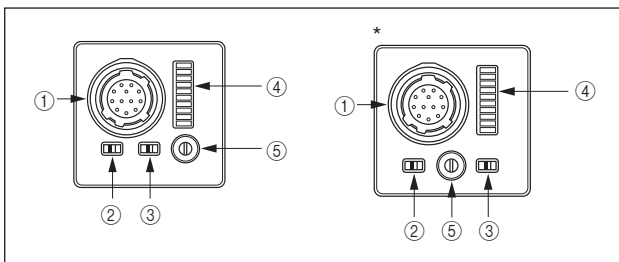
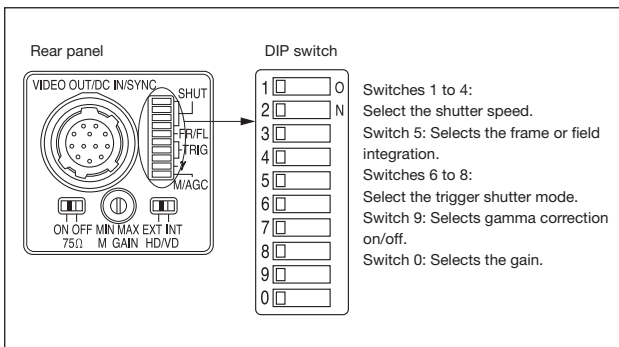
Be sure to turn the power off before making switch settings.

As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

## Factory Mode Settings of Rear Panel

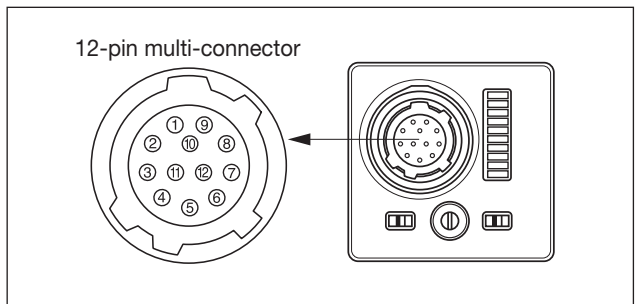
No.	Switch	Factory-setting mode
②	75 Ω termination selector switch	ON
③	HD/VD input-output selector switch	EXT
Shutter speed/mode setting DIP switch		
④	Switches 1 to 4: Select the shutter speed.	OFF
	Switch 5: Selects the frame or field integration.	FRAME
	Switches 6 to 8: Select the trigger shutter mode.	Normal
	Switch 9: Selects gamma correction on/off.	OFF
	Switch 0: Selects the gain.	Manual
⑤	Volume control switch	Mechanical center

## Rear Panel



\* The rear panel is different for the serial numbers shown below.  
 XC-ES50/ES30 : 200001  
 XC-ES50CE/ES30CE : 500001

## Connector Pin Assignments



Pin No.	External HD/VD synchronization	Internal HD/VD synchronization
1	Ground	Ground
2	+12 V DC	+12 V DC
3	Ground	Ground
4	VIDEO output	VIDEO output
5	Ground	Ground
6	External HD input	Internal HD output
7	<sup>1</sup> External VD input	Internal VD output
8	Ground	Ground
9	-	-
10	<sup>2</sup> WEN output	<sup>2</sup> WEN output
11	TRIG input	TRIG input
12	Ground	Ground

<sup>1</sup>: An input VD signal is required when the restart/reset mode is used.

<sup>2</sup>: A WEN output signal is valid only in the external trigger shutter mode.



## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to clearly capture a high-speed moving object.

### Setting of normal shutter speed

Shutter OFF	1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)	Flickerless* (EIA: 1/100 CCIR: 1/120)	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>

(Unit: seconds)

\* In the flickerless mode, the normal shutter speed is 1/100 sec for XC-ES50/ES30 and XC-EI50/EI30 (EIA) and 1/120 sec for XC-ES50CE/ES30 CE and XC-EI50CE/EI30CE (CCIR).

#### Note

It is recommended to set DIP switch 5 for field selection. (The field selection is about two times in sensitivity as high as the frame selection.)

## External Trigger Shutter

These modes are used to capture one image (one field) per trigger pulse. Set DIP switches 6, 7, and 8 on the rear panel to mode 1 or 2. (Refer to the table below.) When the trigger pulse width is 1/3 sec or more, the output signal is switched to a normal video signal. There are two modes for timing in which a video signal is obtained.

### Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- A video signal is synchronized with the external VD signal when an external HD/VD signal is input.
- A video signal is synchronized with an internal VD signal when no external HD/VD signal is input.

### Mode 2 (Reset mode)

In this mode, an internal video signal is output from a trigger pulse after a certain period of time.

### Setting of external trigger shutter speed

There are two ways to set the shutter speed.

Mode 1 (Non-reset mode)				Mode 2 (Reset mode)			
*1/100 (EIA) 1/120 (CCIR)	1/125	1/250	1/500	*1/100 (EIA) 1/120 (CCIR)	1/125	1/250	1/500
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/1000	1/2000	1/4000	**1/10000 (EIA) 1/8000 (CCIR)	1/1000	1/2000	1/4000	**1/10000 (EIA) 1/8000 (CCIR)
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>

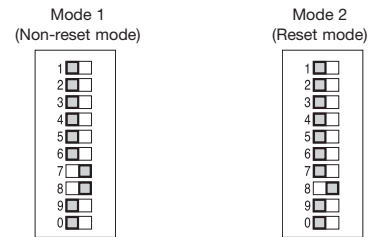
(Unit: seconds)

\* The external trigger shutter speed is set to 1/100 sec for XC-ES50/ES51/ES30 (EIA) and 1/120 sec for XC-ES50CE/ES51CE/ES30CE (CCIR).

\*\* The external trigger shutter speed is set to 1/10000 sec for XC-ES50/ES51/ES30 (EIA) and 1/8000 sec for XC-ES50CE/ES51CE/ES30CE (CCIR).

### Using trigger pulse width

- Set DIP switches 1 to 4 on the rear panel to 0.
- An arbitrary shutter speed\* can be obtained by setting the trigger pulse width to the range of 2  $\mu$ s to 250 ms.



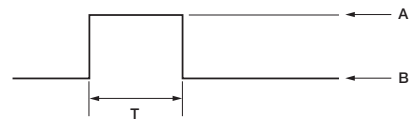
$$\text{Exposure time} = \text{Trigger pulse width} + 97 \mu\text{s (EIA)} \\ 120 \mu\text{s (CCIR)}$$

\* Variable range  
EIA: 1/4 sec to 1/10,000 sec  
CCIR: 1/4 sec to 1/8,000 sec

#### Note

1. It is recommended to set DIP switch 5 for field selection. (The field selection is about two times in sensitivity as high as the frame selection.)
2. After a trigger pulse is input, a new trigger pulse must not be input before the video signal obtained by the trigger pulse has been output.

### Specifications of trigger pulse



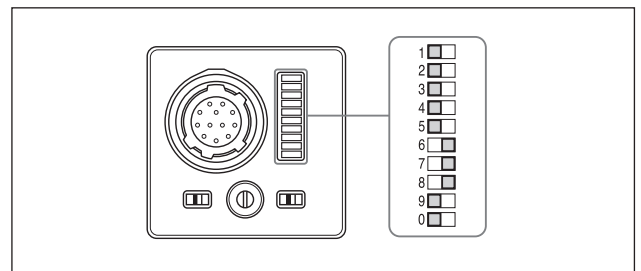
A: 4 V to 5.0 V  
B: 0 V to 1.0 V  
T: 2  $\mu$ s to 1/4 s

T: 2 ms to 1/4 sec, 100  $\mu$ s to 1/4 sec when setting the shutter speed using DIP switch  
\* Input impedance: 10 k $\Omega$  or more

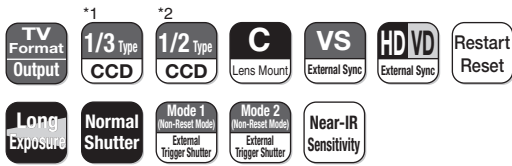
\* The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

## Restart/Reset

The information on one screen can be extracted at any time by inputting a restart/reset signal (HD/VD) from the outside. To enter this mode, set DIP switches 6, 7, and 8 on the rear panel of a camera as shown in the table below. The setting is especially effective for the following operation.



# XC-EI50/EI50CE XC-EI30/EI30CE



\*1: XC-EI50/EI50CE  
\*2: XC-EI30/EI30CE



Connection Diagram **P96**



## Outline

Like the XC-EI50/EI50CE and XC-EI30/EI30CE, the XC-ES50/ES30 is compact and lightweight and offers near-infrared sensitivity. Extremely sharp images can be obtained when used under red LED illumination or in near-infrared light, such as in funduscopes.

## Features

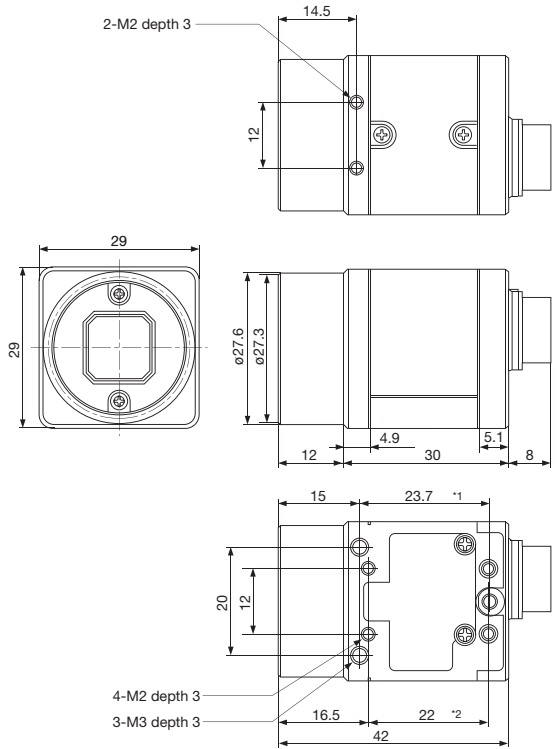
- XC-EI50/EI50CE: 1/2-type IT CCD
- XC-EI30/EI30CE: 1/3-type IT CCD
- Near-IR sensitivity
- High sensitivity: F1.4  
XC-EI50/EI50CE: 0.1 lx  
XC-EI30/EI30CE: 0.2 lx
- High S/N ratio: 60 dB
- Electronic shutter  
XC-EI50/EI30: 1/100 sec to 1/10,000 sec  
XC-EI50CE/EI30CE: 1/120 sec to 1/8,000 sec
- External trigger shutter  
XC-EI50/EI30: 1/4 sec to 1/10,000 sec  
XC-EI50CE/EI30CE: 1/4 sec to 1/8,000 sec
- 2:1 Interlaced/Non-Interlaced
- Frame/Field accumulation
- Restart/Reset
- Sync system: Internal/External (HD/VD)
- High Shock and Vibration Resistance

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

Camera body of all XC-E models



\*1: M3 screw size  
\*2: M2 screw size

Unit: mm

## Notice

From January 2005, the outside dimensions of XC-E series consoles will be changed to the same dimensions of XC-HR series consoles.

For the new outside dimensions, see page 90.

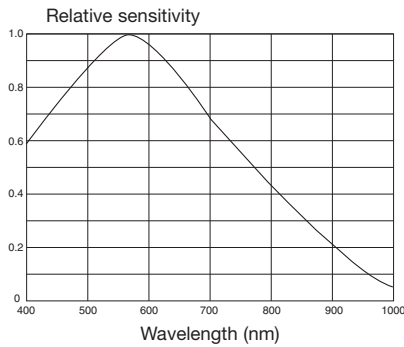
The outside dimensions will be changed from the following serial numbers.

- XC-ES50/XC-ES30: 250001
- XC-ES50CE/ES30CE: 550001
- XC-ES51: 150001
- XC-ES51CE: 450001

# Spectral Sensitivity Characteristics

## • XC-EI30

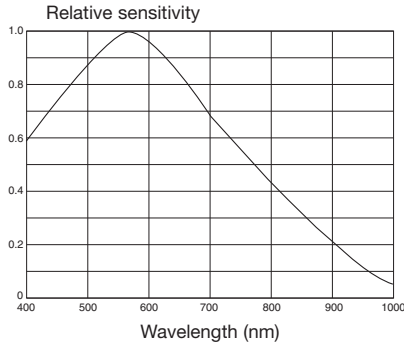
(Typical Values)



(Lens characteristics and light source characteristics excluded.)

## • XC-EI30CE

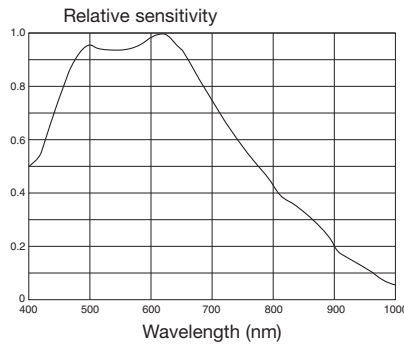
(Typical Values)



(Lens characteristics and light source characteristics excluded.)

## • XC-EI50

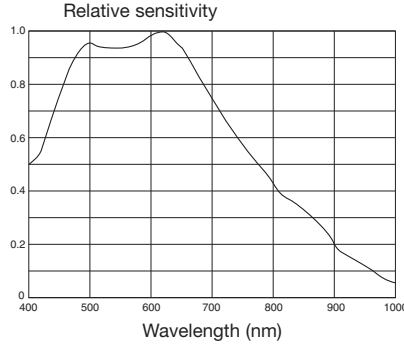
(Typical Values)



(Lens characteristics and light source characteristics excluded.)

## • XC-EI50CE

(Typical Values)

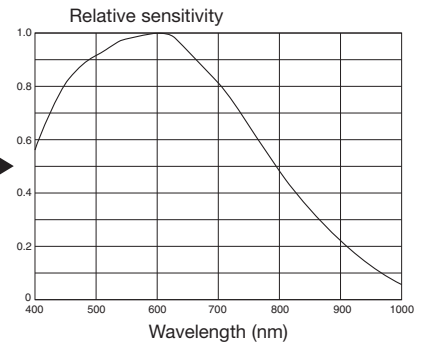


(Lens characteristics and light source characteristics excluded.)

## • XC-EI50\*

On and after S/No.200001

(Typical Values)

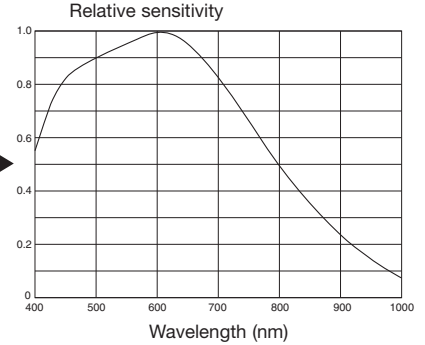


(Lens characteristics and light source characteristics excluded.)

## • XC-EI50CE\*

On and after S/No.500001

(Typical Values)



(Lens characteristics and light source characteristics excluded.)

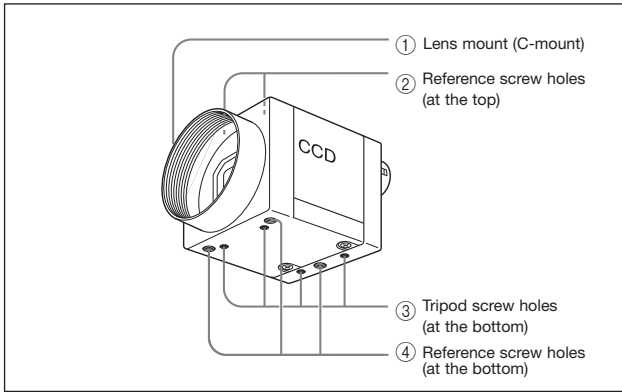
\* The Special Sensitivity Characteristics are changed from the following serial number  
• S/N XC-EI50 200001 XC-EI50CE 500001

# Specifications

	XC-EI50	XC-EI50CE	XC-EI30	XC-EI30CE
Image device	1/2-type IT CCD		1/3-type IT CCD	
Signal system	EIA	CCIR	EIA	CCIR
Effective picture elements (H × V)	768 × 494	752 × 582	768 × 494	752 × 582
Effective lines (H × V)	752 × 485	736 × 575	752 × 485	736 × 575
Cell size (H × V)	8.4 μm × 9.8 μm	8.6 μm × 8.3 μm	6.35 μm × 7.4 μm	6.5 μm × 6.25 μm
Horizontal frequency	15.734 kHz	15.625 kHz	15.734 kHz	15.625 kHz
Vertical frequency	59.94 Hz	50 Hz	59.94 Hz	50 Hz
Lens mount	C-mount			
Sync system	Internal/External (Automatically switched according to input signal)			
External sync signal input	HD/VD (HD/VD level: 2 Vp-p to 5 Vp-p)			
External sync frequency	±1% (in horizontal sync frequency)			
H Jitter	less than ±20 nsec			
Scanning system	525 lines: 2:1 Interlaced	625 lines: 2:1 Interlaced	525 lines: 2:1 Interlaced	625 lines: 2:1 Interlaced
Video output	(automatic switching according to input signal) 1.0 Vp-p, negative, 75 Ω unbalanced			
Horizontal resolution	570 TV lines	560 TV lines	570 TV lines	560 TV lines
Sensitivity	400 lx F11 (γ=ON, MIN GAIN)		400 lx F8 (γ=ON, MIN GAIN)	
Minimum illumination*	0.1 lx		0.2 lx	
S/N ratio	60 dB			
Gain	AGC/Manual (adjustable on the rear panel)			
Gamma	ON/OFF (adjustable on the rear panel)			
Normal shutter	1/100 sec to 1/10,000 sec	1/120 sec to 1/8,000 sec	1/100 sec to 1/10,000 sec	1/120 sec to 1/8,000 sec
External trigger shutter	1/4 sec to 1/10,000 sec	1/4 sec to 1/8,000 sec	1/4 sec to 1/10,000 sec	1/4 sec to 1/8,000 sec
Power requirements	DC 12 V (9 V to 16 V)			
Power consumption	1.6 W		1.4 W	
Dimension (W × H × D)	29 × 29 × 30 mm (excluding protrusions)			
Mass	Approx. 50 g			
Operating temperature	-5°C to +45°C			
Storage temperature	-30°C to +60°C			
Performance guarantee temperature	0°C to 40°C			
Operating humidity	20% to 80% (no condensation)			
Storage humidity	20% to 95% (no condensation)			
Vibration resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction-x, y, z)			
Shock resistance	70 G			
MTBF	126,469 hours (Approx. 14.4 years)			
Regulatory compliance	UL1492, FCC/ICES-003: Class B, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A			
Supplied accessories	Lens mount cap (1), Operating instructions (1)			

\* F1.4, r=ON, MAX GAIN

## Location and Function of Parts and Controls

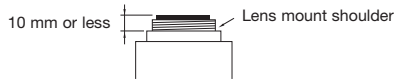


### ① Lens mount section (C-mount)

A commercial C-mount lens or other optical equipment.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



### ② Reference screw holes (at the top)

These screw holes help to lock the camera module.

### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-3331 tripod adaptor using these holes on the bottom of the camera.

### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

### ① 12-pin multi-connector

DC IN/HD/VD (DC power/sync signal input) VIDEO OUT terminal.

### ② 75 Ω termination selector switch

### ③ HD/VD input-output selector switch

### ④ Shutter speed/mode setting DIP switch

### ⑤ Volume control switch

This switch can be changed in the range of Switch 0 to 18 dB when the GAIN switch is set to "M".

\*During factory setting, this switch is adjusted to the mechanical center.

#### Note

When setting DIP switch 5 to the frame integration, set the volume control switch 5 to the MAX side from the mechanical center (because of CCD characteristics).

Be sure to turn the power off before making switch settings.

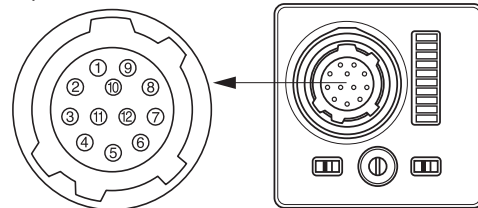
As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

## Factory Mode Settings of Rear Panel

No.	Switch	Factory-setting mode
②	75 Ω termination selector switch	ON
③	HD/VD input-output selector switch	EXT
④	Shutter speed/mode setting DIP switch	
	Switches 1 to 4: Select the shutter speed.	OFF
	Switch 5: Selects the frame or field integration.	FRAME
	Switches 6 to 8: Select the trigger shutter mode.	Normal
	Switch 9: Selects gamma correction on/off.	OFF
	Switch 0: Selects the gain.	Manual
⑤	Volume control switch	Mechanical center

## Connector Pin Assignments

### 12-pin multi-connector

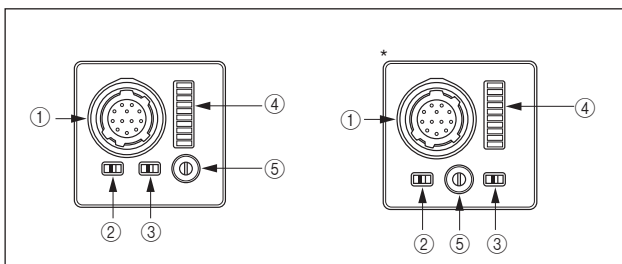
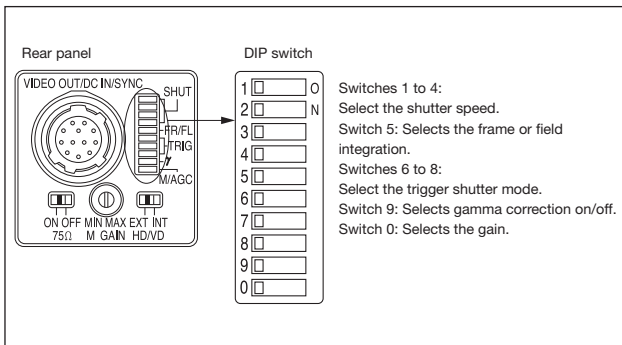


Pin No.	External HD/VD synchronization	Internal HD/VD synchronization
1	Ground	Ground
2	+12 V	+12 V
3	Ground	Ground
4	VIDEO output	VIDEO output
5	Ground	Ground
6	External HD input	Internal HD output
7	*1 External VD input	Internal VD output
8	Ground	Ground
9	-	-
10	*2 WEN output	*2 WEN output
11	TRIG input	TRIG input
12	Ground	Ground

\*1: An input VD signal is required when the restart/reset mode is used.

\*2: A WEN output signal is valid only in the external trigger shutter mode.

## Rear Panel



\* The rear panel is different for the serial numbers shown below.

XC-ES50/ES30 : 200001  
XC-ES50CE/ES30CE : 500001

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to clearly capture a high-speed moving object.

### Setting of normal shutter speed

Shutter OFF	1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
	1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)	*Flickerless (EIA: 1/100 CCIR: 1/120)
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>

(Unit: seconds)

\* In the flickerless mode, the normal shutter speed is 1/100 sec for XC-ES50/ES30 and XC-EI50/EI30 (EIA) and 1/120 sec for XC-ES50CE/ES30 CE and XC-EI50CE/EI30CE (CCIR).

#### Note

It is recommended to set DIP switch 5 for field selection. (The field selection is about two times in sensitivity as high as the frame selection.)

## External Trigger Shutter

These modes are used to capture one image (one field) per trigger pulse. Set DIP switches 6, 7, and 8 on the rear panel to mode 1 or 2. (Refer to the table below.) When the trigger pulse width is 1/3 sec or more, the output signal is switched to a normal video signal. There are two modes for timing in which a video signal is obtained.

### Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- A video signal is synchronized with the external VD signal when an external HD/VD signal is input.
- A video signal is synchronized with an internal VD signal when no external HD/VD signal is input.

### Mode 2 (Reset mode)

In this mode, an internal video signal is output from a trigger pulse after a certain period of time.

### Setting of external trigger shutter speed

There are two ways to set the shutter speed.

Mode 1 (Non-reset mode)				Mode 2 (Reset mode)			
*1/100 (EIA) 1/120 (CCIR)	1/125	1/250	1/500	*1/100 (EIA) 1/120 (CCIR)	1/125	1/250	1/500
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/1000	1/2000	1/4000	**1/10000 (EIA) 1/8000 (CCIR)	1/1000	1/2000	1/4000	**1/10000 (EIA) 1/8000 (CCIR)
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>

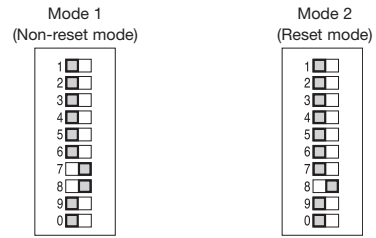
(Unit: second)

\* The external trigger shutter speed is set to 1/100 sec for XC-EI50/EI30 (EIA) and 1/120 sec for XC-EI50CE/EI30CE (CCIR).

\*\* The external trigger shutter speed is set to 1/10000 sec for XC-EI50/EI30 (EIA) and 1/8000 sec for XC-EI50CE/EI30CE (CCIR).

### Using trigger pulse width

- Set DIP switches 1 to 4 on the rear panel to 0.
- An arbitrary shutter speed\* can be obtained by setting the trigger pulse width to the range of 2  $\mu$ s to 250 ms.



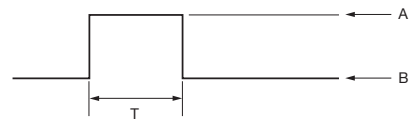
$$\text{Exposure time} = \text{Trigger pulse width} + 97 \mu\text{s (EIA)} \\ 120 \mu\text{s (CCIR)}$$

\* Variable range  
EIA: 1/4 sec to 1/10,000 sec  
CCIR: 1/4 sec to 1/8,000 sec

#### Note

1. It is recommended to set DIP switch 5 for field selection. (The field selection is about two times in sensitivity as high as the frame selection.)
2. After a trigger pulse is input, a new trigger pulse must not be input before the video signal obtained by the trigger pulse has been output.

### Specifications of trigger pulse



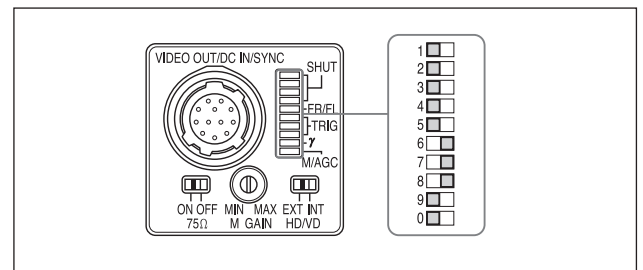
A: 4 V to 5.0 V  
B: 0 V to 1.0 V  
T: 2  $\mu$ s to 1/4 s

T: 2  $\mu$ s to 1/4 sec, 100  $\mu$ s to 1/4 sec when setting the shutter speed using DIP switch  
\* Input impedance: 10 k $\Omega$  or more

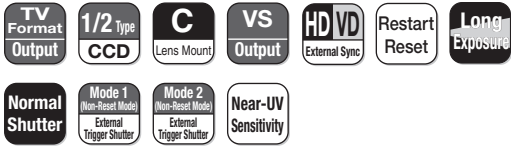
\* The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

## Restart/Reset

The information on one screen can be extracted at any time by inputting a restart/reset signal (HD/VD) from the outside. To enter this mode, set DIP switches 6, 7, and 8 on the rear panel of a camera as shown in the table below. The setting is especially effective for the following operation.



# XC-EU50/EU50CE



Connection Diagram **P96**



## Outline

The XC-EU50/EU50CE is a monochrome video camera module with a 1/2-type CCD for industrial use. With its sensitivity around the near ultraviolet range (around 365 nm), utilized the feature of the shorter wavelength range characteristics and very detailed data can be detected. Small scratches, dust or blemishes hardly visible to the naked eye can be captured as a clear image by combining the camera with a light source that has a wavelength of about 360 nm. This model inherited compact size, rear panel mode switches from the XC-E series and is ideal for use in industrial applications.

## Features

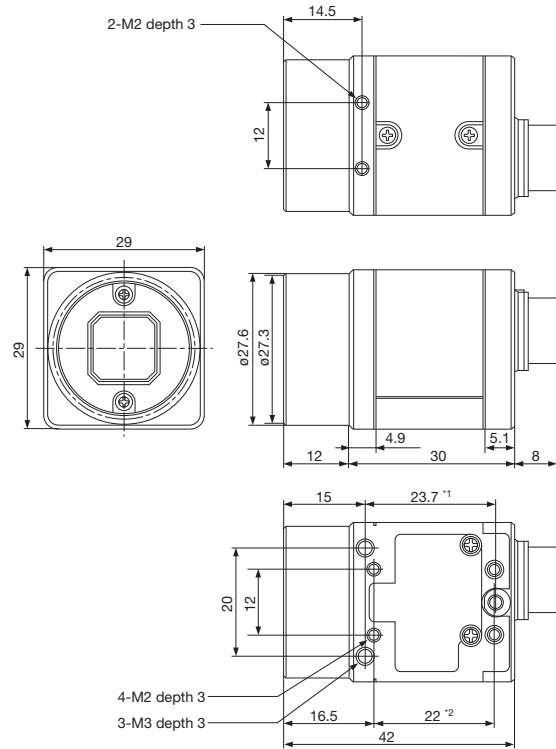
- XC-EU50/EU50CE: 1/2-type IT CCD
- Near-UV sensitivity
- High S/N ratio: 60 dB
- Electronic shutter  
XC-EU50: 1/100 sec to 1/10,000 sec  
XC-EU50CE: 1/120 sec to 1/8,000 sec
- External trigger shutter  
XC-EU50: 1/4 sec to 1/10,000 sec  
XC-EU50CE: 1/4 sec to 1/8,000 sec
- 2:1 Interlaced/Non-Interlaced
- Frame/field accumulation
- Restart/reset
- Sync system: Internal/External (HD/VD)
- High Shock and Vibration Resistance

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)
- Tripod adaptor
  - VCT-333I

## Dimensions

Camera body of all XC-E models



\*1: M3 screw size  
\*2: M2 screw size

Unit: mm

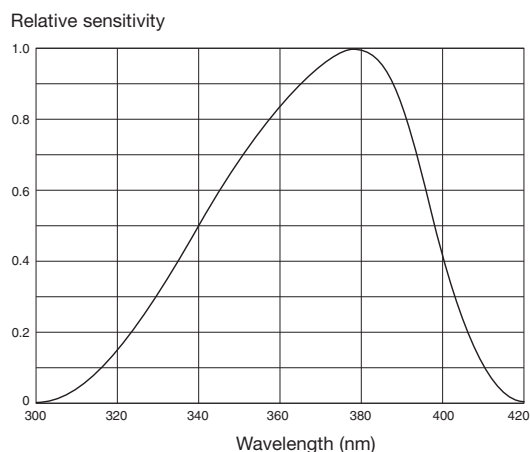
## Notice

From January 2005, the outside dimensions of XC-E series consoles will be changed to the same dimensions of XC-HR series consoles. For the new outside dimensions, see page 90. The outside dimensions will be changed from the following serial numbers.  
XC-EU50: 250001  
XC-EU50CE: 550001

## Spectral Sensitivity Characteristics

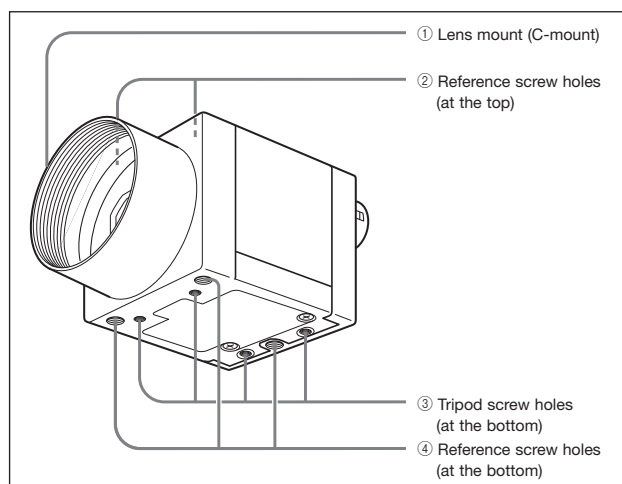
### • XC-EU50/XC-EU50CE

(Typical Values)



(Lens characteristics and light source characteristics excluded.)

## Location and Function of Parts and Controls

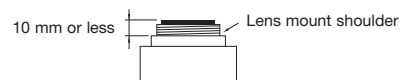


#### ① Lens mount (C-mount)

Attach any C-mount lens or other optical equipment for Near UV.

#### Note

Be sure that the lens does not project more than 10 mm from the lens mount.



#### ② Reference screw holes (at the top)

These screw holes help to lock the camera module.

#### ③ Tripod screw holes (at the bottom)

These four screw holes on the bottom are for installing the camera module on a tripod. To install on a tripod, you will need to install the VCT-333I tripod adaptor using these holes on the bottom of the camera.

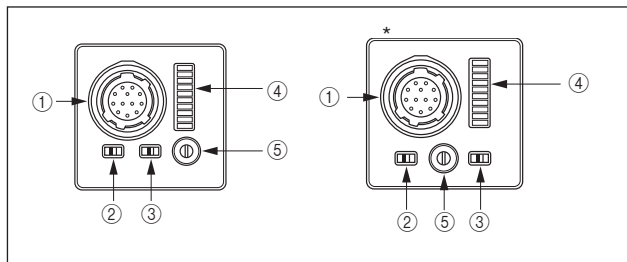
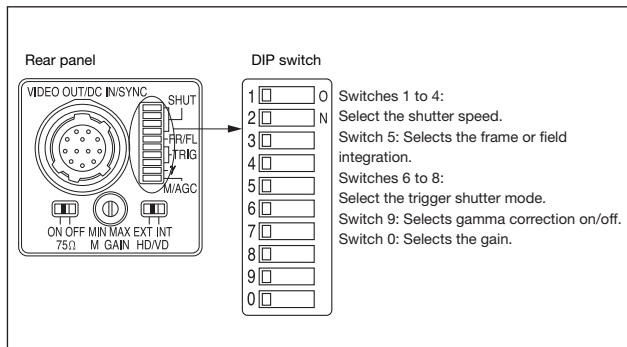
#### ④ Reference screw holes (at the bottom)

These precision screw holes are for locking the camera module. Locking the camera module using these holes secures the optical axis alignment.

## Specifications

	XC-EU50	XC-EU50CE
Image device	1/2-type IT CCD	
Signal system	EIA	CCIR
Effective picture elements (H × V)	768 × 494	752 × 582
Effective lines (H × V)	752 × 485	736 × 575
Cell size (H × V)	8.4 μm × 9.8 μm	8.6 μm × 8.3 μm
Horizontal frequency	15.734 kHz	15.625 kHz
Vertical frequency	59.94 Hz	50 Hz
Lens mount	C-mount	
Sync system	Internal/External (Automatically switched according to input signal)	
External sync signal input	HD/VD (HD/VD level: 2 Vp-p to 5 Vp-p)	
External sync frequency	±1% (automatic switching)	
H Jitter	less than ±20 nsec (external horizontal frequency)	
Scanning system	525 lines: 2:1 Interlaced (automatic switching according to input signal)	625 lines: 2:1 Interlaced (automatic switching according to input signal)
Video output	1.0 Vp-p, negative, 75 Ω unbalanced	
Horizontal resolution	570 TV lines	560 TV lines
S/N ratio	60 dB	
Gain	AGC/Manual (adjustable on the rear panel)	
Gamma	ON/OFF (adjustable on the rear panel)	
Normal shutter	1/100 sec to 1/10,000 sec	1/120 sec to 1/8,000 sec
External trigger shutter	1/4 sec to 1/10,000 sec	1/4 sec to 1/8,000 sec
Power requirements	DC 12 V (9 V to 16 V)	
Power consumption	1.6 W	
Dimension (W × H × D)	29 × 29 × 30 mm (excluding protrusions)	
Mass	Approx. 50 g	
Operating temperature	-5°C to +45°C	
Storage temperature	-30°C to +60°C	
Performance guarantee temperature	0°C to 40°C	
Operating humidity	20% to 80% (no condensation)	
Storage humidity	20% to 95% (no condensation)	
Vibration resistance	10 G (20 Hz to 200 Hz) 20 minutes for each direction-x, y, z)	
Shock resistance	70 G	
MTBF	126,469 hours (Approx. 14.4 years)	
Regulatory compliance	UL1492, FCC/ICES-003: Class B, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A	
Supplied accessories	Lens mount cap (1), Operating instructions (1)	

## Rear Panel



\* The rear panel is different for the serial numbers shown below.  
XC-EU50 : 200001  
XC-EU50CE : 500001

### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

- ① **12-pin multi-connector**  
DC IN/HD/VD (DC power/sync signal input) VIDEO OUT terminal.
- ② **75 Ω termination selector switch**
- ③ **HD/VD input-output selector switch**
- ④ **Shutter speed/mode setting DIP switch**
- ⑤ **Volume control switch**  
This switch can be changed in the range of Switch 0 to 18 dB when the GAIN switch is set to "M".  
\*During factory setting, this switch is adjusted to the mechanical center.

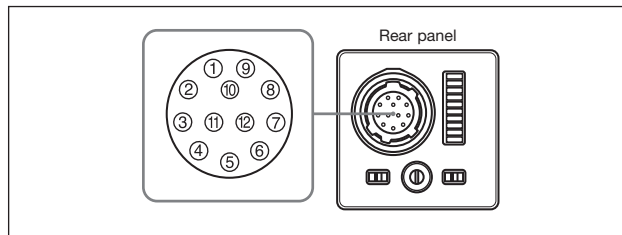
### Note

When setting DIP switch 5 to the frame integration, set the volume control switch 8 to the MAX side from the mechanical center (because of CCD characteristics).

## Factory Mode Settings of Rear Panel

No.	Switch	Factory-setting mode
②	75 Ω termination selector switch	ON
③	HD/VD input-output selector switch	EXT
④	Shutter speed/mode setting DIP switch	
	Switches 1 to 4: Select the shutter speed.	OFF
	Switch 5: Selects the frame or field integration.	FRAME
	Switches 6 to 8: Select the trigger shutter mode.	Normal
	Switch 9: Selects gamma correction on/off.	OFF
⑤	Switch 0: Selects the gain.	Manual
	Volume control switch	Mechanical center

## Connector Pin Assignments



Pin No.	Camera sync output	External Sync (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	WEN output (Signal)
11	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	VD input (Ground)

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

### Setting of the Normal Shutter

- Using the DIP switches on the rear panel

Shutter OFF	1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)	Flickerless* (EIA: 1/100 CCIR: 1/120)	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	

(Unit: second)

\* If you set the mode to flickerless, the positions of DIP switches 1 to 3 are optional.

### Note

- The positions of DIP switches 6 and 7 are optional.
- The DIP switch 5 position is optional. (The field setting is recommended.) The field setting can obtain a sensitivity that is twice that of the frame setting.



## External Trigger Shutter

By inputting an external trigger pulse, the camera is able to capture fast-moving objects clearly.

Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2 (See the table below).

When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

There are two modes for timing in which a video signal is obtained.

### • Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- A video signal is synchronized with the external VD signal when an external HD/VD signal is input.
- A video signal is synchronized with an internal VD signal when no external HD/VD signal is input.

### • Mode 2 (Reset mode)

In this mode, an internal VD is reset, then an internal video signal is output after trigger pulse input after a certain period of time.

## Setting of the External Trigger Shutter

You can set the shutter speed with the DIP switches or using the trigger pulse width.

### • Using the DIP switches on the rear panel

Mode 1 (Non-reset mode)				Mode 2 (Reset mode)			
1/100 (EIA)* 1/120 (CCIR)*	1/125	1/250	1/500	1/100 (EIA)* 1/120 (CCIR)*	1/125	1/250	1/500
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/1000	1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)	1/1000	1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>

(Unit: second)

(Unit: second)

\* If 1/100 (EIA) or 1/120 (CCIR) has been set, the positions of DIP switches 1 to 3 are optional.

### Note

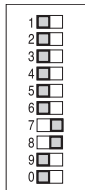
The positions of DIP switches 5, 9 and 0 are optional.

### • Setting the external shutter speed with the trigger pulse width

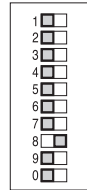
Set all DIP switches (1 to 4 on the rear panel) to 0.

You can obtain an arbitrary shutter speed\* by setting the trigger pulse width to the range of 2  $\mu$ s to 250 ms.

Mode 1 (Non-reset mode)



Mode 2 (Reset mode)



Exposure time = Trigger pulse width + 97  $\mu$ s (EIA)

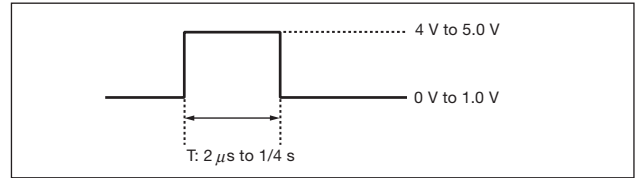
Trigger pulse width + 120  $\mu$ s (CCIR)

\* Variable range  
EIA: 1/4 sec to 1/10,000 sec  
CCIR: 1/4 sec to 1/8,000 sec

### Note

- The DIP switch 5 position is optional. (The field setting is recommended.) The field setting can obtain a sensitivity that is twice that of the frame setting.
- If you input a new trigger pulse before the video signal output for the previous trigger pulse is output completely, an incorrect video signal will be output.

## • Specifications of the Trigger Pulse



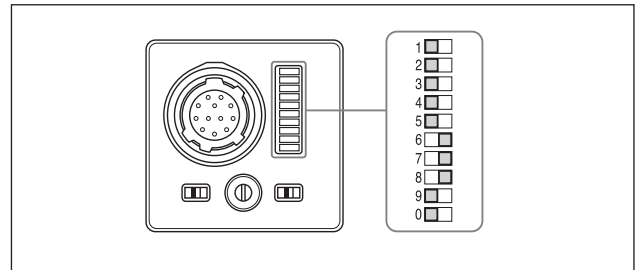
T: If you set the trigger pulse with the DIP switches, use the 100  $\mu$ s to 1/4 s pulse width.

- Input impedance; 10 k $\Omega$  or more.
- The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

## Restart/Reset

### To Set Restart/Reset Mode

The information on one screen can be extracted at any time by externally inputting a restart/reset signal (HD/VD). To enter this mode, set DIP switches 6, 7, and 8 on the rear panel of the camera as shown in the figure below. The setting is especially effective for the operation explained below.



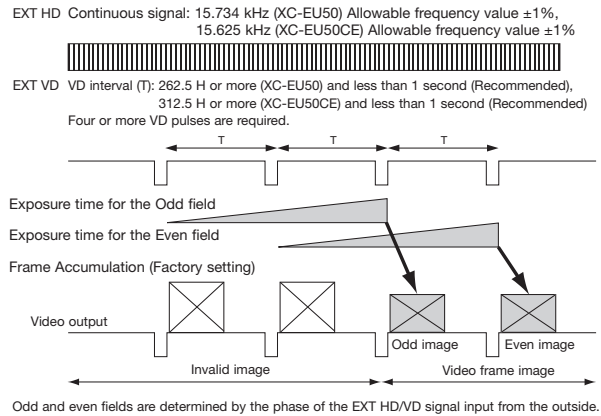
## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in a highly sensitive image. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe a moving object. Extend the VD interval (T) period between external VD pulses.

### Note

Some white spots may appear after a long exposure.

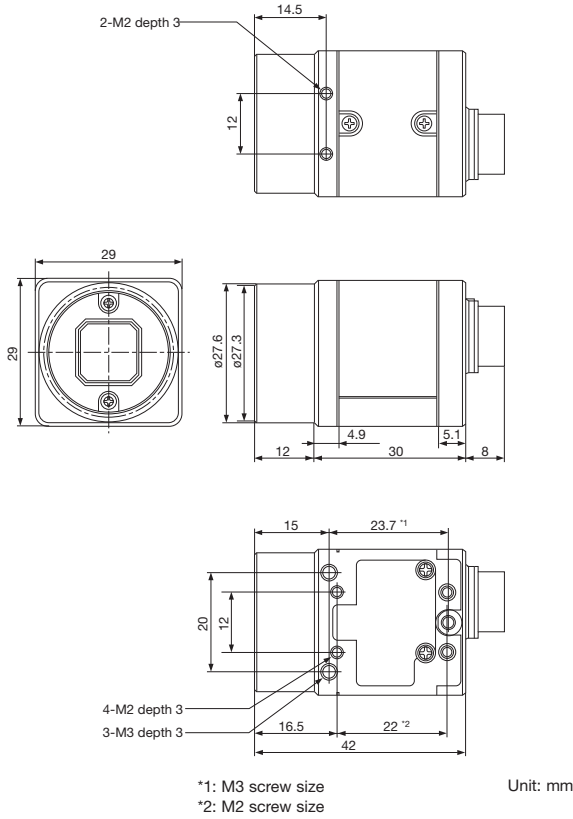
### Sample input timing chart 1



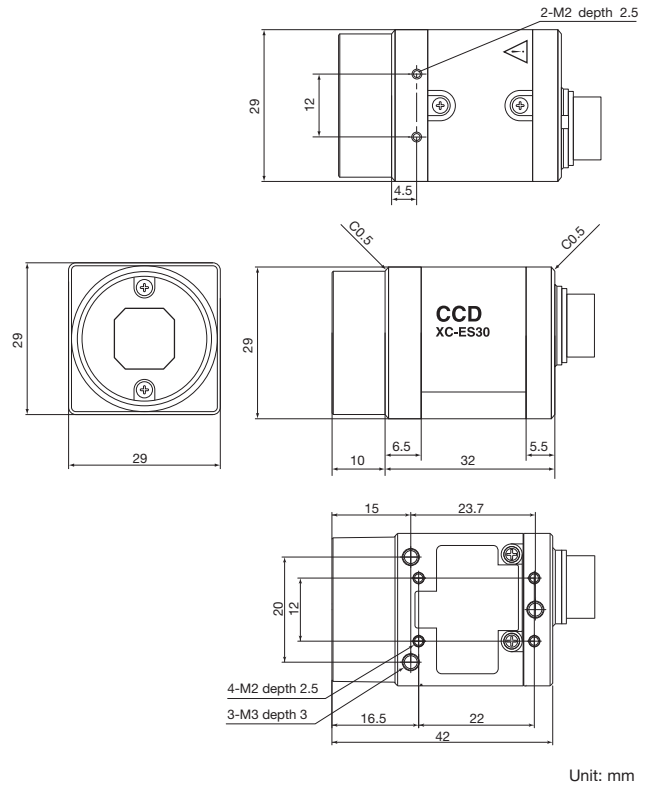
## Information of XC-E Series Console Modification

From January 2005, the outside dimensions of XC-E series consoles will be changed to the same dimensions of XC-HR series consoles.

### New Dimensions



### Old Dimensions



The outside dimensions will be changed from the following serial number.

XC-ES50/ES30	: 250001
XC-ES50CE/ES30CE	: 550001
XC-ES51	: 150001
XC-ES51CE	: 450001
XC-EI50/EI30	: 250001
XC-EI50CE/EI30CE	: 550001
XC-EU50	: 250001
XC-EU50CE	: 550001

Digital Video Camera  
XCL XCG XCD

Analog Video Camera  
XC (Non-TV Format)

XC (TV Format)

Accessories

Color Camera Module  
FCB-HD FCB-SD

# XC-ES50L

- TV Format Output
- 1/2 Type CCD
- C Lens Mount
- VS Output
- HD/VD External Sync
- Restart Reset
- Long Exposure
- Normal Shutter
- Mode 1 (Non-Reset Mode) External Trigger Shutter
- Mode 2 (Non-Reset Mode) External Trigger Shutter
- L Type



Connection Diagram **P97**



## Outline

The XC-ES50L cameras is an L-shaped and small-sized lightweight monochrome camera module equipped with IR-cut filter designed to be fit into such as in limited space. With the mode switches on the rear panel, these cameras make it ideal for use in industrial equipment.

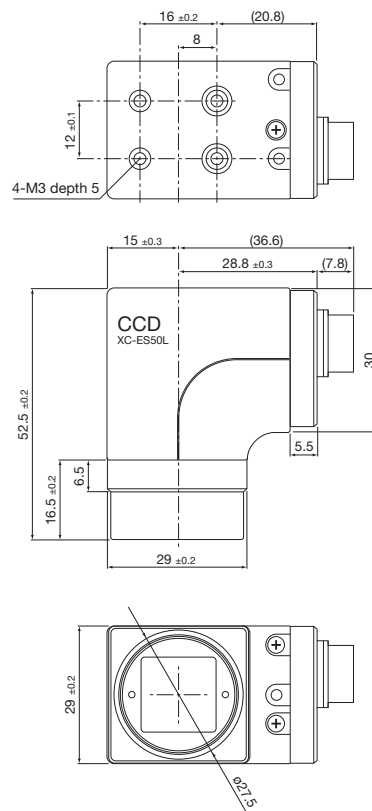
## Features

- 1/2-type interline CCD
- Dimensions: 29 (W) × 42.5 (H) × 43.8 (D) mm, Mass: Approx. 110 g
- High S/N ratio: 60 dB
- Electronic shutter : 1/100 sec to 1/10,000 sec
- External trigger shutter : 1/4 sec to 1/10,000 sec
- 2:1 Interlaced/Non-Interlaced
- Frame/Field accumulation
- Restart/Reset
- IR cut filter
- Sync system: Internal/External (HD/VD)
- High Shock and Vibration Resistance

## Accessories

- Compact camera adaptor
  - DC-700/700CE
- 12-pin camera cable (CE standard)
  - CCXC-12P02N (2 m)
  - CCXC-12P05N (5 m)
  - CCXC-12P10N (10 m)
  - CCXC-12P25N (25 m)

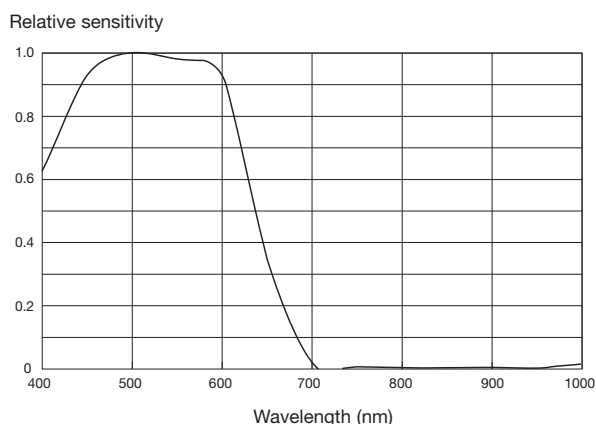
## Dimensions



Unit: mm

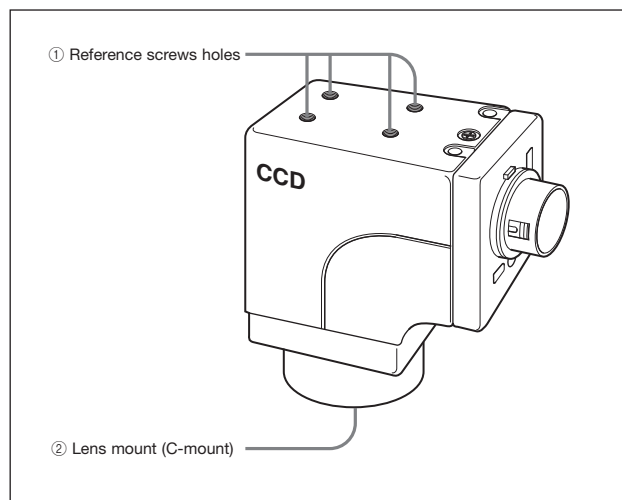
## Spectral Sensitivity Characteristics

### • XC-ES50L (Typical Values)



(Lens characteristics and light source characteristics excluded.)

## Location and Function of Parts and Controls



#### ① Reference screw holes

These precision screw holes are for locking the camera module.

#### ② Lens mount (C-mount)

Attach any C-mount lens or other optical equipment.

#### Note

The lens must not project more than 10 mm from the lens mount.

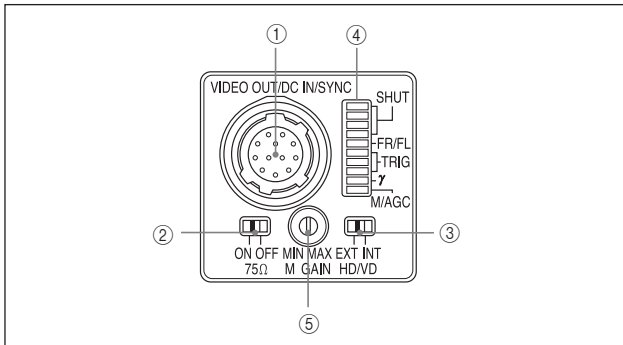


## Specifications

XC-ES50L	
Image device	1/2-type IT CCD
Signal system	EIA
Effective picture elements (H × V)	768 × 494
Effective lines (H × V)	752 × 485
Cell size (H × V)	8.4 μm × 9.8 μm
Horizontal frequency	15.734 kHz
Vertical frequency	59.94 Hz
Lens mount	C-mount
Sync system	Internal/External (Automatically switched according to input signal)
External sync signal input	HD/VD (HD/VD level: 2 Vp-p to 5 Vp-p)
External sync frequency	±1% (in horizontal sync frequency)
H Jitter	less than ±20 nsec
Scanning system	525 lines 2:1 Interlaced (Automatic switching according to input signal)
Video output	1.0 Vp-p, negative, 75 Ω unbalanced
Horizontal resolution	570 TV lines
Sensitivity	400 lx F4 (γ=ON, MAX GAIN, IR cut filter)
Minimum illumination*	3.0 lx
S/N ratio	60 dB
Gain	AGC/Manual (adjustable on the rear panel)
Gamma	ON/OFF (adjustable on the rear panel)
Normal shutter	1/100 sec to 1/10,000 sec
External trigger shutter	1/4 sec to 1/10,000 sec
Power requirements	DC 12 V (9 V to 16 V)
Power consumption	1.6 W
Dimension (W × H × D)	29 × 42.5 × 43.8 mm (excluding protrusions)
Mass	Approx. 110 g
Operating temperature	-5°C to +45°C
Storage temperature	-30°C to +60°C
Performance guarantee temperature	0°C to 40°C
Operating humidity	20% to 80% (no condensation)
Storage humidity	20% to 95% (no condensation)
Vibration resistance	10 G (20 Hz to 200 Hz 20 minutes for each direction-x, y, z)
Shock resistance	70 G
MTBF	126,469 hours (Approx. 14.4 years)
Regulatory compliance	UL1492, FCC/ICES-003: Class B, CE: EN61326, AS/NZ: EN61326, KC: KN22/KN24: Class A (XC-ES50L only)
Supplied accessories	Lens mount cap (1), Operating instructions (1)

\* F1.4, r=ON, MAX GAIN, IR cut filter

## Rear Panel



### Note

Be sure to turn the power off before making switch settings. As the variable controller for manual adjustment is a small precise component, do not apply force more than required when adjusting. Doing so will break the component. The controller is not a 360-degree rotation type. Do not turn the controller beyond the stopper of the component. The range of rotation is about 260 degrees. For the adjustment of the variable controller, use a flathead screwdriver. The sizes of a recommended flathead screwdrivers are 1.9 mm width, 0.5 mm thickness and more than 0.45 mm length.

#### ① Video out/DC IN/SYNC (video output/DC power input/sync signal I/O) connector (12-pin)

Connect a CCXC-12P05N camera cable to this connector for the +12 V DC power supply and the video signal output from the camera module. When a sync signal generator is connected to this connector, the camera module is synchronized with the external sync signals (HD/VD signals).

#### ② 75 $\Omega$ termination switch

Turn this to OFF when not terminated. (Factory setting: ON)

#### ③ HD/VD signal input/output switch

Set the switch to INT to output HD/VD signals from the camera module. Set the switch to EXT to input HD/VD signals from an external unit. (Factory setting: EXT)

#### ④ Shutter speed/Mode setting DIP switch Shutter speed (bits 1 to 4)

Set an appropriate shutter speed. (Factory setting: OFF)

#### Potential accumulation mode (bit 5):

(Factory setting: FRAME)

#### Restart reset/External trigger shutter mode switch (bits 6-8):

(Factory setting: Normal)

#### $\gamma$ compensation ON/OFF switch (bit 9):

Turn on this switch to enable the  $\gamma$  compensation.

(Factory setting: OFF)

#### GAIN switch (bit 0):

This switch selects MGC (manual adjustment) or AGC (automatic adjustment). (Factory setting: MGC)

#### ⑤ Manual GAIN (M GAIN) control knob

If you have selected MGC with the GAIN switch (DIP switch ②), this knob adjusts the gain. (Factory setting: twelve o'clock position)

### Note

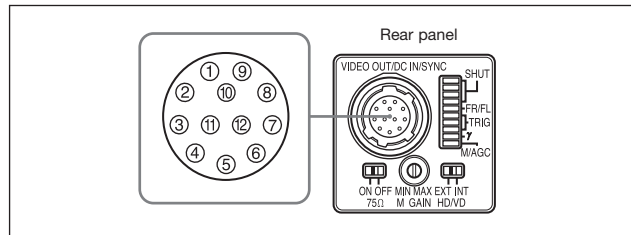
If you have selected FRAME using the Potential accumulation mode (DIP switch ②), set this knob to MAX. (This is due to requirement CCD.)

## Factory Mode Settings of Rear Panel

No.	Switch	Factory-setting mode
②	75 $\Omega$ termination selector switch	ON
③	HD/VD input-output selector switch	EXT
④	Shutter speed/mode setting DIP switch	
	Switches 1 to 4: Select the shutter speed.	OFF
	Switch 5: Selects the frame or field integration.	FRAME
	Switches 6 to 8: Select the trigger shutter mode.	Normal
	Switch 9: Selects gamma correction on/off.	OFF
⑤	Volume control switch	Mechanical center

\* When the GAIN switch is set to "MGC" (Manual), you can change the gain level in a range from 0 dB to 18 dB.

## Connector Pin Assignments



Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output (Signal)	Video output (Signal)
5	HD output (Ground)	HD input (Ground)	HD input (Ground)	HD input (Ground)
6	HD output (Signal)	HD input (Signal)	HD input (Signal)	HD input (Signal)
7	VD output (Signal)	VD input (Signal)	Reset (Signal)	VD input (Signal)
8	—	—	—	—
9	—	—	—	—
10	—	—	—	WEN output (Signal)
11	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	Reset (Ground)

## Normal Shutter

This mode provides continuous video output with the electronic shutter selected by switches to capture a high-speed moving object clearly.

### Setting of the Normal Shutter

- Using the DIP switches on the rear panel

Shutter OFF	1/125	1/250	1/500	1/1000
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/2000	1/4000	1/10000	Flickerless* (EIA: 1/100 CCIR: 1/120)	
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	

(Unit: second)

\* If you set the mode to flickerless, the positions of DIP switches 1 to 3 are optional.

### Note

- The positions of DIP switches 6 and 7 are optional.
- The DIP switch 5 position is optional. (The field setting is recommended.) The field setting can obtain a sensitivity that is twice that of the frame setting.

## External Trigger Shutter

By inputting an external trigger pulse, the camera is able to capture fast-moving objects clearly.

Set DIP switches 6, 7, and 8 on the rear panel to Mode 1 or Mode 2 (See the table below).

When you set the trigger pulse width to 1/3 of a second or more, the output signal changes to the normal VIDEO signal.

There are two modes for timing in which a video signal is obtained.

### • Mode 1 (Non-reset mode)

In this mode, a video signal synchronized with a VD signal is output after a trigger pulse is input.

- A video signal is synchronized with the external VD signal when an external HD/VD signal is input.
- A video signal is synchronized with an internal VD signal when no external HD/VD signal is input.

### • Mode 2 (Reset mode)

In this mode, an internal VD is reset, then an internal video signal is output after trigger pulse input after a certain period of time.

## Setting of the External Trigger Shutter

You can set the shutter speed with the DIP switches or using the trigger pulse width.

### • Using the DIP switches on the rear panel

Mode 1 (Non-reset mode)				Mode 2 (Reset mode)			
1/100 (EIA)* 1/120 (CCIR)*	1/125	1/250	1/500	1/100 (EIA)* 1/120 (CCIR)*	1/125	1/250	1/500
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>
1/1000	1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)	1/1000	1/2000	1/4000	1/10000 (EIA) 1/8000 (CCIR)
1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>	1 <input type="checkbox"/>
2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>
3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>
4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>	5 <input type="checkbox"/>
6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>	6 <input type="checkbox"/>
7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>	7 <input type="checkbox"/>
8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>	9 <input type="checkbox"/>
0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>	0 <input type="checkbox"/>

(Unit: second)

(Unit: second)

\* If 1/100 (EIA) or 1/120 (CCIR) has been set, the positions of DIP switches 1 to 3 are optional.

### Note

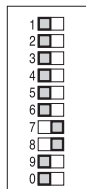
The positions of DIP switches 5, 9 and 0 are optional.

### • Setting the external shutter speed with the trigger pulse width

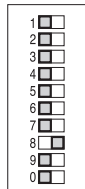
Set all DIP switches (1 to 4 on the rear panel) to 0.

You can obtain an arbitrary shutter speed\* by setting the trigger pulse width to the range of 2  $\mu$ s to 250 ms.

Mode 1 (Non-reset mode)



Mode 2 (Reset mode)



$$\text{Exposure time} = \text{Trigger pulse width} + 97 \mu\text{s (EIA)}$$

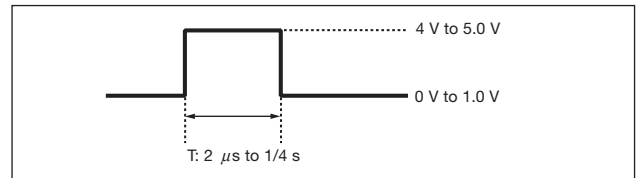
$$\text{Trigger pulse width} + 120 \mu\text{s (CCIR)}$$

\* Variable range  
EIA: 1/4 sec to 1/10,000 sec  
CCIR: 1/4 sec to 1/8,000 sec

### Note

- The DIP switch 5 position is optional. (The field setting is recommended.) The field setting can obtain a sensitivity that is twice that of the frame setting.
- An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

## • Specifications of the Trigger Pulse



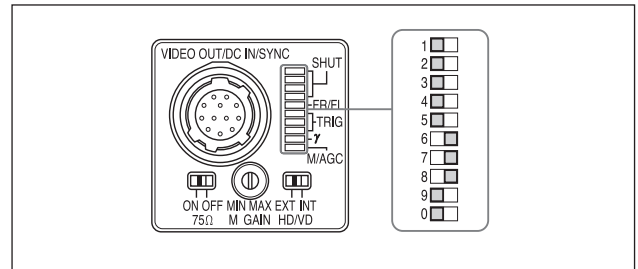
T: If you set the trigger pulse with the DIP switches, use the 100  $\mu$ s to 1/4 sec pulse width.

- Input impedance; 10 k $\Omega$  or more.
- The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

## Restart/Reset

### To Set Restart/Reset Mode

The information on one screen can be extracted at any time by externally inputting a restart/reset signal (HD/VD). To enter this mode, set DIP switches 6, 7, and 8 on the rear panel of the camera as shown in the figure below. The setting is especially effective for the operation explained below.



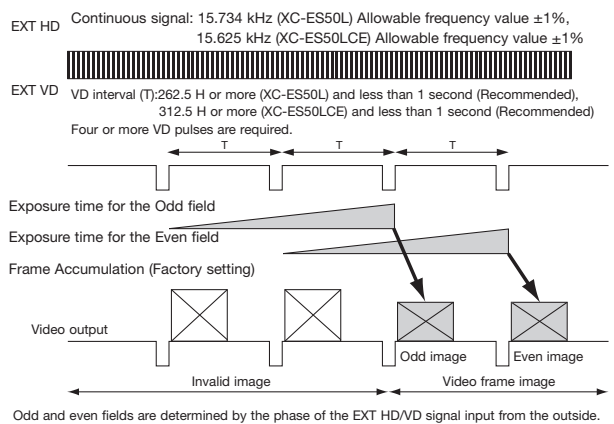
## Long Exposure

The Restart/Reset function extends the CCD accumulation time, resulting in a highly sensitive image. This function is effective when you cannot gain satisfactory sensitivity under normal operating conditions, or when you want to observe a moving object. Extend the VD interval (T) period between external VD pulses.

### Note

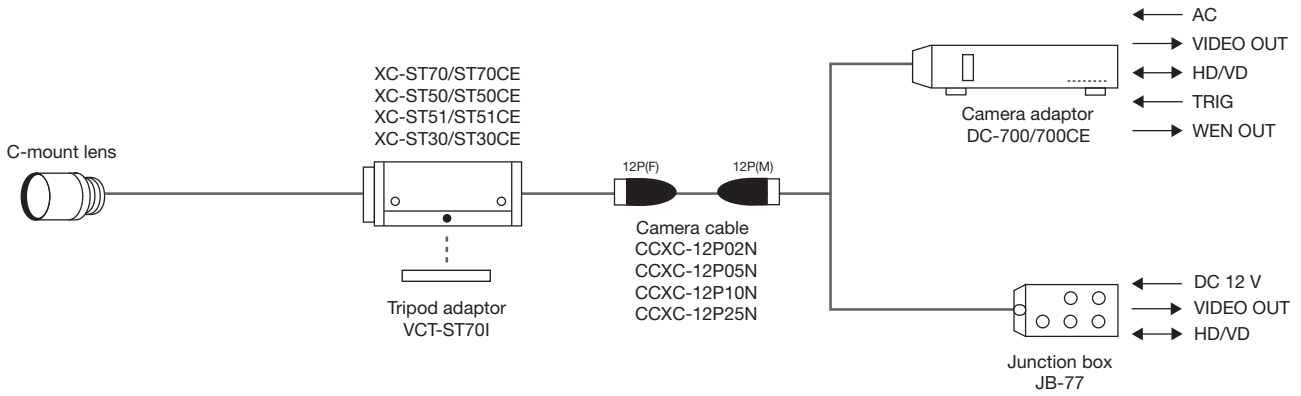
Some white spots may appear after a long exposure.

### Sample input timing chart 1



# Connection Diagram

## XC-ST Series



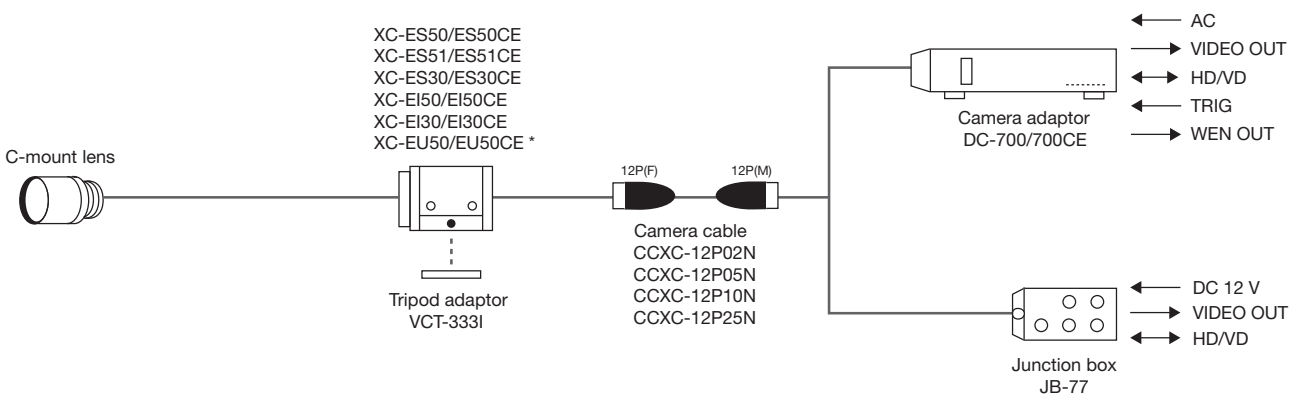
### Note

When using the JB-77, not all of the XC-ST series functions can be used. See the table on the right.

O: Usable X: Not usable

XC-ST Series	JB-77
Normal	O
Normal shutter	O
Restart/reset (R/R)	O
External trigger shutter	X
WEN OUT	X

## XC-E Series



\*Recommended lens for XC-EU/EU50CE : Near UV Lens

### Note

When using the JB-77, not all of the XC-E series functions can be used. See the table on the right.

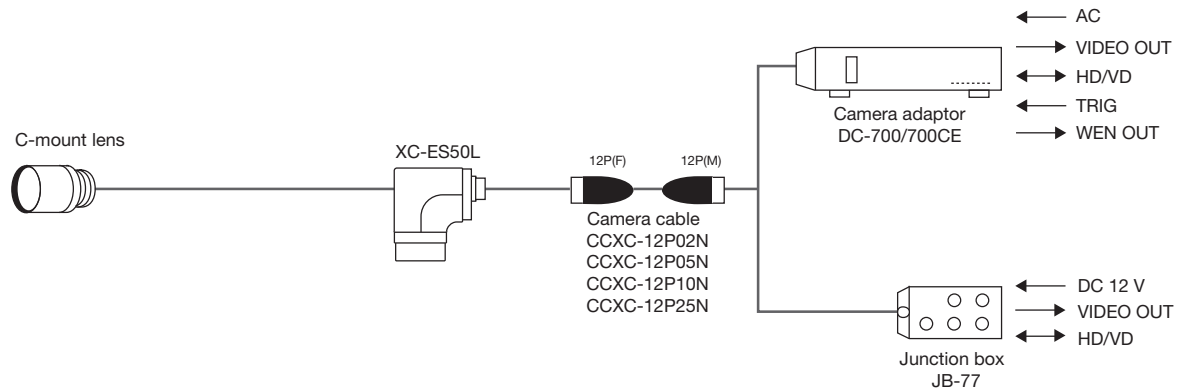
O: Usable X: Not usable

XC-E Series	JB-77
Normal	O
Normal shutter	O
Restart/reset (R/R)	O
External trigger shutter	X
WEN OUT	X



# Connection Diagram

## XC-ES50L



### Note

When using the JB-77, not all of the XC-E series functions can be used. See the table on the right.

O: Usable X: Not usable

XC-E Series	JB-77
Normal	O
Normal shutter	O
Restart/reset (R/R)	O
External trigger shutter	X
WEN OUT	X

# DC-700 (J)

# DC-700 (UC)

# DC-700CE



## Outline

The DC-700/700CE is a compact, lightweight camera adaptor for XC series cameras. In line with the size reduction of XC series cameras, it is smaller and lighter than the conventional power adaptors (DC-77RR and DC-777). It is compatible with all of the XC series cameras and accessories, includes VIDEO OUT 2, TRIG IN, and WEN OUT connections.

## Features

- Compact, lightweight
- External sync input/output
- Trigger input/WEN output
- Built-in high-performance switching power supply

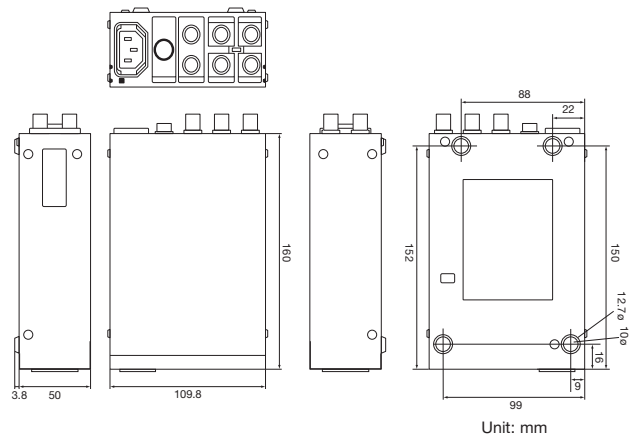
## Specifications

	DC-700 (J)	DC-700 (UC)	DC-700CE
Region	Japan	USA	Europe
Signal system	EIA / NTSC	EIA / NTSC	CCIR / PAL
Power requirements	AC 100 V	AC 100 to 120 V	AC 100 to 240 V
Voltage	50 Hz / 60 Hz		
Output voltage	DC 13 V, 1.3 A		
Power consumption	34 VA	22 W	22 W
Operating temperature/humidity	-5°C to +45°C/10% to 90% (no condensation)		
Storage temperature/humidity	-30°C to +60°C/10% to 90% (no condensation)		
Input terminals	WEN terminal BNC type (1) TRIG terminal BNC type (1) HD terminal BNC type (1) VD/SYNC terminal BNC type (1) VIDEO1 terminal BNC type (1) VIDEO2 terminal BNC type (1) CAMERA terminal 12-pin (1)		
Mass	700 g		
Dimensions (W x H x D)	110 x 53 x 160 mm		
Supplied accessories	Power cord (1), Operating instructions (1), AC plug adaptor (1) (Included with DC-700(J))		
Regulatory compliance	Electrical Appliance and Material Safety Law	UL1310-1+CSAC22.2 No.223, FCC/ICES-003: ClassA	FCC Class A, CE: EN61326 & EN60065, AS/NZ: EN61326, Demko: EN60065

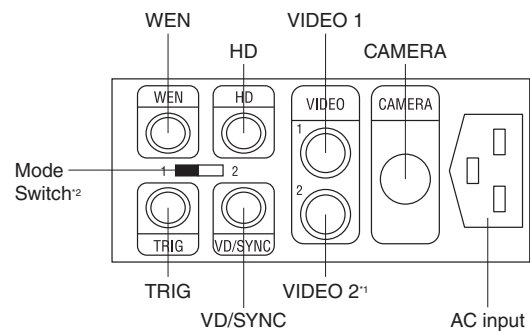
### Note

The above products comply safety standards for each district. Select the product suitable to the district to use.

## Dimensions



## Rear Panel



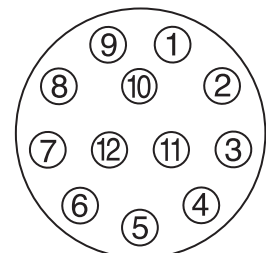
\*1 Two video outputs may not be available for some types of cameras.

This becomes TRIG input terminal when using, XC-56, XC-56B, XC-55, XC-55BB.

\*2 Set the switch to 2 only when using XC-999.

## Connector Pin Assignments

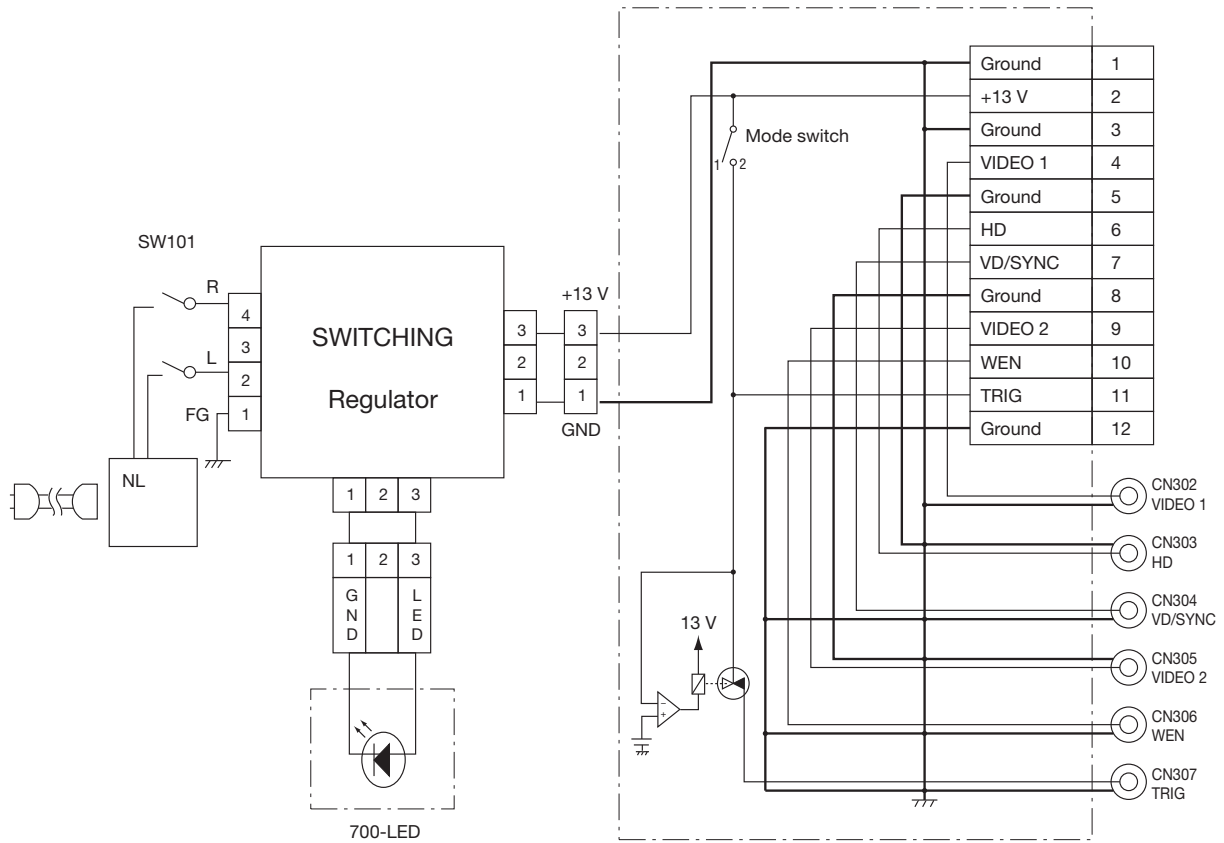
Pin No.	
1	Ground
2	+13 V
3	Ground
4	VIDEO 1
5	Ground
6	HD
7	VD/SYNC
8	Ground
9	VIDEO 2 *
10	WEN
11	TRIG
12	Ground



\* This becomes TRIG input terminal when using XC-55, XC-55BB, XC-56, XC-56BB.

\* The production of underlined models is discontinued.

# Block Diagram



# Comparative Tables

Comparison with DC-77RR and DC-777 Camera Adaptors

	DC-700	DC-77RR	DC-777
Video output	2 video outputs <sup>*1</sup>	2 video outputs <sup>*2</sup> (both identical)	1 video outputs
S-video output	x	x	○
External sync input	○	○	○
Loop-through output	x	○	x
Clock output	x	○	x
WEN output	○	x	x
TRIG input	○	x	x

\*1 Outputs video signals from the 4th pins and the 9th pins of the camera individually.  
(Only in cases of the XC-7500/8500CE (Discontinued model)).

\*2 Video output from pin no. 4 is output from two BNC connectors via two buffer amps.

\* The production of underlined models is discontinued.

XC Series Camera Input/Output Chart for DC-700

Connector	VIDEO 1	VIDEO 2	HD	VD/SYNC	WEN	TRIG	Remarks
12-pin connector pin no.	No.4	No.9	No.6	No.7	No.10	No.11	
XCL-S900/S900C XCL-S600/S600C	GPI 1/GPO 1 *	GPO 4 (ISO)	GPO 2 (ISO +)	GPI 3/GPO 3 *	GPO 4 (ISO +)	GPI 2	*Factory setting: Input
XCL-C500/C500C XCL-C280/C280C XCL-C130/C130C XCL-C32/C32C XCL-C30/C30C	GPO 1	GPO 3	GPO 2	GPI 3	GPI 2	GPI 1 *	*Factory setting: TRIG IN
XCL-5005/5005CR XCL-U100	x	x	x	x	GPO *	TRIG	*Selectable from GND/DVAL output/ Exposure output
XCG-5005E/5005CR XCG-U100E/U100CR XCG-SX99E XCG-SX97E XCG-V60E	Multi Function Out (TTL) *	x	Multi Function Out (ISO) *	GPI In (ISO)	x	TRIG	*Selectable from Exposure output/ Strobe control outputs/GPO
XCD-MV6	Strobe OUT	GPO 2	GPO 1	GPI 2	GPI 1	TRIG	
XCD-U100/U100CR XCD-SX90/SX90CR XCD-V60/V60CR	Strobe OUT	GPO 2	GPO 1	GPI 2	GPI 1	TRIG	
XC-HR90	Video output	x *	HD	VD	WEN	TRIG	*Not available on RS-232C control
XC-HR70 XC-HR50/HR57 XC-HR58	Video output	x	HD	VD	WEN	TRIG	
XC-56/56BB	Video output	TRIG	HD	VD	x	x	
XC-ST Series	Video output	x	HD	VD/VS	WEN	TRIG	
XC-E Series	Video output	x	HD	VD	WEN	TRIG	

**Note**

DC-700 do not support connecting to RS-232C of XC-HR90, XC-505 and XC-555 (Discontinued model).

XCL Digital Video Camera  
XCG Analog Video Camera  
XCD Color Camera Module  
XC (Non-TV Format)  
XC (TV Format)

Accessories

micro  
FCB-HD  
FCB-SD

## Lens Accessories

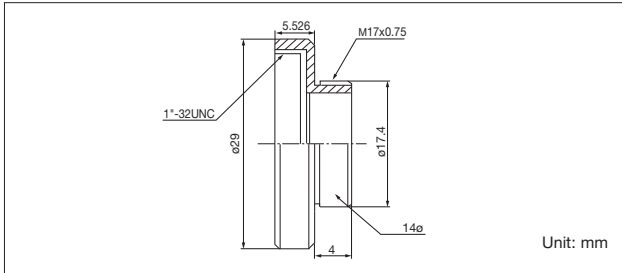
### ■ C-mount adaptor

When a C-mount type lens is attached, a C-mount adaptor (LO-999CMT) is required.

#### LO-999CMT



Mass 12 g



Be sure that the lens does not project more than 4.1 mm from the lens mount.



For setting the camera when using C-mount adaptor, fix the lens mount (C-mount) instead of fixing the camera head in order to avoid applying unnecessary forces to the camera head.

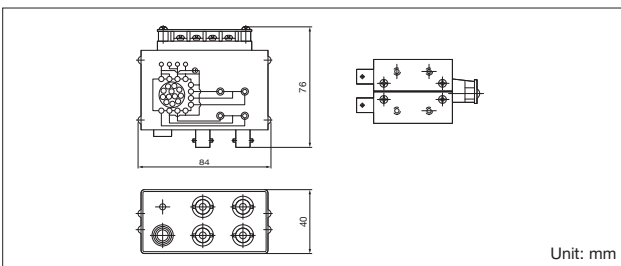
Avoid using C-mount adaptor in the places where vibrations or shocks are applied often. Doing so will damage the equipment or loosen the connection.

## Junction Box

### ■ Junction Box

This junction box enables simple conversion from 12-pin camera cable to BNC. Also, 12 V DC can be supplied from general-purpose power supply to the junction box's power terminal.

#### JB-77



\* TRIG input terminal when using XC-56 and XC-56BB.



- Camera cable connection (12-pin x 1)
- Video OUT (BNC x 1)
- Clock OUT (BNC x 1)
- VD IN/OUT (BNC x 1)
- HD IN/OUT (BNC x 1)

#### <Supplied accessories>

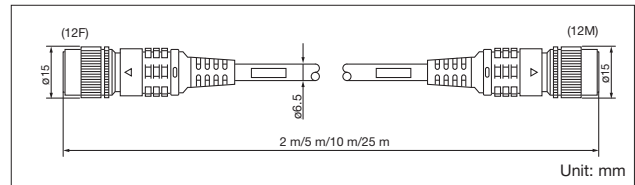
- Mount Blankets (2)
- Screw (4)

## Cables

### ■ Camera cable (for XC series)

This 12-pin camera cable is used for connecting an XC camera to a DC-700/700CE camera adaptor or JB-77 junction box.

- CCXC-12P02N (2 m) (Aspect of connector: straight)
- 12P05N (5 m) (Aspect of connector: straight)
- 12P10N (10 m) (Aspect of connector: straight)
- 12P25N (25 m) (Aspect of connector: straight)

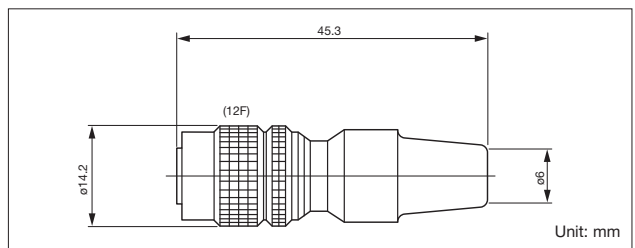


- Camera connection (12-pin/female) ↔ DC-700 (JB-77) connection (12-pin/male)
- Shielded

## Connectors

### ■ Connectors

#### PC-XC12



- 12-pin/female

# Tripod Adaptor

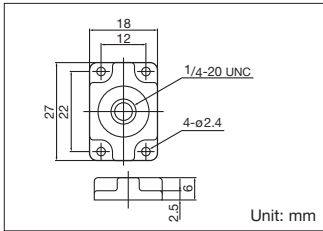
## ■ Tripod Adaptor

Use these adaptors to mount a camera on a tripod. Use the included screws to attach the adaptor to the camera. The adaptors are threaded for commercially available tripods.

### VCT-333I



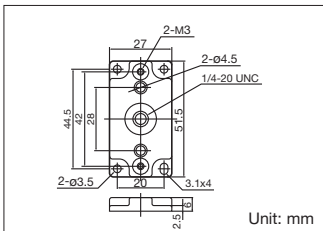
- Material: ABS resin
- Insulated type



### VCT-55I



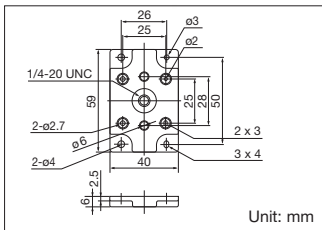
- Material: ABS resin
- Insulated type



### VCT-ST70I



- Material: ABS resin
- Insulated type



# FCB-micro Series Function Chart

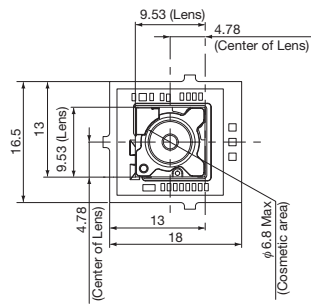
Model		FCB-micro Series		
		FCB-MA130	FCB-MA132	FCB-MA133
Zoom Lens				
Horizontal Viewing Angle	Movie	53°	85°	115°
	Still	58°	94°	128°
Progressive Scan Mode		●	●	●
Wide Dynamic Range		ATR *1	ATR *1	ATR *1
Auto mode				
IS/PS mode				
Defog				
Visibility Enhancer (VE)				
Image Stabilization		●	●	●
StableZoom				
High Resolution Mode				
Digital Output		●	●	●
Auto ICR				
Sync System		Internal	Internal	Internal
Zoom Mode				
Digital Zoom		16x	16x	16x
Spherical Privacy Zone Masking				
Electronic-Flip (E-Flip)		●	●	●
Motion Detection				
Focusing System		One-Push AF, Manual control	Manual control	Manual control
White Balance		Auto, Hold, ATW, Fixed (Light Bulb, Neutral Color Fluorescent Light, Clear Sky, Cloudy Sky, Daylight Color Fluorescent Light, Light Bulb Color Fluorescent Light)	Auto, Hold, ATW, Fixed (Light Bulb, Neutral Color Fluorescent Light, Clear Sky, Cloudy Sky, Daylight Color Fluorescent Light, Light Bulb Color Fluorescent Light)	Auto, Hold, ATW, Fixed (Light Bulb, Neutral Color Fluorescent Light, Clear Sky, Cloudy Sky, Daylight Color Fluorescent Light, Light Bulb Color Fluorescent Light)
AE (Auto exposure mode)		Auto, Hold, Manual, Shutter priority, Gain priority	Auto, Hold, Manual, Shutter priority, Gain priority	Auto, Hold, Manual, Shutter priority, Gain priority
Slow Shutter		●	●	●
Slow AE Response				
Exposure Compensation		● (0 step to + 13 step, 1/3 EV step/Total, 13 steps)	● (0 step to + 13 step, 1/3 EV step/Total, 13 steps)	● (0 step to + 13 step, 1/3 EV step/Total, 13 steps)
Aperture Control				
Backlight Compensation		●	●	●
Gamma				
Mirror Image		●	●	●
Alarm				
Picture Effects				
Picture Freeze		●	●	●
Noise Reduction		3D	3D	3D
Temperature Readout				
Title Display				
Date/Time Display				
Camera Mode Display				
Camera Control Interface		I2C	I2C	I2C
Key Switch Control				
Camera Operation Switch				

\*1 ATR: ATR(Adaptive Tone Reproduction) have the same effect as Wide Dynamic Range.

\* StableZoom is a trademark of Sony Corporation.

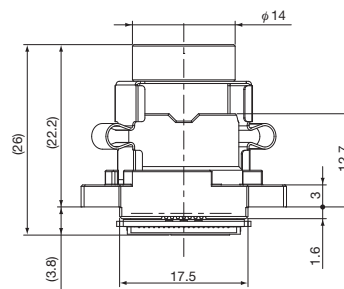
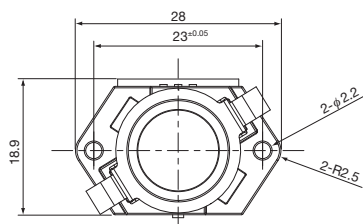
# Dimensions FCB-micro Series

## < FCB-MA130 >



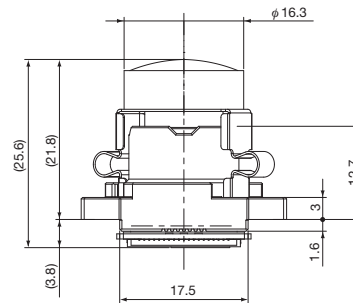
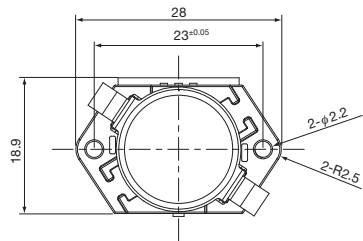
Unit: mm

## < FCB-MA132 >



Unit: mm

## < FCB-MA133 >



Unit: mm

XCL  
XCG  
XCD

XC (Non-TV Format)  
XC (TV Format)

Accessories

micro  
FCB-HD  
FCB-SD

Digital Video Camera

Analog Video Camera

Color Camera Module

FCB-micro Series

**FCB-MA130**  
**FCB-MA132** (NEW)  
**FCB-MA133** (NEW)



Outline

The FCB-micro series are color camera modules that incorporate an Exmor™ CMOS image sensor and Sony's unique ISP in a compact size with high-density mounting technology, which is ideal for industrial applications.

Combined with the FCB-MA130 using a specialized lens and incorporating one-push AF (auto focus) function, and newly launched FCB-MA132 and FCB-MA133 using fixed focus M12 mount lenses, and supporting 94° and 128° angle-of-view capabilities, a full line-up of FCB-micro series has finally been completed.

The FCB-micro series with various functions such as image stabilizer (camera shake correction), face detection, adaptive tone reproduction, and backlight compensation enables you to capture full HD resolution movies and still images of up to 13 megapixels.

With several lens version covering from narrow to wide angle-of-view capabilities, in addition to high-definition, high-performance and compact cases, the FCB-micro series is suitable for a broad range of applications to satisfy your needs.

Image sensor : 1/2.45-type Exmor CMOS image sensor  
 Approx. 13.19 Megapixels

**FCB-MA130**  
 Fixed focal length lens (5.3 mm) F2.8 (Fixed),  
 Piezo actuator motor

**FCB-MA132**  
 Fixed focal length lens (3.8 mm) F2.2 (Fixed)

**FCB-MA133**  
 Fixed focal length lens (2.8 mm) F2.8 (Fixed)

Features

- Supports Still Images and Video at a high resolution  
 Output pixels (Full resolution):  
 Movie image 1920 (H) x 1080 (V)  
 Still image 4192 (H) x 3104 (V)
- Output pixels (H x V)  
 Moving image: 1920 x 1080 (FHD), 1600 x 1200 (UXGA),  
 1280 x 960 (SXGA), 1280 x 720 (HD),  
 1024 x 768 (XGA), 800 x 480 (WVGA),  
 640 x 480 (VGA); 30 fps/25 fps \*1  
 Still image: 4192 x 3104, 4128 x 3096 (13M),  
 3264 x 2448 (8 M), 2592 x 1944 (5 M),  
 1920 x 1080 (FHD), 1280 x 960 (SXGA),  
 1280 x 720 (HD), 640 x 480 (VGA)
- \*1 Non-standard video format of ITU-R BT.1120.
- Video Output  
 CMOS:  
 CMOS Clock 81 MHz,  
 Parallel 16 bit (Y/Cb/Cr 4:2:2 / SAV, EAV) / Sync Signal (HD, VD)  
 MIPI:  
 MIPI D-PHY Clock 324 MHz,  
 Data 2lane CSI-2 (Y/Cb/Cr 4:2:2)
- Digital zoom 16x
- ATR (Adaptive Tone Reproduction)
- Backlight Correction
- Face Detection
- Noise reduction (3D)
- Image Stabilization
- AF mode (Focusing system)
- AE (Auto exposure mode)  
 Auto, Hold, Manual, Shutter priority, Gain priority
- Picture effects
- White Balance
- Sync System: Internal
- Camera Control Interface: I2C
- Dimensions (W x H x D)/Mass  
 FCB-MA130 : 16.5 x 10.3 x 18.0 mm, Mass : Approx 2.2g  
 FCB-MA132 : 28.0 x 26.0 x 18.9 mm, Mass : Approx 9.7g  
 FCB-MA133 : 28.0 x 25.6 x 18.9 mm, Mass : Approx 8.7g

Digital Video Camera XCL XCG XCD  
 Analog Video Camera XC (Non-TV Format) XC (TV Format)  
 Accessories  
 Color Camera Module FCB-HD FCB-SD



# Features

## Angle-of-View Size

Product Name			FCB-MA130	FCB-MA132	FCB-MA133
Lens Type			Single focal lens		
F Number			F2.8 (Fixed)	F2.2 (Fixed)	F2.8 (Fixed)
Digital Zoom			16x		
Focus System			One push AF, Manual control	Manual control	
Angle-of-View	Moving Images 1080 mode (Full HD)	Horizontal	53°	85°	115°
		Vertical	29°	46°	62°
	Still Images (13 Mega)	Horizontal	58°	94°	128°
		Vertical	42°	67°	91°

< Image examples >



58° HFOV  
(FCB-MA130)



94° HFOV  
(FCB-MA132)



128° HFOV  
(FCB-MA133)

Note: As the angle becomes wider, the surrounding image becomes distorted.

## Incorporating a 1/2.45-type Exmor™ CMOS Sensor

Either the moving image output or still image can be selected for high resolution images.

Maximum size of 1920 (H) x 1080 (V) for moving images and 4192 (H) x 3104 (V) for still images can be output.

### ● Moving Images

H Effective Pixel	V Effective Pixel	Number of Output Pixels	Frame Rate
1920	1080	Full HD (16:9)	30.0 fps / 25.0 fps
1600	1200	UXGA (4:3)	30.0 fps / 25.0 fps
1280	960	SXGA (4:3)	30.0 fps / 25.0 fps
1280	720	HD (16:9)	30.0 fps / 25.0 fps
1024	768	XGA (4:3)	30.0 fps / 25.0 fps
800	480	WVGA	30.0 fps / 25.0 fps
640	480	VGA	30.0 fps / 25.0 fps

### ● Still Images

H Effective Pixel	V Effective Pixel	Number of Output Pixels
4192	3104	13 Mega
4128	3096	13 Mega (4:3)
3264	2448	8 Mega
2592	1944	5 Mega
1920	1080	Full HD (16:9)
1280	960	SXGA (4:3)
1280	720	HD (16:9)
640	480	VGA

Note: In the still image mode, the same image is repeatedly output at regular intervals.

## Focus System

FCB-MA130: One push AF, Manual control

FCB-MA132/MA133: Manual control

## Face Detection

It can be set to "ON" or "OFF" and detect up to 8 individual faces by linking with AE.



(\* Image)

## Image Stabilizer

Image stabilizer function reduces image blurring cause by vibration with Digital processing

## Adaptive Tone Reproduction (ATR)

This technology enables the reproduction of high luminance areas without decreasing the image contrast.

An effect similar to the Wide Dynamic range can be achieved by using the ATR.



When this function is set to "OFF"  
(\* Image)

When this function is set to "ON"  
(\* Image)

## Backlight Correction



When this function is set to "OFF"  
(\* Image)

When this function is set to "ON"  
(\* Image)

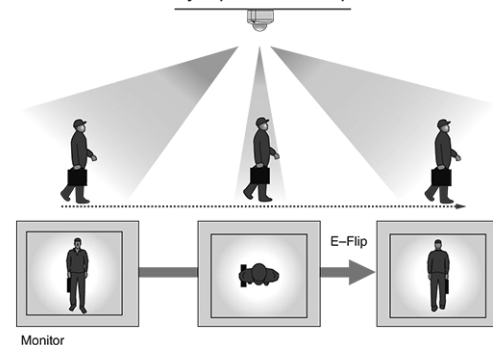
## Automatic Exposure Mode

Auto, Hold, Manual, Shutter priority, Gain priority

## Picture Effects

- Flip horizontal (Mirror)
- Flip vertical (E-Flip)

This function vertically flips video outputs from the camera.



## Noise Reduction

By combining 2D and 3D noise reduction, the camera offers a wide selection of noise-reduction settings, from Level 1 to Level

5, to allow you to choose the ideal level for different shooting conditions.

## White Balance

- Auto, Hold
- ATW, Fixed (Light Bulb, Neutral Color Fluorescent Light, Clear Sky, Cloudy Sky, Daylight Color Fluorescent Light, Light Bulb Color Fluorescent Light)

# Specifications

			FCB-MA130	FCB-MA132	FCB-MA133
<b>Camera</b>					
Image sensor (Number of effective pixels)		1/2.45-type Exmor CMOS (Approx. 13.19 Megapixels)			
Output pixels	Movie image (H × V) *1	1920 × 1080 (FHD), 1600 × 1200 (UXGA), 1280 × 960 (SXGA), 1280 × 720 (HD), 1024 × 768 (XGA), 800 × 480 (WVGA), 640 × 480 (VGA) ; 30 fps/25 fps			
	Still image (H × V)	4192 × 3104, 4128 × 3096 (13M), 3264 × 2448 (8M), 2592 × 1944 (5M), 1920 × 1080 (FHD), 1280 × 960 (SXGA), 1280 × 720 (HD), 640 × 480 (VGA)			
Gain		Auto (2 dB to 36 dB)			
Shutter speed		1/25 to 1/5,000 sec, 24 steps			
Sync system		Internal			
AE (Auto exposure mode)		Auto, Hold, Manual, Shutter priority, Gain priority			
Backlight compensation		Yes			
White balance		Auto, Hold, ATW, Fixed (Light Bulb, Neutral Color Fluorescent Light, Clear Sky, Cloudy Sky, Daylight Color Fluorescent Light, Light Bulb Color Fluorescent Light)			
Lens		Fixed focal length lens (f=5.3 mm) F2.8 (Fixed), Piezo actuator motor	Fixed focal length lens (f=3.8 mm) F2.2 (Fixed)	Fixed focal length lens (f=2.8 mm) F2.8 (Fixed)	
Digital zoom		16×			
Focusing system		One-push AF, Manual control	Manual control *2	Manual control *2	
Angle-of-View	Moving Images 1080 mode (Full HD)	Horizontal	53°	85°	115°
		Vertical	29°	46°	62°
	Still Images (13 Mega)	Horizontal	58°	94°	128°
		Vertical	42°	67°	91
Minimum object distance		100 mm	–	–	
<b>Camera Features</b>					
Auto ICR		No	No	No	
Adaptive Tone Reproduction (ATR)		Yes	Yes	Yes	
Noise reduction		3D	3D	3D	
Image stabilization	Movie image	Yes	Yes	Yes	
	Still image	Yes	Yes	Yes	
Face Detection		Yes	Yes	Yes	
Picture effects	Electronic-Flip (E-Flip)	Yes	Yes	Yes	
	Mirror image	Yes	Yes	Yes	
<b>Interface</b>					
Video output	CMOS	CMOS Clock 81 MHz, Parallel 16 bit (Y/Cb/Cr 4:2:2 / SAV, EAV) / Sync Signal (HD, VD)			
	MIPI	MIPI D-PHY Clock 324 MHz, Data 2lane CSI-2 (Y/Cb/Cr 4:2:2)			
Camera control interface		I2C			
<b>General</b>					
Power requirements		3.3±0.1, 1.8±0.1, 1.2-0.05/+0.1 V DC			
Power consumption		700 mW 730 mW (AF Movie image)	710 mW		
Operating temperature		–5°C to +50°C	–5°C to +50°C *3		
Storage temperature		–20°C to +60°C	–20°C to +60°C		
Operating humidity		20% to 80% (no condensation)			
Dimensions (W × H × D)		16.5 × 10.3 × 18.0 mm	28.0 × 26.0 × 18.9 mm	28.0 × 25.6 × 18.9 mm	
Mass		Approx. 2.2 g	Approx. 9.7 g	Approx. 8.7 g	

\*1 Non-standard video format of ITU-R BT.1120.

\*2 Adjust the focus to operating distance.

\*3 Focus position fluctuates according to temperature change.  
Adjust the focus to operating temperature condition.

\* Exmor is a trademark of Sony Corporation.

## Connector Pin Assignments

Pin No.	Symbol	I/O	Description
1	GND	–	GND
2	GND	–	GND
3	VDD_33	–	Power Supply (3.3 V)
4	VDD_33	–	Power Supply (3.3 V)
5	VDD_33	–	Power Supply (3.3 V)
6	VDD_12	–	Power Supply (1.2 V)
7	VDD_12	–	Power Supply (1.2 V)
8	VDD_12	–	Power Supply (1.2 V)
9	VDD_18	–	Power Supply (1.8 V)
10	GND	–	GND
11	GND	–	GND
12	N.C.	–	Not Connected
13	TRIG	O	Mode Transition Signal
14	C7	O	Parallel Output Video Data (Chroma Parallel Data 7)
15	C6	O	Parallel Output Video Data (Chroma Parallel Data 6)
16	C5	O	Parallel Output Video Data (Chroma Parallel Data 5)
17	C4	O	Parallel Output Video Data (Chroma Parallel Data 4)
18	C3	O	Parallel Output Video Data (Chroma Parallel Data 3)
19	C2	O	Parallel Output Video Data (Chroma Parallel Data 2)
20	C1	O	Parallel Output Video Data (Chroma Parallel Data 1)
21	C0	O	Parallel Output Video Data (Chroma Parallel Data 0)
22	DLCK	O	Parallel Output Video Clock
23	Y7	O	Parallel Output Video Data (Luminance Parallel Data 7)

\*1 An external pull-up resistor (10k Ω) is recommended.

Pin No.	Symbol	I/O	Description
24	Y6	O	Parallel Output Video Data (Luminance Parallel Data 6)
25	Y5	O	Parallel Output Video Data (Luminance Parallel Data 5)
26	Y4	O	Parallel Output Video Data (Luminance Parallel Data 4)
27	Y3	O	Parallel Output Video Data (Luminance Parallel Data 3)
28	Y2	O	Parallel Output Video Data (Luminance Parallel Data 2)
29	Y1	O	Parallel Output Video Data (Luminance Parallel Data 1)
30	Y0	O	Parallel Output Video Data (Luminance Parallel Data 0)
31	HD	O	Parallel Output Video H-Active Signal
32	VD	O	Parallel Output Video V-Active Signal
33	GND	O	GND
34	MIPI_D0-	O	MIPI Output Data Lane 0 (-)
35	MIPI_D0+	O	MIPI Output Data Lane 0 (+)
36	MIPI_CK-	O	MIPI Output Clock (-)
37	MIPI_CK+	O	MIPI Output Clock (+)
38	MIPI_D1-	O	MIPI Output Data Lane 1 (-)
39	MIPI_D1+	O	MIPI Output Data Lane 1 (+)
40	GND	O	GND
41	XRST	I	System Reset, or not connected
42	SDA	IO	I2C Serial Bus Data I/O *1
43	SCL	I	I2C Serial Bus Clock *1
44	GND	O	GND
45	GND	O	GND

XCL  
XCG  
XCD

XC (Non-TV Format)  
XC (TV Format)

Accessories

micro  
FCB-HD  
FCB-SD

# FCB Series Function Chart

Model	FCB-HD series					
	FCB-EV7500	FCB-EV7300	FCB-EV7310	FCB-EV7100	FCB-EV5500	FCB-EV5300
Zoom Lens	30x	20x	20x	10x	30x	20x
Progressive Scan Mode	●	●	●	●	●	●
Wide Dynamic Range	●	●		●	●	●
Auto Mode	● <sup>*2</sup>	● <sup>*2</sup>		● <sup>*2</sup>	● <sup>*2</sup>	● <sup>*2</sup>
IS/PS Mode	●	●		●	●	●
Visibility Enhancer (VE)	●	●	●	●	●	●
Defog	● (low/mid/high)	● (low/mid/high)	● (low/mid/high)	● (low/mid/high)	● (low/mid/high)	● (low/mid/high)
Image Stabilization	●	●			●	●
StableZoom (Magnification) <sup>*1</sup>	● (36x)	● (24x)	● (24x)	● (12x)	● (36x)	● (24x)
High Resolution Mode	●	●	●	●	●	●
Digital Output	●	●	●	●	●	●
Auto ICR	●	●	●	●	●	●
Sync System	Internal					
Zoom Mode	Standard Speed Mode/Variable Speed Mode/Direct Mode					
Digital Zoom	● (12x)	● (12x)	● (12x)	● (12x)	● (12x)	● (12x)
Spherical Privacy Zone masking	●	●	●	●	●	●
Electronic-Flip (E-Flip)	●	●	●	●	●	●
Motion Detection	●	●	●	●	●	●
Focusing System	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Near Limit, ICR-on Focus compensation					
White Balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode (fix/auto/Outdoor Auto), One Push WB, Manual WB					
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Slow AE					
Slow Shutter	●	●	●	●	●	●
Slow AE Response	●	●	●	●	●	●
Exposure Compensation	● (0 step to + 28 step, 2 step/Total 15 steps)					
Aperture Control	● (16 steps)	● (16 steps)	● (16 steps)	● (16 steps)	● (16 steps)	● (16 steps)
Backlight Compensation	●	●	●	●	●	●
Gamma	Standard/Straight gamma					
Mirror Image	●	●	●	●	●	●
Alarm	●	●	●	●	●	●
Picture Effects	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement					
Picture Freeze	●	●	●	●	●	●
Noise Reduction	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)
Temperature Readout	●	●	●	●	●	●
Title Display	● (20 characters/line, max. 11 lines)					
Date/Time Display						
Camera Mode Display	● (English)	● (English)	● (English)	● (English)	● (English)	● (English)
Camera Control Interface	VISCA protocol (CMOS 5 V level) Baud rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, 115.2 kbps, Stop bit: 1 bit					
Key Switch Control						
Camera Operation Switch						

<sup>\*1</sup> StableZoom: Stable zoom incases the magnification is that combined optical zoom and digital zoom.

<sup>\*2</sup> Wide Dynamic Range(Auto Mode): When Wide-D is activated, it automatically switch to Auto mode.

<sup>\*</sup> StableZoom is a trademark of Sony Corporation.

Model Functions	FCB-EX series					
	F Version					
	FCB-EX2700	FCB-EX2700P	FCB-EX2400	FCB-EX2400P	FCB-EX2200	FCB-EX2200P
Zoom Lens	40x		28x		18x	
Progressive Scan Mode	●	●	●	●	●	●
Wide Dynamic Range	●	●	●	●	●	●
	Auto Mode	●*2	●*2	●*2	●*2	●*2
	IS/PS Mode	●	●	●	●	●
Visibility Enhancer (VE)	●	●	●	●	●	●
Defog	●	●	●	●	●	●
Image Stabilization	●	●	●	●		
StableZoom (Magnification) *1	● (44x)	● (44x)	● (31x)	● (31x)		
High Resolution Mode	●	●	●	●	●	●
Digital Output	●	●	●	●	●	●
Auto ICR	●	●	●	●	●	●
Sync System	Internal/External (V-Lock)					
Zoom Mode	Standard Speed Mode/Variable Speed Mode/Direct Mode					
Digital Zoom	● (12x)	● (12x)	● (12x)	● (12x)	● (12x)	● (12x)
Spherical Privacy Zone masking	● (Spherical, Color, Harftone, with mosaic effect)					
Electronic-Flip (E-Flip)	●	●	●	●	●	●
Motion Detection	●	●	●	●	●	●
Focusing System	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Near Limit, ICR-on Focus compensation					
White Balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode (fix/auto), One Push WB, Manual WB					
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Slow AE					
Slow Shutter	●	●	●	●	●	●
Slow AE Response	● (max. 2 min.)	● (max. 2 min.)	● (max. 2 min.)	● (max. 2 min.)	● (max. 2 min.)	● (max. 2 min.)
Exposure Compensation	● (- 3 step to + 28 step, 2 step/Total 16 steps)					
Aperture Control	● (16 steps)	● (16 steps)	● (16 steps)	● (16 steps)	● (16 steps)	● (16 steps)
Backlight Compensation	●	●	●	●	●	●
Gamma	Standard					
Mirror Image	●	●	●	●	●	●
Alarm	●	●	●	●	●	●
Picture Effect	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement					
Picture Freeze	●	●	●	●	●	●
Noise Reduction	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)	● (3D + 2D)
Temperature Readout	●	●	●	●	●	●
Title Display	● (20 characters/line, max. 11 lines)					
Date/Time Display						
Camera Mode Display	● (English)	● (English)	● (English)	● (English)	● (English)	● (English)
Camera Control Interface	VISCA protocol (CMOS 5 V level) Baud rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1 bit					
Key Switch Control						
Camera Operation Switch	●	●	●	●	●	●

\*1 StableZoom: Stable zoom incases the magnification is that combined optical zoom and digital zoom.  
\*2 Wide Dynamic Range(Auto Mode): When Wide-D is activated, it automatically switch to Auto mode.

\* StableZoom is a trademark of Sony Corporation.

Model	FCB-EX series							
	E Version							
	FCB-EX1020	FCB-EX1020P	FCB-EX995E	FCB-EX995EP	FCB-EX985E	FCB-EX985EP	FCB-EX490E	FCB-EX490EP
Zoom Lens	36x		28x		28x		18x	
Progressive Scan Mode	●		●		(Interrace mode only)		●	
Wide Dynamic Range	●		●				●	
Auto Mode	●		●				●	
IS/PS Mode	●		●				●	
Visibility Enhancer (VE)								
Defog								
Image Stabilization	●		●		●			
StableZoom (Magnification) *1	● (40x)		● (31x)		● (31x)			
High Resolution Mode	●		●		●		●	
Digital Output	●		●		●		●	
Auto ICR	●		●		●		●	
Sync System	Internal/External (V-Lock)							
Zoom Mode	Standard Speed Mode/Variable Speed Mode/Direct Mode							
Digital Zoom	● (12x) (Combine Mode/Separate Mode)		● (12x) (Combine Mode/Separate Mode)		● (12x) (Combine Mode/Separate Mode)		● (12x) (Combine Mode/Separate Mode)	
Spherical Privacy Zone Masking	● (Spherical, Color, Half tone, mosaic effect)							
Electronic-Flip (E-Flip)	●		●		●		●	
Motion Detection	●		●		●		●	
Focusing System	Auto Focus (Normal, Interval AF, Zoom Trigger AF, [Sensitivity: normal, low]), Manual, One-push AF, Infinity, ICR-ON Focus Compensation							
White Balance	Auto WB, ATW, Indoor, Outdoor, (fix/auto), Sodium Vapor Lamp (fix/auto), One push WB, Manual WB							
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, Spot Exposure, Slow AE							
Slow Shutter	●		●		●		●	
Slow AE Response	● (Max. 2 min.)		● (Max. 2 min.)		● (Max. 2 min.)		● (Max. 2 min.)	
Exposure Compensation	● (-10.5 dB to +10.5 dB, 1.5 dB step/Total 15 steps)							
Aperture Control	● (16 steps)							
Backlight Compensation	●		●		●		●	
Gamma	Standard							
Mirror Image	●		●		●		●	
Alarm	●		●		●		●	
Picture Effects	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement							
Picture Freeze	●		●		●		●	
Noise Reduction	● (3D + 2D)		● (3D + 2D)		● (3D + 2D)		● (3D + 2D)	
Temperature Readout	●		●		●		●	
Title Display	● (20 characters/line, max. 11 lines)		● (20 characters/line, max. 11 lines)		● (20 characters/line, max. 11 lines)		● (20 characters/line, max. 11 lines)	
Date/Time Display								
Camera Mode Display	● (English*, Chinese) * Default		● (English*, Chinese) * Default		● (English*, Chinese) * Default		● (English*, Chinese) * Default	
Camera Control Interface	VISCA protocol (CMOS 5 V level) Baud rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1/2 bit (selectable)							
Key Switch Control	●		●		●		●	
Camera Operation Switch	● (Zoom Tele, Zoom Wide)		● (Zoom Tele, Zoom Wide)		● (Zoom Tele, Zoom Wide)		● (Zoom Tele, Zoom Wide)	

\*1 StableZoom: Stable zoom incases the magnification is that combined optical zoom and digital zoom.

\* StableZoom is a trademark of Sony Corporation.

Model  Functions	FCB-EX series				FCB-IX series	
	E Version				FCB-IX11A FCB-IX11AP	FCB-IX47C FCB-IX47CP
	FCB-EX48E	FCB-EX48EP	FCB-EX15E	FCB-EX15EP		
Zoom Lens	18x		12x		10x	18x
Progressive Scan Mode	(Interrace mode only)				●	
Wide Dynamic Range					●	
Auto Mode					●	
IS/PS Mode					●	
Visibility Enhancer (VE)						
Defog						
Image Stabilization						
StableZoom (Magnification) *1						
High Resolution Mode	●		●			
Digital Output	●		●			
Auto ICR			●			
Sync System	Internal/External (V-Lock)				Internal	
Zoom Mode	Standard Speed Mode/Variable Speed Mode/Direct Mode				Standard Speed Mode/Variable Speed Mode/Direct Mode	
Digital Zoom	● (12x) (Combine Mode/Separate Mode)		● (12x) (Combine Mode/Separate Mode)		● (4x) (Combine Mode/Separate Mode)	
Spherical Privacy Zone Masking	● (Spherical, Color, Half tone, with mosaic effect)				● (Spherical, Color, Half tone)	
Electronic-Flip (E-Flip)	●		●		●	
Motion Detection	●		●		●	
Focusing System	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual One Push Trigger, Infinity ICR-on Focus compensation *2				Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual, One Push Trigger, Infinity, Near Limit	
White Balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode (fix/auto), One Push WB, Manual WB		Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode (fix/auto), One Push WB, Manual WB		Auto WB, ATW, Indoor, Outdoor, One Push WB, Manual WB	
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, Spot Exposure, Slow AE		Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Spot Exposure, Slow AE		Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Spot Exposure, Slow AE	
Slow Shutter	●		●		●	
Slow AE Response	● (Max. 2 min.)		● (Max. 2 min.)		●	
Exposure Compensation	● (-10.5 dB to +10.5 dB, 1.5 dB step/Total 15 steps)				● (-10.5 dB to +10.5 dB, 1.5 dB step/Total 15 steps)	
Aperture Control	● (16 steps)				● (16 steps)	
Backlight Compensation	●		●		●	
Gamma	Standard					
Mirror Image	●		●		●	
Alarm	●		●		●	
Picture Effects	Neg. Art (Negative/Positive Reversal), Color enhancement, Black White (Monochrome Image)				Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image)	
Picture Freeze	●		●		●	
Noise Reduction	● (3D + 2D)		● (3D + 2D)		● (FIX)	
Temperature Readout	●		●			
Title Display	● (20 characters/line, max. 11 lines)		● (20 characters/line, max. 11 lines)		● (One-Line only, 20 characters/line)	
Date/Time Display					●	
Camera Mode Display	● (English*, Chinese) * Default		● (English*, Chinese) * Default		● (English)	
Camera Control Interface	VISCA protocol (CMOS 5 V level) Baud rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1/2 bit (selectable)		VISCA protocol (CMOS 5 V level) Baud Rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1 bit		VISCA protocol (RS-232C level/CMOS 5 V level) Baud rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1 bit	
Key Switch Control	●				●	
Camera Operation Switch	● (Zoom Tele, Zoom Wide)				● (Zoom Tele, Zoom Wide)	

\*1 StableZoom: Stable zoom incases the magnification is that combined optical zoom and digital zoom.  
\*2 ICR-on Focuss Compensation (FCB-EX15E/EX15EP)

\* StableZoom is a trademark of Sony Corporation.

FCB-HD Series • EV Series

**FCB-EV7500**  
**FCB-EV7300** NEW  
**FCB-EV7310** NEW  
**FCB-EV7100**



FCB-EV7500

FCB-EV7300  
FCB-EV7310

FCB-EV7100

Outline

The FCB-EV7000 series are high-resolution color modules that support HD video formats, incorporating Sony's latest Exmor™ CMOS sensor and newly developed ISP. Combined with new 20x optical zoom color models, visibility has been greatly enhanced by various functions including 130dB achievable wide dynamic range function and three level selectable Defog function. The FCB-EV7310 with a high sensitive sensor in near-infrared domains enables you to capture images with high fidelity even in dark environments. Furthermore, the same interface is used for the FCB-EV series.

Image sensor: Exmor CMOS image sensor  
 1/2.8-type Exmor CMOS image sensor

Auto Focus Zoom Lens

FCB-EV7500  
 30x optical zoom Auto Focus Zoom Lens  
 f = 4.3 mm (wide) to 129.0 mm (tele), F1.6 to F4.7

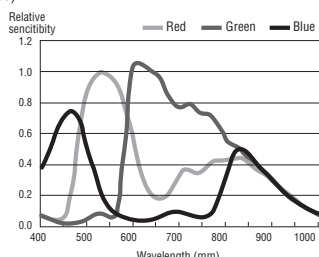
FCB-EV7300/EV7310  
 20x optical zoom Auto Focus Zoom Lens  
 f = 4.7 mm (wide) to 94.0 mm (tele), F1.6 to F3.5

FCB-EV7100  
 10x optical zoom Auto Focus Zoom Lens  
 f = 3.8 mm (wide) to 38.0 mm (tele), F1.8 to F3.4

Features

- **Format**  
 HD: 1080p/60, 1080p/59.94, 1080p/50,  
 1080p/30, 1080p/29.97, 1080p/25,  
 1080i/60, 1080i/59.94, 1080i/50,  
 720p/60, 720p/59.94, 720p/50,  
 720p/30, 720p/29.97, 720p/25  
 SD: NTSC/PAL
- **Output pixels (H x V)**  
 1920 x 1080, 1280 x 720
- **Video output**  
 FCB-EV7500/EV7300/EV7100  
 HD : Analog : Component Y/Pb/Pr  
 FCB-EV7500/EV7300/EV7310/EV7100  
 HD : Digital : Y/Pb/Pr 4 : 2 : 2 (LVDS)  
 (SMPTE 274M/SMPTE 296M)  
 SD : VBS 1.0 Vp-p (sync negative)
- **Sensitivity in near-frared High scenticity sensor :**  
 FCB-EV7310

Spectral Sensitivity (relative response) \* Without lens and light source parameters.



- **Wide-D : FCB-EV7500/EV7300/EV7100**  
 It enables you to obtain images in which portions ranging from dark to light can be recognized, even when capturing a subject with a large intensity difference that is backlit or includes extremely light portions. The wide dynamic range mode corrects blocked-up shadows and blown-out highlights in accordance with the intensity difference. This mode can be set to be switched automatically ON/OFF in accordance with the intensity difference of the subject. Upgraded wide-D supports 130dB.
- **Visibility Enhancer (VE)**  
 Depending on the imaging scene, the Visibility Enhancer function makes the darker part of a camera image brighter, and automatically correct brightness and contrast to show bright parts clearly.
- **Defog**  
 When the surrounding area of the subject is foggy and low contrast, the defog mode will make the subject appear clearer.
- **Noise reduction (3D + 2D)**
- **Auto ICR**  
 An infrared (IR) Cut-Filter can be disengaged from the image path for increased sensitivity in low light environments. The ICR will automatically engage depending on the ambient light, allowing the camera to be effective in day/night environments.
- **Digital zoom 12x**
- **Privacy Zone Masking**  
 Privacy Zone protects private objects and areas such as house windows, entrances, and exits which are within the camera's range of vision but not subject to surveillance. The masking block feature that accurately tracks the orbit of a subject by three dimensions masking even during pan operation when tilting the camera.
- **Motion Detection**
- **Color enhancement**
- **Slow AE response**  
 The slow AE response function slows down the response speed of automatic exposure. Usually, it is set so that adequate exposure adjustment can be performed in about one second.
- **Image Stabilization: FCB-EV7500/EV7300**
- **Temperature Readout**  
 The camera's internal temperature can be read from the temperature sensor installed in the circuit board.
- **Electronic-Flip (E-Flip)**
- **Sync system: Internal**
- **VISCA protocol (CMOS 5 V level)**



# Specifications

	FCB-EV7500	FCB-EV7300	FCB-EV7310	FCB-EV7100
<b>Camera</b>				
Image sensor (Number of effective pixels)	1/2.8-type Exmor CMOS (Approx. 2.38 Megapixels)			
Output pixels (H x V)	1,920 x 1,080, 1,280 x 720			
Signal system (HD)	1080p/60, 1080p/59.94, 1080p/50, 1080p/30, 1080p/29.97, 1080p/25, 1080i/60, 1080i/59.94, 1080i/50, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/25			
Signal system (SD)	NTSC/PAL			
Minimum illumination (50%, High sensitivity mode ON)	0.35 lx (Shutter speed 1/30 sec) 0.05 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.013 lx (Shutter speed 1/30 sec) 0.002 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec, 30%)	0.1 lx (Shutter speed 1/30 sec) 0.02 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.008 lx (Shutter speed 1/30 sec) 0.001 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec, 30%)	0.1 lx (Shutter speed 1/30 sec) 0.02 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.008 lx (Shutter speed 1/30 sec) 0.001 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec, 30%)	0.35 lx (Shutter speed 1/30 sec) 0.05 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.03 lx (Shutter speed 1/30 sec) 0.002 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec, 30%)
Minimum illumination (50%, High sensitivity mode OFF)	1.4 lx (Shutter speed 1/30 sec) 0.19 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.05 lx (Shutter speed 1/30 sec)	1.4 lx (Shutter speed 1/30 sec) 0.05 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.03 lx (Shutter speed 1/30 sec)	1.4 lx (Shutter speed 1/30 sec) 0.05 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.03 lx (Shutter speed 1/30 sec)	1.4 lx (Shutter speed 1/30 sec) 0.19 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.12 lx (Shutter speed 1/30 sec)
Recommended illumination	100 lx to 100,000 lx			
S/N ratio	More than 50 dB			
Gain	Auto/Manual (0 step to 28 step, 2 step/Total 15 steps)			
Shutter speed	1/1 to 1/10,000 sec, 22 steps			
Sync system	Internal			
Exposure compensation	0 step to 28 step, 2 step/Total 15 steps			
Backlight compensation	Yes			
Gamma	Standard/Straight gamma			
Aperture control	16 steps			
White balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode (fix/auto/Outdoor Auto), One Push WB, Manual WB			
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Slow AE			
Lens (wide) to (tele)	30x optical zoom f=4.3 mm to 129.0 mm, F1.6 to F4.7	20x optical zoom f=4.7 mm to 94.0 mm, F1.6 to F3.5	20x optical zoom f=4.7 mm to 94.0 mm, F1.6 to F3.5	10x optical zoom f=3.8 mm to 38.0 mm, F1.8 to F3.4
Zoom mode	Standard Speed Mode/Variable Speed Mode/Direct Mode			
Digital zoom	12x (360x with optical zoom)	12x (240x with optical zoom)	12x (240x with optical zoom)	12x (120x with optical zoom)
<b>Zoom movement speed</b>				
Optical wide to Optical tele	4.6 sec (Focus Tracking ON), 3.2 sec (Focus Tracking OFF)	2.1 sec (Focus Tracking ON), 1.5 sec (Focus Tracking OFF)	2.1 sec (Focus Tracking ON), 1.5 sec (Focus Tracking OFF)	1.2 sec (Focus Tracking ON/OFF)
Optical wide to Digital 12x tele	6.7 sec (60p/30p), 7.1 sec (50p/25p)	4.2 sec (60p/30p), 4.6 sec (50p/25p)	4.2 sec (60p/30p), 4.6 sec (50p/25p)	3.2 sec (60p/30p), 3.6 sec (50p/25p)
Digital wide to Digital 12x tele	2.2 sec (60p/30p), 2.7 sec (50p/25p)	2.1 sec (60p/30p), 2.5 sec (50p/25p)	2.1 sec (60p/30p), 2.5 sec (50p/25p)	2.2 sec (60p/30p), 2.6 sec (50p/25p)
<b>Focusing system</b>				
Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Near Limit, ICR-in Focus Compensation				
Focus movement speed	∞ to Near: 1.1 sec	∞ to Near: 0.7 sec	∞ to Near: 0.7 sec	∞ to Near: 0.8 sec
Horizontal viewing angle (1080p/1080i mode) (wide) to (tele)	63.7 degrees to 2.3 degrees	59.5 degrees to 3.3 degrees	59.5 degrees to 3.3 degrees	67 degrees to 7.6 degrees
Horizontal viewing angle (720p mode) (wide) to (tele)	63.7 degrees to 2.3 degrees	59.5 degrees to 3.3 degrees	59.5 degrees to 3.3 degrees	67 degrees to 7.6 degrees
Minimum object distance (wide) to (tele)	10 mm to 1200 mm	10 mm to 1000 mm	10 mm to 1000 mm	10 mm to 800 mm
<b>Camera Features</b>				
Auto ICR	Yes	Yes	Yes	Yes
Wide-D	Yes	Yes	No	Yes
	(Auto mode) Yes*2	Yes*2	No	Yes*2
	(IS/PS mode) Yes	Yes	No	Yes
Visibility Enhancer (VE)	Yes	Yes	Yes	Yes
Defog	Yes (low/mid/high)	Yes (low/mid/high)	Yes (low/mid/high)	Yes (low/mid/high)
Noise reduction	Yes (3D + 2D)	Yes (3D + 2D)	Yes (3D + 2D)	Yes (3D + 2D)
Progressive scan mode	Yes	Yes	Yes	Yes
Image stabilization	Yes	Yes	No	No
StableZoom™ (Magnification)*1	Yes	Yes	Yes	Yes
Digital output	Yes	Yes	Yes	Yes
Spherical privacy zone masking	Yes	Yes	Yes	Yes
Motion detection	Yes	Yes	Yes	Yes
Alarm	Yes	Yes	Yes	Yes
Slow AE response	Yes	Yes	Yes	Yes
<b>Picture effects</b>				
Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement				
Picture freeze	Yes	Yes	Yes	Yes
Electronic-Flip (E-Flip)	Yes	Yes	Yes	Yes
Mirror image	Yes	Yes	Yes	Yes
Slow shutter	Yes	Yes	Yes	Yes
Temperature readout	Yes	Yes	Yes	Yes
Title display	Yes (20 characters/line, max. 11 lines)	Yes (20 characters/line, max. 11 lines)	Yes (20 characters/line, max. 11 lines)	Yes (20 characters/line, max. 11 lines)
Date/Time display	No	No	No	No
Camera mode display	Yes (English)	Yes (English)	Yes (English)	Yes (English)
Key switch control	No	No	No	No
Camera operation switch	No	No	No	No
<b>Interface</b>				
Video output (HD)	Digital: Y/Pb/Pr 4:2:2 (LVDS) (Y: 8 bit, C: 8 bit, Vsync, Hsync, Field, Clock), (Comparable to SMPTE 274M/SMPTE 296M)			
Video output (SD)	Analog: Component (Y/Pb/Pr) - Analog: Component (Y/Pb/Pr)			
Camera control interface	VBS: 1.0 Vp-p (sync negative) VISCA protocol (CMOS 5 V level) Baud Rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, 115.2 kbps, Stop bit: 1 bit			
<b>General</b>				
Power requirements	6.0 V to 12.0 V DC			
Power consumption	2.9 W (motors active: 3.5 W)	2.9 W (motors active: 3.5 W)	2.5 W (motors active: 3.0 W)	3.4 W (motors active: 3.7 W)
Operating temperature	-5°C to +60°C			
Storage temperature	-20°C to +60°C			
Operating humidity	20% to 80% (no condensation) (Absolute humidity: 36 g/m <sup>3</sup> )			
Storage humidity	20% to 95% (no condensation) (Absolute humidity: 36 g/m <sup>3</sup> )			
Dimensions (W x H x D)	50.0 x 60.0 x 89.7 mm	50.0 x 60.0 x 87.9 mm	50.0 x 60.0 x 87.9 mm	45.6 x 48.8 x 78.0 mm
Mass	Approx. 260 g	Approx. 270 g	Approx. 270 g	Approx. 210 g

\*1 StableZoom: Stable zoom incases the magnification that combined optical zoom and digital zoom.  
\*2 Wide-D (Wide dynamic range): When Wide-D is activated, it automatically switch to Auto mode.

\* Exmor and StableZoom are trademarks of Sony Corporation.

FCB-HD Series • EV Series

# FCB-EV5500

# FCB-EV5300 (NEW)



FCB-EV5500

FCB-EV5300

## Outline

The FCB-EV5000 series are high-resolution color modules that support HD video formats, incorporating Sony's latest Exmor™ CMOS sensor and newly developed ISP. Combined with new 20x optical zoom color models, visibility has been greatly enhanced by various functions including 130dB achievable wide dynamic range function and three level selectable Defog function. Furthermore, the same interface is used for the FCB-EV series.

Image sensor: Exmor CMOS image sensor  
1/3-type Exmor CMOS image sensor

### Auto Focus Zoom Lens

#### FCB-EV5500

30x optical zoom Auto Focus Zoom Lens  
f = 4.3 mm (wide) to 129.0 mm (tele), F1.6 to F4.7

#### FCB-EV5300

20x optical zoom Auto Focus Zoom Lens  
f = 4.7 mm (wide) to 94.0 mm (tele), F1.6 to F3.5

## Features

### Format

HD : 720p/60, 720p/59.94, 720p/50,  
720p/30, 720p/29.97, 720p/25  
SD : NTSC/PAL

### Output pixels (H x V)

1280 x 720

### Video output

#### FCB-EV5500

HD : Analog : Component Y/Pb/Pr

#### FCB-EV5500/EV5300

HD : Digital : Y/Pb/Pr 4 : 2 : 2 (LVDS)  
(SMPTE 274M/SMPTE 296M)

SD : VBS1.0 Vp-p (sync negative)

### Wide-D

It enables you to obtain images in which portions ranging from dark to light can be recognized, even when capturing a subject with a large intensity difference that is backlit or includes extremely light portions. The wide dynamic range mode corrects blocked-up shadows and blown-out highlights in accordance with the intensity difference. This mode can be set to be switched automatically ON/OFF in accordance with the intensity difference of the subject. Upgraded wide-D supports 130dB.

### Visibility Enhancer (VE)

Depending on the imaging scene, the Visibility Enhancer function makes the darker part of a camera image brighter, and automatically corrects brightness and contrast to show bright parts clearly.

### Defog

When the surrounding area of the subject is foggy and low contrast, the defog mode will make the subject appear clearer.

### Noise reduction (3D + 2D)

### Auto ICR

An infrared (IR) Cut-Filter can be disengaged from the image path for increased sensitivity in low light environments. The ICR will automatically engage depending on the ambient light, allowing the camera to be effective in day/night environments.

### Digital zoom 12x

### Privacy Zone Masking

Privacy Zone masking protects private objects and areas such as house windows, entrances, and exits which are within the camera's range of vision but not subject to surveillance. The masking block feature that accurately tracks the orbit of a subject by three dimensions masking even during pan operation when tilting the camera.

### Motion Detection

### Color enhancement

### Slow AE response

The slow AE response function slows down the response speed of automatic exposure. Usually, it is set so that adequate exposure adjustment can be performed in about one second.

### Image Stabilization

### Temperature Readout

The camera's internal temperature can be read from the temperature sensor installed in the circuit board.

### Electronic-Flip (E-Flip)

### Sync system: Internal

### VISCA protocol (CMOS 5 V level)

Digital Video Camera  
XCL  
XCG

Analog Video Camera  
XC (Non-TV Format)  
XC (TV Format)

Accessories

micro

Color Camera Module  
FCB-HD

FCB-SD

# Specifications

	FCB-EV5500	FCB-EV5300
<b>Camera</b>		
Image sensor (Number of effective pixels)	1/3-type Exmor CMOS (Approx. 1.37 Megapixels)	1/3-type Exmor CMOS (Approx. 1.37 Megapixels)
Output pixels (H x V)	1280x720	
Signal system (HD)	720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/25	
Signal system (SD)	NTSC/PAL	
Minimum illumination (50%, High sensitivity mode ON)	0.25 lx (Shutter speed 1/30 sec) 0.03 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.008 lx (Shutter speed 1/30 sec) 0.001 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec, 30%)	0.05 lx (Shutter speed 1/30 sec) 0.01 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.004 lx (Shutter speed 1/30 sec) 0.001 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec)
Minimum illumination (50%, High sensitivity mode OFF)	1.0 lx (Shutter speed 1/30 sec) 0.1 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.03 lx (Shutter speed 1/30 sec)	0.2 lx (Shutter speed 1/30 sec) 0.025 lx (NTSC shutter speed 1/4 sec, PAL shutter speed 1/3 sec) ICR-ON mode: 0.015 lx (Shutter speed 1/30 sec)
Recommended illumination	100 lx to 100,000 lx	
S/N ratio	More than 50 dB	
Gain	Auto/Manual (0 step to 28 step, 2 step/Total 15 steps)	
Shutter speed	1/1 to 1/10,000 sec, 22 steps	
Sync system	Internal	
Exposure compensation	0 step to 28 step, 2 step/Total 15 steps	
Backlight compensation	Yes	Yes
Gamma	Standard/Straight gamma	
Aperture control	16 steps	
White balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode(fix/auto/Outdoor Auto), One Push WB, Manual WB	
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Spot Exposure, Slow AE	
Lens (wide) to (tele)	30x optical zoom f=4.3 mm to 129.0 mm, F1.6 to F4.7	20x optical zoom f=4.7 mm to 94.0 mm, F1.6 to F3.5
Zoom mode	Standard Speed Mode/Variable Speed Mode/Direct Mode	
Digital zoom	12x (360x with optical zoom)	12x (240x with optical zoom)
Zoom movement speed		
Optical wide to Optical tele	4.6 sec (Focus Tracking ON), 3.2 sec (Focus Tracking OFF)	2.1 sec (Focus Tracking ON), 1.5 sec (Focus Tracking OFF)
Optical wide to Digital 12x tele	6.7 sec (60p/30p), 7.1 sec (50p/25p)	4.2 sec (60p/30p), 4.6 sec (50p/25p)
Digital wide to Digital 12x tele	2.2 sec (60p/30p), 2.7 sec (50p/25p)	2.1 sec (60p/30p), 2.5 sec (50p/25p)
ocusing system	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Near Limit, ICR-in Focus Compensation	
Focus movement speed	∞ to Near: 1.1 sec	∞ to Near: 0.7 sec
Horizontal viewing angle (1080p/1080i mode) (wide) to (tele)	-	
Horizontal viewing angle (720p mode) (wide) to (tele)	58.3 degrees to 2.1 degrees	54.1 degrees to 2.9 degrees
Minimum object distance (wide) to (tele)	10 mm to 1200 mm	10 mm to 1000 mm
<b>Camera Features</b>		
Auto ICR	Yes	Yes
Wide-D	Yes	Yes
(Auto mode)	Yes*2	Yes*2
(IS/PS mode)	Yes	Yes
Visibility Enhancer (VE)	Yes	Yes
Defog	Yes (low/mid/high)	Yes (low/mid/high)
Noise reduction	Yes (3D + 2D)	Yes (3D + 2D)
Progressive scan mode	Yes	Yes
Image stabilization	Yes	Yes
StableZoom™ (Magnification)*1	Yes	Yes
Digital output	Yes	Yes
Spherical privacy zone masking	Yes	Yes
Motion detection	Yes	Yes
Alarm	Yes	Yes
Slow AE response	Yes	Yes
Picture effects	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement	
Picture freeze	Yes	Yes
Electronic-Flip (E-Flip)	Yes	Yes
Mirror image	Yes	Yes
Slow shutter	Yes	Yes
Temperature readout	Yes	Yes
Title display	Yes (20 characters/line, max. 11 lines)	Yes (20 characters/line, max. 11 lines)
Date/Time display	No	No
Camera mode display	Yes (English)	Yes (English)
Key switch control	No	No
Camera operation switch	No	No
<b>Interface</b>		
Video output (HD)	Digital: Y/Pb/Pr 4:2:2 (LVDS) (Y: 8 bit, C: 8 bit, Vsync, Hsync, Field, Clock), (Comparable to SMPTE 274M/SMPTE 296M) Analog: Component (Y/Pb/Pr)	
Video output (SD)	VBS: 1.0 Vp-p (sync negative)	
Camera control interface	VISCA protocol (CMOS 5 V level) Baud Rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, 115.2 kbps, Stop bit: 1 bit	
<b>General</b>		
Power requirements	6.0 V to 12.0 V DC	
Power consumption	2.9 W (motors active: 3.5 W)	1.9 W (motors active: 2.4 W)
Operating temperature	-5°C to +60°C	
Storage temperature	-20°C to +60°C	
Operating humidity	20% to 80% (no condensation) (Absolute humidity: 36 g/m <sup>3</sup> )	
Storage humidity	20% to 95% (no condensation) (Absolute humidity: 36 g/m <sup>3</sup> )	
Dimensions (W x H x D)	50.0 x 60.0 x 89.7 mm	50.0 x 60.0 x 89.7 mm
Mass	Approx. 260 g	Approx. 270 g

\*1 StableZoom: Stable zoom in cases that combined optical zoom and digital zoom.  
\*2 Wide-D (Wide dynamic range): When Wide-D is activated, it automatically switches to Auto mode.

\* Exmor and StableZoom are trademarks of Sony Corporation.

**FCB-EX Series F Version**

**FCB-EX2700(NTSC)**  
**FCB-EX2700P(PAL)**  
**FCB-EX2400(NTSC)**  
**FCB-EX2400P(PAL)**  
**FCB-EX2200(NTSC)**  
**FCB-EX2200P(PAL)**



**Outline**

The FCB-EX series is equipped with Super HAD CCD II™ image sensors (960H CCD) and a newly developed image processor that achieve excellent picture quality with a horizontal resolution of 670 TV lines. The picture quality is enhanced dynamically by new useful functions such as Defog and enhanced Wide-D. These cameras also incorporate high-performance optical zoom lenses (including high-resolution 40x), allowing you to select the right camera according to your varying needs.

**Auto Focus Zoom Lens**

**FCB-EX2700/EX2700P**

40x optical zoom Auto Focus Zoom Lens  
 f=3.06 mm (wide) to 122.4 mm (tele), F1.6 to F4.6

**FCB-EX2400/EX2400P**

28x optical zoom Auto Focus Zoom Lens  
 f=3.5 mm (wide) to 98.0 mm (tele), F1.35 to F3.7

**FCB-EX2200/EX2200P**

18x optical zoom Auto Focus Zoom Lens  
 f=4.1 mm (wide) to 73.8 mm (tele), F1.4 to F3.0

**Features**

- Progressive Scan
- Digital output (comparable to ITU-R BT656)
- Image Stabilization: StableZoom™  
 FCB-EX2700/EX2700P  
 FCB-EX2400/EX2400P
- Wide-D
- Visibility Enhancer (VE)  
 Depending on the imaging scene, the Visibility Enhancer function makes the darker part of a camera image brighter, and automatically correct brightness and contrast to show bright parts clearly.
- Defog  
 When the surrounding area of the subject is foggy and low contrast, the defog mode will make the subject appear clearer.
- Horizontal resolution: 670 TV lines
- Noise reduction (3D + 2D)
- Digital zoom 12x
- Color enhancement
- Spherical privacy zone masking (with mosaic effect)
- Slow AE response
- Auto ICR (Auto Focus)
- Temperature readout  
 The camera unit's internal temperature can be read out via VISCA. This data can be used as reference data to activate peripherals such as a fan or heater inside the camera equipment.
- White Balance  
 Versatile modes including Outdoor auto and Sodium Vapor Lamp mode are available according to your varying needs.
- VISCA protocol (CMOS 5 V level)

Digital Video Camera XCL XCG XCD  
 Analog Video Camera XC (Non-TV Format)  
 XC (TV Format)  
 Accessories  
 Color Camera Module FCB-HD FCB-SD  
 micro

# Specifications

	FCB-EX2700	FCB-EX2700P	FCB-EX2400	FCB-EX2400P	FCB-EX2200	FCB-EX2200P	
<b>Camera</b>							
Image sensor	1/4-type Super HAD CCD II		1/4-type Super HAD CCD II		1/4-type Super HAD CCD II		
Image sensor (Number of effective pixels)	Approx. 480,000 pixels	Approx. 570,000 pixels	Approx. 480,000 pixels	Approx. 570,000 pixels	Approx. 480,000 pixels	Approx. 570,000 pixels	
Signal system	NTSC	PAL	NTSC	PAL	NTSC	PAL	
Minimum illumination (50%, Normal mode, wide-end, aperture (MAX), F ratio) (typical)	0.6 lx (Shutter speed: 1/60 sec)	0.6 lx (Shutter speed: 1/50 sec)	0.4 lx (Shutter speed: 1/60 sec)	0.4 lx (Shutter speed: 1/50 sec)	0.4 lx (Shutter speed: 1/60 sec)	0.4 lx (Shutter speed: 1/50 sec)	
	0.04 lx (Shutter speed: 1/4 sec)	0.04 lx (Shutter speed: 1/3 sec)	0.03 lx (Shutter speed: 1/4 sec)	0.03 lx (Shutter speed: 1/3 sec)	0.03 lx (Shutter speed: 1/4 sec)	0.03 lx (Shutter speed: 1/3 sec)	
	0.01 lx (Shutter speed: 1/4 sec, ICR ON)	0.01 lx (Shutter speed: 1/3 sec, ICR ON)	0.01 lx (Shutter speed: 1/4 sec, ICR ON)	0.01 lx (Shutter speed: 1/3 sec, ICR ON)	0.01 lx (Shutter speed: 1/4 sec, ICR ON)	0.01 lx (Shutter speed: 1/3 sec, ICR ON)	
Recommended illumination	100 lx to 100,000 lx						
S/N ratio	More than 50 dB						
Gain	Auto/Manual (-3 step to +28 step, 2 step/Total 16 steps)						
Shutter speed	1/1 to 1/10,000 sec, 22 steps						
Sync system	Internal/External (V-Lock)						
Exposure compensation	-30 step to +28 step, 2 step/Total 16 steps						
Backlight compensation	Yes		Yes		Yes		
Gamma	Normal						
Aperture control	16 steps						
White balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp mode(fix/auto), One Push WB, Manual WB						
AE (Auto exposure mode)	Full Auto, Manual, Priority mode (shutter/iris), Bright, EV compensation, Slow AE						
Lens (wide) to (tele)	40x optical zoom f=3.06 mm to 122.4 mm, F1.6 to F4.6		28x optical zoom f=3.5 mm to 98.0 mm, F1.35 to F3.7		18x optical zoom f=4.1 mm to 73.8 mm, F1.4 to F3.0		
Zoom mode	Standard Speed Mode/Variable Speed Mode/Direct Mode						
Digital zoom	12x (480x with optical zoom)		12x (336x with optical zoom)		12x (216x with optical zoom)		
<b>Zoom movement speed</b>							
Optical wide to Optical tele	3.5 sec (Focus Tracking ON), 1.9 sec (Focus Tracking OFF)	3.5 sec (Focus Tracking ON), 1.9 sec (Focus Tracking OFF)	2.5 sec (Focus Tracking ON), 1.7 sec (Focus Tracking OFF)	2.5 sec (Focus Tracking ON), 1.7 sec (Focus Tracking OFF)	2.5 sec (Focus Tracking ON), 2.0 sec (Focus Tracking OFF)	2.8 sec (Focus Tracking ON), 2.4 sec (Focus Tracking OFF)	
Optical wide to Digital 12x tele	5.5 sec (Focus Tracking ON), 1.9 sec (Focus Tracking OFF)	6.0 sec (Focus Tracking ON), 1.9 sec (Focus Tracking OFF)	4.7 sec (Focus Tracking ON), 1.7 sec (Focus Tracking OFF)	4.9 sec (Focus Tracking ON), 1.7 sec (Focus Tracking OFF)	4.5 sec (Focus Tracking ON), 2.0 sec (Focus Tracking OFF)	5.2 sec (Focus Tracking ON), 2.4 sec (Focus Tracking OFF)	
Digital wide to Digital 12x tele	2.0 sec	2.5 sec	2.0 sec	2.5 sec	2.0 sec	2.5 sec	
Focusing system	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Near Limit, ICR-in Focus Compensation						
Focus movement speed	∞ to Near: 1.0 sec		∞ to Near: 0.7 sec		∞ to Near: 0.5 sec		
Horizontal viewing angle (wide) to (tele)	60.0 degrees to 1.6 degrees		55.8 degrees to 2.1 degrees		48.0 degrees to 2.8 degrees		
Minimum object distance (wide) to (tele)	10 mm to 1500 mm		10 mm to 1500 mm		10 mm to 800 mm		
Horizontal resolution	670 TV lines						
<b>Camera Features</b>							
Auto ICR	Yes		Yes		Yes		
Wide-D	(Auto mode)	Yes *2		Yes *2		Yes *2	
	(IS/PS mode)	Yes		Yes		Yes	
Visibility Enhancer (VE)	Yes		Yes		Yes		
Defog	Yes		Yes		Yes		
Noise reduction	Yes (3D + 2D)		Yes (3D + 2D)		Yes (3D + 2D)		
Progressive scan mode	Yes		Yes		Yes		
Image stabilization	Yes		Yes		No		
StableZoom™: (Magnification)*1	Yes		Yes		No		
Digital output	Yes		Yes		Yes		
Spherical privacy zone masking	Yes		Yes		Yes		
Motion detection	Yes		Yes		Yes		
Alarm	Yes		Yes		Yes		
Slow AE response	Yes (Max. 2 min.)		Yes (Max. 2 min.)		Yes (Max. 2 min.)		
Picture effects	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement						
Picture freeze	Yes		Yes		Yes		
Electronic-Flip (E-Flip)	Yes		Yes		Yes		
Mirror Image	Yes		Yes		Yes		
Slow shutter	Yes		Yes		Yes		
Temperature readout	Yes		Yes		Yes		
Title display	Yes (20 characters/line, max. 11 lines)		Yes (20 characters/line, max. 11 lines)		Yes (20 characters/line, max. 11 lines)		
Camera mode display	Yes (English)		Yes (English)		Yes (English)		
Key switch control	Yes		Yes		Yes		
Camera operation switch	Yes		Yes		Yes		
<b>Interface</b>							
Video output	Digital: Y/Pb/Pr 4:2:2 (Comparable to ITU-R BT656) Analog: VBS: 1.0 Vp-p (sync negative), Y/C						
Camera control interface	VISCA protocol (CMOS 5 V level) Baud Rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1 bit						
<b>General</b>							
Power requirements	6.0 V to 12.0 V DC						
Power consumption	2.4 W (motors active: 3.2 W)						
Operating temperature	-5°C to +60°C						
Storage temperature	-20°C to +60°C						
Operating humidity	20% to 80% (no condensation) (Absolute humidity: 36 g/m³)						
Storage humidity	20% to 95% (no condensation) (Absolute humidity: 36 g/m³)						
Dimensions (W × H × D)	50.0 × 60.0 × 90.9 mm		50.0 × 57.5 × 89.8 mm		52.7 × 57.5 × 88.5 mm		
Mass	Approx. 265 g		Approx. 245 g		Approx. 225 g		

\*1 StableZoom: Stable zoom increases the magnification that combined optical zoom and digital zoom.

\* Super HAD CCD II and StableZoom are trademarks of Sony Corporation.

\*2 Wide-D (Wide dynamic range): When Wide-D is activated, it automatically switches to Auto mode.

**FCB-EX Series E Version**

NTSC	PAL
<b>FCB-EX1020</b>	<b>FCB-EX1020P</b>
<b>FCB-EX995E</b>	<b>FCB-EX995EP</b>
<b>FCB-EX985E</b>	<b>FCB-EX985EP</b>
<b>FCB-EX490E</b>	<b>FCB-EX490EP</b>
<b>FCB-EX48E</b>	<b>FCB-EX48EP</b>
<b>FCB-EX15E</b>	<b>FCB-EX15EP</b>



FCB-EX1020/EX1020P



FCB-EX995E/EX995EP  
FCB-EX985E/EX985EP

**Outline**

Combined with new models using standard digital outputs with newly added functions such as progress scanning, image stabilizer, and wide dynamic range (Wide-D), the FCB-EX series E version cameras have increased functionality. Various built-in functions can be controlled by VISCA protocol commands. The custom preset function allows you to customize the initial setting of each function when the power of the camera is turned on. The use of these modules enables wide ranging applications, not limited to analog camera applications, and even digital camera applications.

**Auto Focus Zoom Lens**

- FCB-EX1020/EX1020P  
36x optical zoom Auto Focus Zoom Lens  
f = 3.4 mm (wide) to 122.4 mm (tele), F1.6 to F4.5
- FCB-EX995E/EX995EP  
FCB-EX985E/EX985EP  
28x optical zoom Auto Focus Zoom Lens  
f = 3.5 mm (wide) to 98.0 mm (tele), F1.35 to F3.7
- FCB-EX490E/EX490EP  
FCB-EX48E/EX48EP  
18x optical zoom Auto Focus Zoom Lens  
f = 4.1 mm (wide) to 73.8 mm (tele), F1.4 to F3.0
- FCB-EX15E/EX15EP  
12x optical zoom Auto Focus Zoom Lens  
f = 3.7 mm (wide) to 44.4 mm (tele), F1.6 to F2.5

**Features**

- Progressive Scan  
FCB-EX1020/EX1020P  
FCB-EX995E/EX995EP  
FCB-EX490E/EX490EP  
FCB-EX15E/EX15EP
- Digital output (comparable to ITU-R BT656)
- Image Stabilization: StableZoom™  
FCB-EX1020/EX1020P  
FCB-EX995E/EX995EP  
FCB-EX985E/EX985EP
- Wide dynamic range)  
FCB-EX1020/EX1020P  
FCB-EX995E/EX995EP  
FCB-EX490E/EX490EP  
FCB-EX15E/EX15EP
- Noise reduction (3D + 2D)
- Color enhancement
- Spherical privacy zone masking (with mosaic effect)
- Slow AE response
- Auto ICR (Auto Focus)  
FCB-EX1020/EX1020P  
FCB-EX995E/EX995EP  
FCB-EX985E/EX985EP  
FCB-EX490E/EX490EP  
FCB-EX15E/EX15EP
- Temperature Readout
- White Balance
- VISCA protocol (CMOS 5 V level)

Digital Video Camera XCL XCG XCD  
 Analog Video Camera XC (Non-TV Format) XC (TV Format)  
 Accessories  
 Color Camera Module FCB-HD FCB-SD

# Specifications

XCL Digital Video Camera  
 XCG Analog Video Camera  
 XCD  
 XC (Non-TV Format)  
 XC (TV Format)  
 Accessories  
 micro Color Camera Module  
 FCB-HD  
 FCB-SD

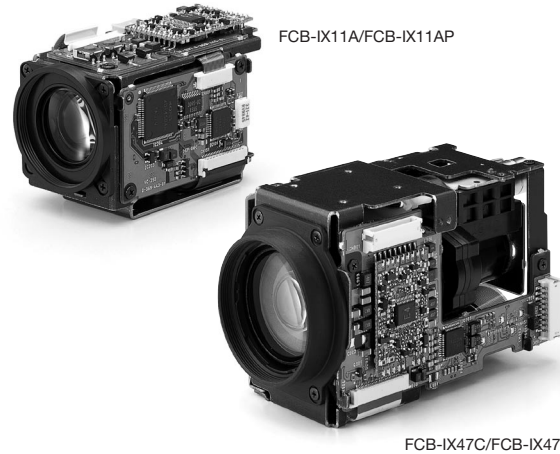
	FCB-EX1020	FCB-EX1020P	FCB-EX995E	FCB-EX995EP	FCB-EX985E	FCB-EX985EP	FCB-EX490E	FCB-EX490EP	FCB-EX48E	FCB-EX48EP	FCB-EX15E	FCB-EX15EP		
Camera														
Image sensor	1/4-type EXview HAD CCD®				1/4-type Super HAD CCD II™			1/4-type EXview HAD CCD®		1/4-type CCD		1/4-type EXview HAD CCD®		
Image sensor (Number of effective pixels)	Approx. 380,000 pixels	Approx. 440,000 pixels	Approx. 380,000 pixels	Approx. 440,000 pixels	Approx. 380,000 pixels	Approx. 440,000 pixels	Approx. 380,000 pixels	Approx. 440,000 pixels	Approx. 380,000 pixels	Approx. 440,000 pixels	Approx. 380,000 pixels	Approx. 440,000 pixels		
Signal system	NTSC	PAL	NTSC	PAL	NTSC	PAL	NTSC	PAL	NTSC	PAL	NTSC	PAL		
Minimum illumination (50%, Normal mode, wide-end, aperture (MAX), F ratio) (typical)	1.4 lx (Shutter speed: 1/60 sec) 0.1 lx (Shutter speed: 1/4 sec) 0.01 lx (Shutter speed: 1/4 sec, ICR ON)	1.4 lx (Shutter speed: 1/50 sec) 0.1 lx (Shutter speed: 1/4 sec) 0.01 lx (Shutter speed: 1/4 sec, ICR ON)	0.65 lx (Shutter speed: 1/60 sec) 0.04 lx (Shutter speed: 1/4 sec) 0.005 lx (Shutter speed: 1/4 sec, ICR ON)	0.65 lx (Shutter speed: 1/50 sec) 0.04 lx (Shutter speed: 1/4 sec) 0.005 lx (Shutter speed: 1/4 sec, ICR ON)	0.25 lx (Shutter speed: 1/60 sec) 0.016 lx (Shutter speed: 1/4 sec) 0.0015 lx (Shutter speed: 1/4 sec, ICR ON)	0.25 lx (Shutter speed: 1/50 sec) 0.016 lx (Shutter speed: 1/4 sec) 0.0015 lx (Shutter speed: 1/4 sec, ICR ON)	0.7 lx (Shutter speed: 1/60 sec) 0.04 lx (Shutter speed: 1/4 sec) 0.001 lx (Shutter speed: 1/4 sec, ICR ON)	0.7 lx (Shutter speed: 1/50 sec) 0.04 lx (Shutter speed: 1/4 sec) 0.001 lx (Shutter speed: 1/4 sec, ICR ON)	0.4 lx (Shutter speed: 1/60 sec) 0.02 lx (Shutter speed: 1/4 sec)	0.4 lx (Shutter speed: 1/60 sec) 0.02 lx (Shutter speed: 1/4 sec)	0.9 lx (Shutter speed: 1/60 sec) 0.05 lx (Shutter speed: 1/4 sec) 0.01 lx (Shutter speed: 1/4 sec, ICR ON)	0.9 lx (Shutter speed: 1/50 sec) 0.05 lx (Shutter speed: 1/4 sec) 0.01 lx (Shutter speed: 1/4 sec, ICR ON)		
Recommended illumination	100 lx to 100,000 lx													
S/N ratio	More than 50 dB													
Gain	Auto/Manual/Max. Gain Limit (-3 dB to +28 dB, 2 dB step/Total 16 steps)													
Shutter speed	1/1 sec to 1/10,000 sec, 22 steps, Limit													
Sync system	Internal/External (V-Lock)													
Exposure compensation	-10.5 dB to +10.5 dB, 1.5 dB step/Total 16 steps													
Backlight compensation	Yes		Yes		Yes		Yes		Yes		Yes			
Gamma	Standard													
Aperture control	16 steps													
White balance	Auto WB, ATW, Indoor, Outdoor (fix/auto), Sodium Vapor Lamp (fix/auto), One Push WB, Manual WB													
AE (Auto exposure mode)	Full Auto Manual, Priority mode (shutter/iris), Bright, Spot Exposure, Slow AE													
Lens (wide) to (tele)	36x optical zoom, f=3.4 mm (wide) to 122.4 mm (tele), F1.6 to F4.5			28x optical zoom, f=3.5 mm (wide) to 98.0 mm (tele), F1.35 to F3.7				18x optical zoom, f=4.1 mm (wide) to 73.8 mm (tele), F1.4 to F3.0			12x optical zoom, f=3.7 mm (wide) to 44.4 mm (tele), F1.6 to F2.8			
Zoom mode	Standard Speed Mode/Variable Speed Mode/Direct Mode													
Digital zoom	12x (432x with optical zoom)			12x (336x with optical zoom)				12x (216x with optical zoom)			12x (144x with optical zoom)			
Zoom movement speed														
Optical wide to Optical tele	4.0 sec (Focus Tracking ON), 2.7 sec (Focus Tracking OFF)			2.5 sec (Focus Tracking ON), 1.7 sec (Focus Tracking OFF)				2.5 sec (Focus Tracking ON), 2.0 sec (Focus Tracking OFF)		2.8 sec (Focus Tracking ON), 2.4 sec (Focus Tracking OFF)		2.5 sec (Focus Tracking ON), 2.0 sec (Focus Tracking OFF)		
Optical wide to Digital 12x tele	6.0 sec	6.2 sec	4.5 sec	4.9 sec	4.5 sec	4.9 sec	4.5 sec	5.2 sec	4.5 sec	5.2 sec	3.3 sec	3.8 sec		
Digital wide to Digital 12x tele	2.1 sec	2.3 sec	2.0 sec	2.5 sec	2.0 sec	2.5 sec	2.0 sec	2.5 sec	2.0 sec	2.5 sec	2.0 sec	2.5 sec		
Focusing system	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Infinity, Near Limit, ICR-ON Focus compensation													
Focus movement speed	∞ to Near: 1.0 sec			∞ to Near: 0.7 sec				∞ to Near: 0.5 sec						
Horizontal viewing angle (wide) to (tele)	57.8 degrees to 1.7 degrees			55.8 degrees to 2.1 degrees				48.0 degrees to 2.8 degrees			53.6 degrees to 4.6 degrees			
Minimum object distance (wide) to (tele)	320 mm to 1,500 mm			300 mm to 1,500 mm				290 mm to 800 mm			300 mm to 1,000 mm			
Horizontal resolution	(10mm (wide) by VISCA control) 550 TV line													
Camera Features														
Auto ICR	Yes			Yes				Yes		No		Yes		
Wide-D	(Auto mode)	Yes			No				Yes		No		Yes	
	(IS/PS mode)	Yes			Yes				No		No		Yes	
Visibility Enhancer (VE)	No			No				No		No		No		
Defog	No			No				No		No		No		
Noise reduction	Yes (3D + 2D)			Yes (3D + 2D)				Yes (3D + 2D)		Yes (3D + 2D)		Yes (3D + 2D)		
Progressive scan mode	Yes			Yes				No		Yes		No		
Image stabilization	Yes			Yes				No		No		No		
StableZoom: (Magnification)*1	Yes (40x)			Yes (31x)				Yes (31x)		No		No		
Digital output	Yes			Yes				Yes		Yes		Yes		
Spherical privacy zone masking	Spherical, Color, Half tone, with mosaic effect													
Motion detection	Yes			Yes				Yes		Yes		Yes		
Alarm	Yes			Yes				Yes		Yes		Yes		
Slow AE response	Yes (Max. 2 min.)			Yes (Max. 2 min.)				Yes (Max. 2 min.)		Yes (Max. 2 min.)		Yes (Max. 2 min.)		
Picture effects	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image), Color enhancement													
Picture freeze	Yes			Yes				Yes		Yes		Yes		
Electronic-Flip (E-Flip)	Yes			Yes				Yes		Yes		Yes		
Mirror Image	Yes			Yes				Yes		Yes		Yes		
Slow shutter	Yes			Yes				Yes		Yes		Yes		
Temperature readout	Yes			Yes				Yes		Yes		Yes		
Title display	Yes (20 characters/line, max. 11 lines)			Yes (20 characters/line, max. 11 lines)				Yes (20 characters/line, max. 11 lines)		Yes (20 characters/line, max. 11 lines)		Yes (20 characters/line, max. 11 lines)		
Camera mode display	Yes (English*, Chinese)* Default			Yes (English*, Chinese)* Default				Yes (English*, Chinese)* Default		Yes (English*, Chinese)* Default		Yes (English*, Chinese)* Default		
Key switch control	Yes			Yes				Yes		Yes		No		
Camera operation switch	Yes (Zoom Tele, Zoom Wide)			Yes (Zoom Tele, Zoom Wide)				Yes (Zoom Tele, Zoom Wide)		Yes (Zoom Tele, Zoom Wide)		No		
Interface														
Video output	Digital: Y/Pb/Pr 4:2:2 (comparable to ITU-R BT656) Analog: VBS: 1.0 Vp-p (sync negative), Y/C										Digital: Y/Pb/Pr 4:2:2 (LVDS) (comparable to ITU-R BT656) Analog: VBS: 1.0 Vp-p (sync negative)			
Camera control interface	VISCA protocol (CMOS 5 V level) Baud Rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1 bit													
General														
Power requirements	6.0 V to 12.0 V DC													
Power consumption	2.4 W (motors active: 5.1 W)			2.2 W (motors active: 5.0 W)				1.9 W (motors active: 4.6 W)		2.4 W (motors active: 4.4 W)		2.0 W (motors active: 3.1 W)		
Operating temperature	-5°C to +60°C													
Storage temperature	-20°C to +60°C													
Operating humidity	20% to 80% (no condensation)													
Storage humidity	20% to 95% (no condensation)													
Dimensions (W × H × D)	50.0 × 57.5 × 87.9 mm			50.0 × 57.5 × 89.8 mm				52.7 × 57.5 × 88.5 mm		50.0 × 57.5 × 88.5 mm		44.8 × 46.9 × 71.8 mm		
Mass	Approx. 230 g			Approx. 238 g				Approx. 230 g		Approx. 220 g		Approx. 150 g		

\*1 StableZoom: Stable zoom incases the magnification is that combined optical zoom and digital zoom.

\* EXview HAD CCD and StableZoom are trademarks of Sony Corporation

**FCB-IX Series**

**FCB-IX11A** (NTSC)  
**FCB-IX11AP** (PAL)  
**FCB-IX47C** (NTSC)  
**FCB-IX47CP** (PAL)



**Outline**

The FCB-IX11A/IX11AP, FCB-IX47C/IX47CP cameras are color camera modules that the settings of the camera can be performed by VISCA protocol. The custom preset function allows you to customize the initial setting of each function when the power of the camera is turned on.

**FCB-IX11A/IX11AP**

10x optical zoom Auto Focus Zoom Lens  
 f=4.2 mm (wide) to 42.0 mm (tele), F1.8 to F2.9

**FCB-IX47C/IX47CP**

18x optical zoom Auto Focus Zoom Lens  
 f=4.1 mm (wide) to 73.8 mm (tele), F1.4 to F3.0

**Features**

<FCB-IX11A/IX11AP>

- 1/4-type EXview HAD CCD (380,000 pixels): FCB-IX11A
- 1/4-type EXview HAD CCD (440,000 pixels): FCB-IX11AP
- Minimum illumination: 1.5 lx (at normal shutter speed, 50IRE)
- Compact size
- Digital zoom 4x

<FCB-IX47C/IX47CP>

- 1/4-type Super HAD CCD 380,000 pixel: FCB-IX47C
- 1/4-type Super HAD CCD 440,000 pixel: FCB-IX47CP
- Minimum illumination: 1.0 lx (at normal shutter speed, 50IRE)
- Digital zoom 4x
- Spherical privacy zone masking (with mosaic effect)

<Common features>

- Auto slow shutter
- Still image, horizontal flip, and neg. art
- Preset status backup
- KeySW control
- On-screen date/time and title display
- Initial mode settings can be changed
- VISCA protocol (RS-232C level/CMOS 5 V level)

Digital Video Camera XCL XCG XCD  
 Analog Video Camera XC (Non-TV Format)  
 XC (TV Format)  
 Accessories  
 Color Camera Module FCB-HD FCB-SD  
 micro



# Specifications

	FCB-IX11A	FCB-IX11AP	FCB-IX47C	FCB-IX47CP
<b>Camera</b>				
Image sensor	1/4-type EXview HAD CCD™		1/4-type Super HAD CCD™	
Image sensor (Number of effective pixels)	Approx. 380,000 pixels	Approx. 440,000 pixels	Approx. 380,000 pixels	Approx. 440,000 pixels
Signal system	NTSC	PAL	NTSC	PAL
Minimum illumination (50%, wide-end, aperture (MAX), F ratio) (typical)	1.5 lx (Shutter speed: 1/60 sec) 0.10 lx (Shutter speed: 1/4 sec)	1.5 lx (Shutter speed: 1/50 sec) 0.10 lx (Shutter speed: 1/3 sec)	1.0 lx (Shutter speed: 1/60 sec) 0.07 lx (Shutter speed: 1/4 sec)	1.0 lx (Shutter speed: 1/50 sec) 0.07 lx (Shutter speed: 1/3 sec)
Recommended illumination	100 lx to 100,000 lx			
S/N ratio	More than 50 dB			
Gain	Auto/Manual (-3 dB to +28 dB, 2 dB step/Total 16 steps)			
Shutter speed	1/1 to 1/10,000 sec, 22 steps			
Sync system	Internal			
Exposure compensation	-10.5 dB to +10.5 dB, 1.5 dB step/Total 15 steps			
Backlight compensation	Yes			Yes
Gamma	Normal			
Aperture control	16 steps			
White balance	Auto WB, ATW, Indoor, Outdoor, One Push WB, Manual WB			
AE (Auto exposure mode)	Full Auto Manual, Priority mode (shutter/iris), Bright, Spot Exposure			
Lens (wide) to (tele)	10x optical zoom f=4.2 mm to 42 mm F1.8 to F2.9		18x optical zoom f=4.1 mm to 73.8 mm F1.4 to F3.0	
Zoom mode	Standard Speed Mode/Variable Speed Mode/Direct Mode			
Digital zoom	4x (40x with optical zoom)		4x (72x with optical zoom)	
<b>Zoom movement speed</b>				
Optical wide to Optical tele	1.8 sec		2.1 sec	
Optical wide to Digital 4x tele	3.5 sec		3.7 sec	
Digital wide to Digital 4x tele	1.7 sec		1.7 sec	
<b>Focusing system</b>				
	Auto Focus (Normal AF, Interval AF, Zoom Trigger AF [Sensitivity: normal, low]), Manual (Standard Speed Mode/Variable Speed Mode/Direct Mode), One Push Trigger, Infinity, Near Limit			
Focus movement speed	∞ to Near: 0.5 sec		∞ to Near: 0.5 sec	
Horizontal viewing angle (wide) to (tele)	46.0 degrees to 4.6 degrees		48.0 degrees to 2.8 degrees	
Minimum object distance (wide) to (tele)	10 mm to 1,000 mm		290 mm to 800 mm	
Horizontal resolution	470 TV lines	460 TV lines	470 TV lines	460 TV lines
<b>Camera Features</b>				
Auto ICR	No		No	
Wide-D	No		No	
Defog	No		No	
Noise reduction (Fixed)	Yes		Yes	
Image stabilization	No		No	
Spherical privacy zone masking	No		Spherical, Color, Half tone	
Motion detection	No		No	
Alarm	No		Yes	
Slow AE response	No		Yes	
Picture effects	Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image)		Neg. Art (Negative/Positive Reversal), Black White (Monochrome Image)	
Picture freeze	Yes		Yes	
Electronic-Flip (E-Flip)	No		Yes	
Mirror image	Yes		Yes	
Slow shutter	Yes		Yes	
Title display	Yes (20 characters/line, 1 line only)		Yes (20 characters/line, 1 line only)	
Date/Time	Yes		Yes	
Camera mode display	Yes (English)		Yes (English)	
Key switch control	Yes		Yes	
Camera operation switch	Yes (Zoom Tele, Zoom Wide)		Yes (Zoom Tele, Zoom Wide)	
<b>Interface</b>				
Video output	VBS: 1.0 Vp-p (sync negative), Y/C			
Camera control interface	VISCA protocol (CMOS 5 V level) Baud Rate: 9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit: 1 bit			
<b>General</b>				
Power requirements	6.0 V to 12.0 V DC			
Power consumption	1.6 W (motors active: 2.0 W)		1.5 W (motors active: 2.5 W)	
Operating temperature	0°C to 50°C			
Storage temperature	-20°C to +60°C			
Operating humidity	20% to 80% (no condensation)			
Storage humidity	20% to 95% (no condensation)			
Dimensions (W × H × D)	39.3 × 44.8 × 65.0 mm		48.2 × 56.6 × 92.3 mm	
Mass	Approx. 95 g		Approx. 170 g	

\* EXview HAD CCD and Super HAD CCD are trademarks of Sony Corporation

XCL  
XCG  
XCD

XC (Non-TV Format)  
XC (TV Format)

Accessories

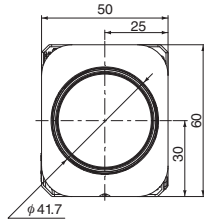
micro  
Color Camera Module  
FCB-HD  
FCB-SD

# Dimensions FCB-HD Series

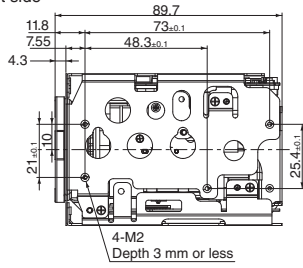
Digital Video Camera  
XCL XCG XCD

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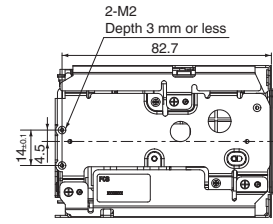
Front



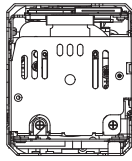
Right side



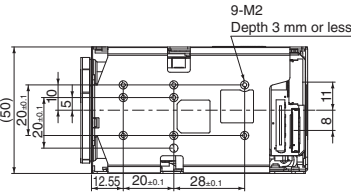
Left side



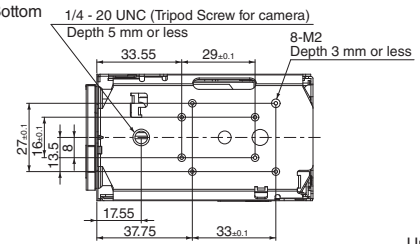
Rear



Top



Bottom

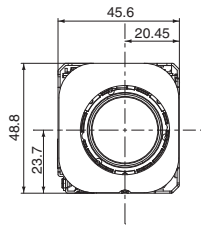


Unit: mm

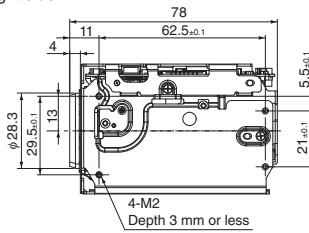
Analog Video Camera  
XC (TV Format) XC (Non-TV Format)

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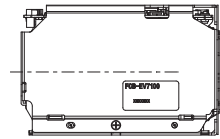
Front



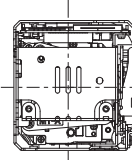
Right side



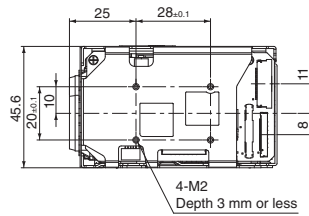
Left side



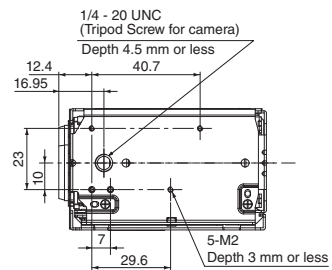
Rear



Top



Bottom

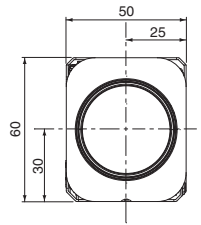


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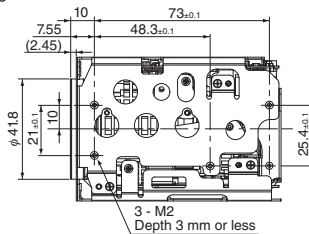
Accessories  
micro

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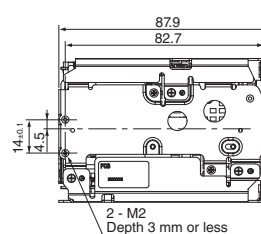
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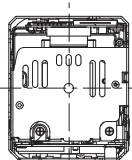
Right side



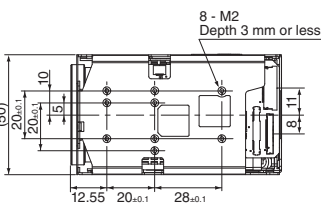
Left side



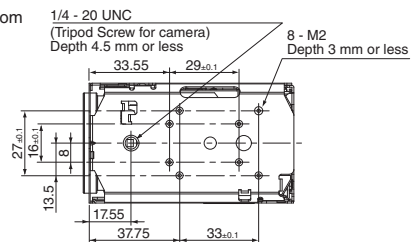
Rear



Top



Bottom

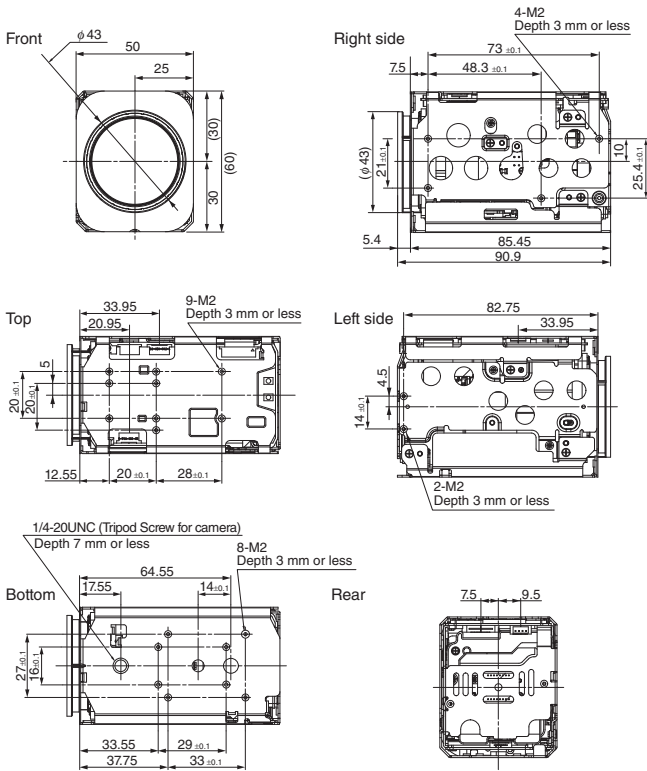


Unit: mm

Color Camera Module  
FCB-HD FCB-SD

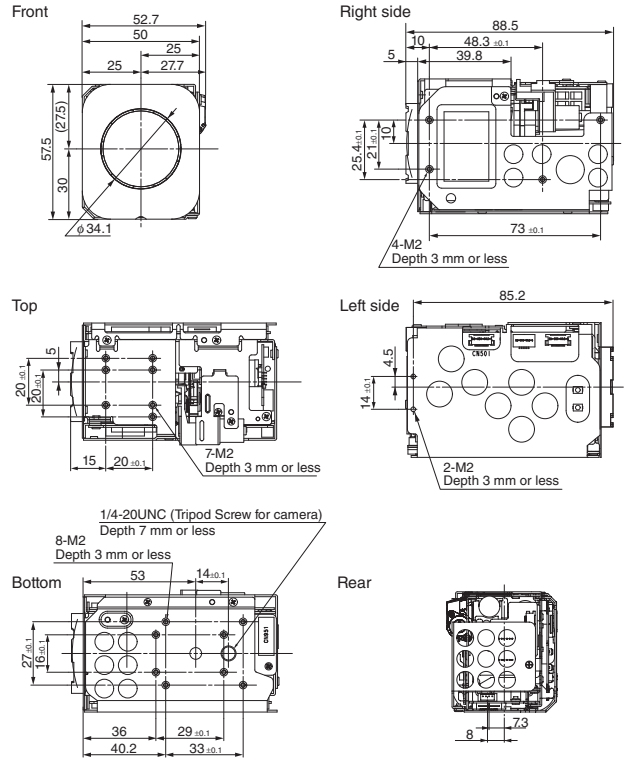
# Dimensions FCB-HD Series

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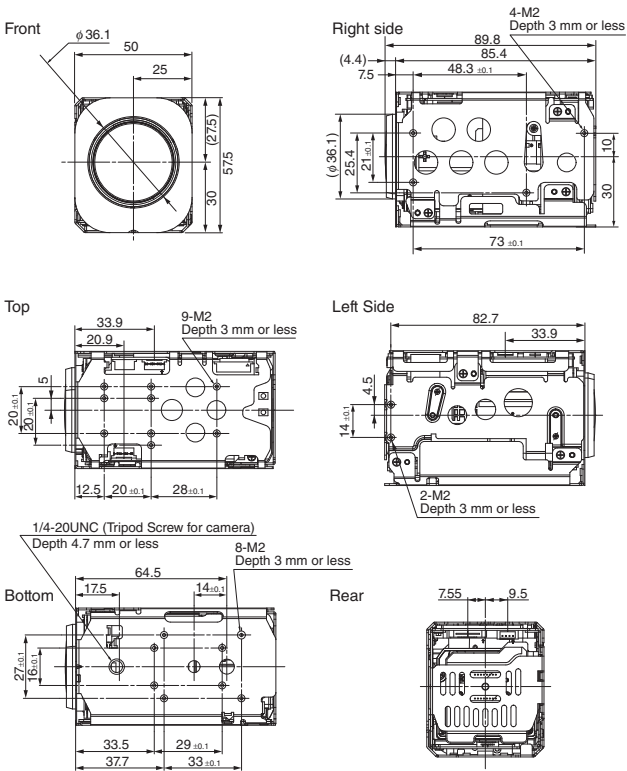
Unit: mm

<FCB-EX2200/FCB-EX2200P>



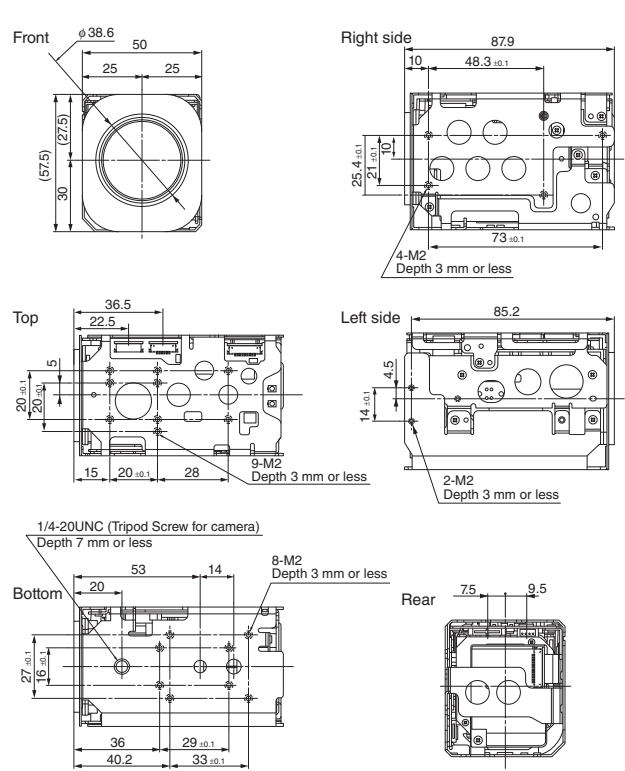
Unit: mm

<FCB-EX2400/FCB-EX2400P>



Unit: mm

<FCB-EX1020/FCB-EX1020P>



Unit: mm

XCL  
XCG  
XCD

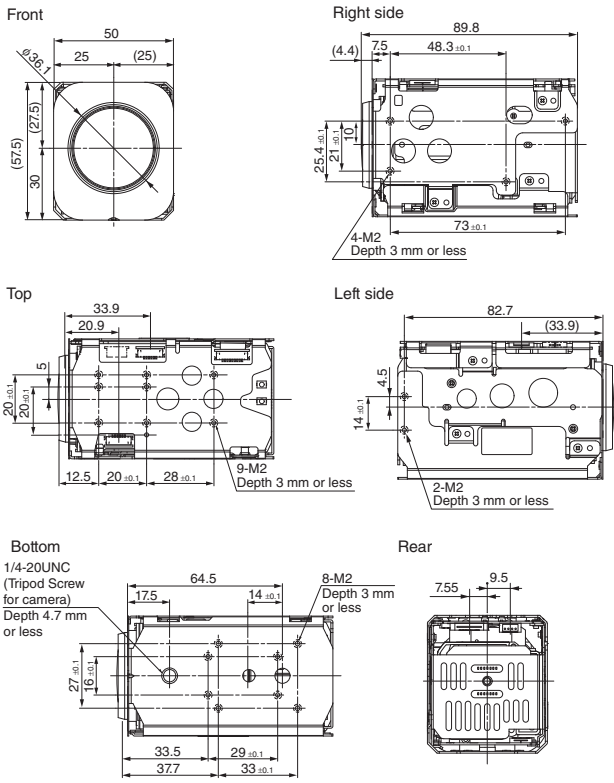
XC (Non-TV Format)  
XC (TV Format)

Accessories

micro  
Color Camera Module  
FCB-HD  
FCB-SD

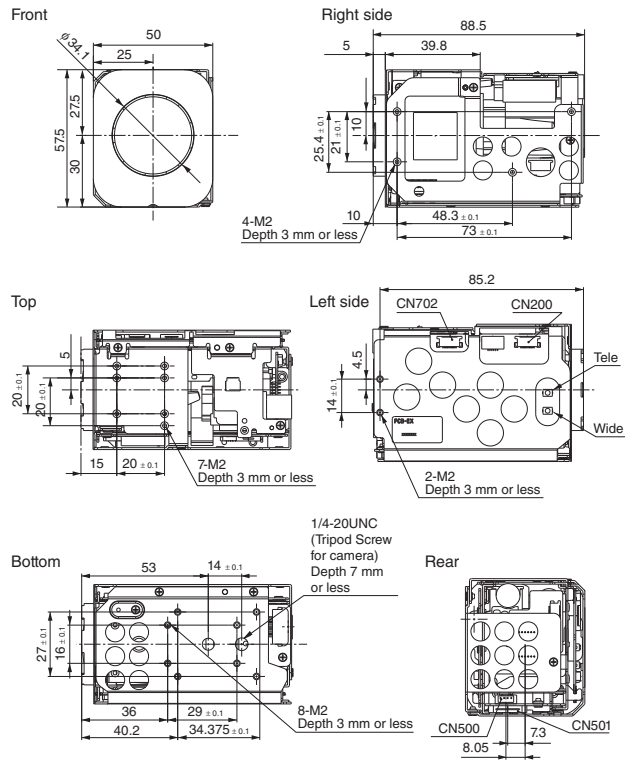
# Dimensions FCB-HD Series

## <FCB-EX995E/FCB-995EP> <FCB-EX985E/FCB-985EP>



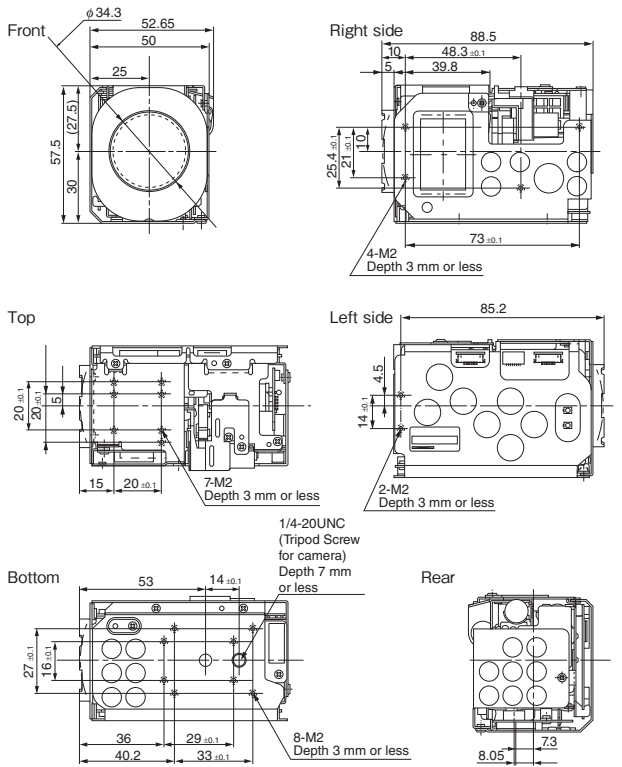
Unit: mm

## <FCB-EX48E/FCB-EX48EP>



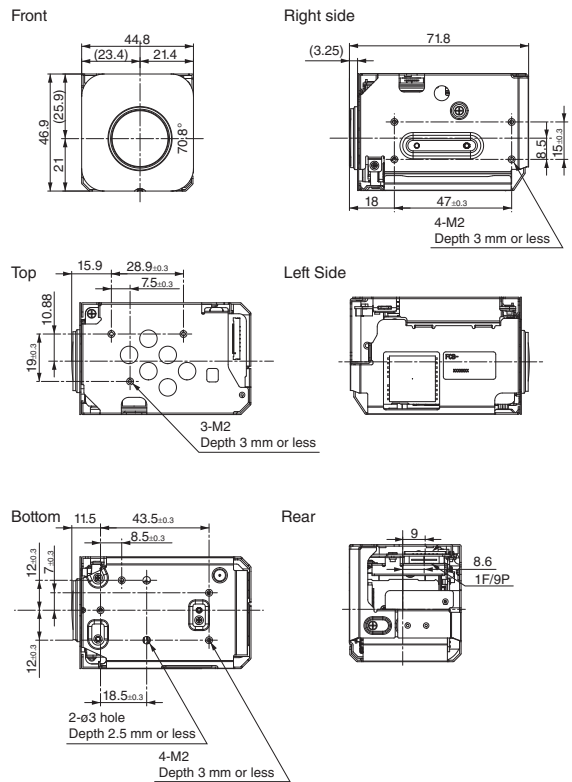
Unit: mm

## <FCB-EX490E/FCB-EX490EP>



Unit: mm

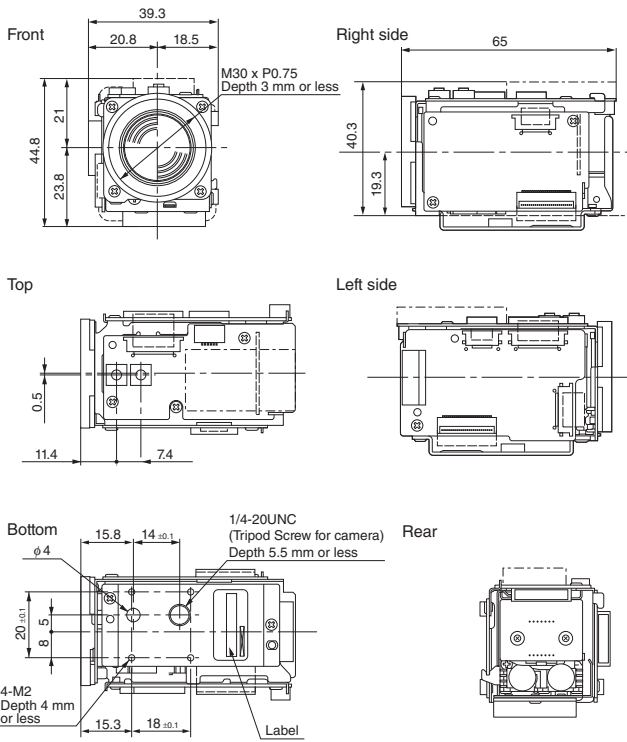
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Unit: mm

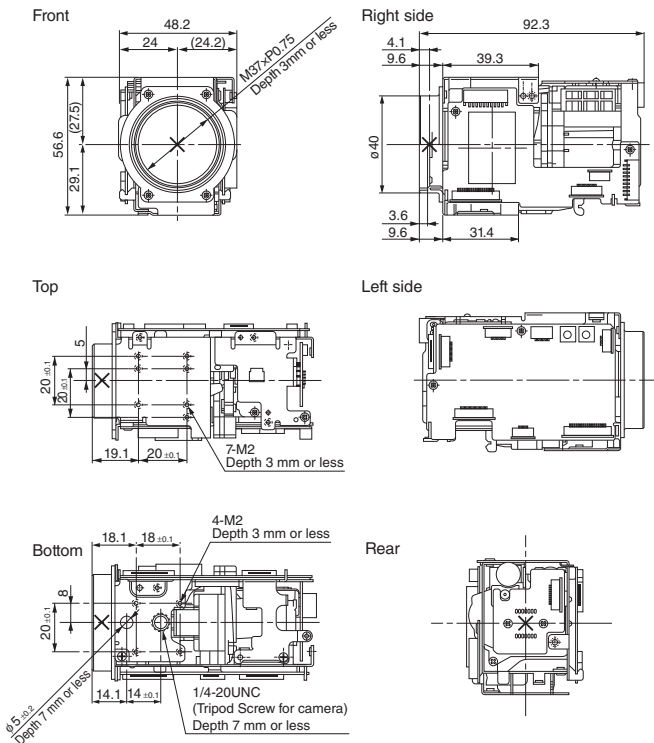
# Dimensions FCB-HD Series

## <FCB-IX11A/FCB-IX11AP>



Unit: mm

## <FCB-IX47C/FCB-IX47CP>



Unit: mm

XCL  
XCG  
XCD

XC (Non-TV Format)  
XC (TV Format)

Accessories

micro

Color Camera Module  
FCB-HD  
FCB-SD

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