

XCG-5005E

XCG-5005CR NEW

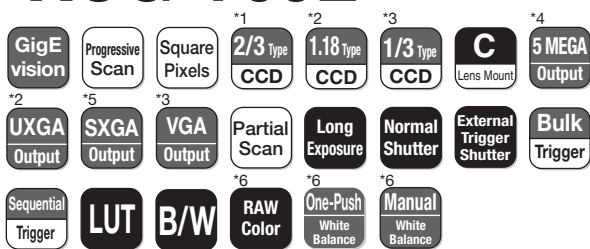
XCG-U100E

XCG-U100CR NEW

XCG-SX99E

XCG-SX97E

XCG-V60E



*1: XCG-5005E/XCG-5005CR/SX99E/SX97E *2: XCG-U100E/XCG-U100CR

*3: XCG-V60E

*4: XCG-5005E/XCG-5005CR

*5: XCG-SX99E/SX97E

*6: XCG-5005CR/SCG-U100CR

Connection Diagram

P44



GIGE
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, the XCG-SX97E, and the XCG-V60E. In addition, the XCG-SX99E, XCG-SX97E, and XCG-5005E feature critical camera functions for security applications such as IR wavelength coverage (XCG-SX99E and XCG-SX97E) 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**
High image quality Progressive-scan CCD produces high-precision, highspeed images.
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-SX97E equips a 1,450,000-pixel 2/3-type CCD that enables image output at 16 fps.
XCG-V60E equips a 330,000-pixel 1/3-type CCD that enables image output at 90 fps.
- **Near-IR sensvity: XCG-SX99E, XCG-SX97E**
- **GigE vision-compliant**
Conforming to GigE Vision version 1.0 standards, this unit is capable of transmitting uncompressed images at high efficiency. EMVA (European Machine Vision Association)
Conforming to EMVA (European Machine Association) standards, this unit uses the Genicam camera control API for industrial use.

■ 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.

■ Special trigger modes

- Normal trigger mode
- Bulk trigger mode
- Sequential trigger mode

■ Trigger input specifications (10 μ s to 2 sec)

■ 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 μ s to 4,000,000 μ s, in 1 μ 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.

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

* "Genicam" is a trademark of EMVA (European Machine Vision Association).

Accessories

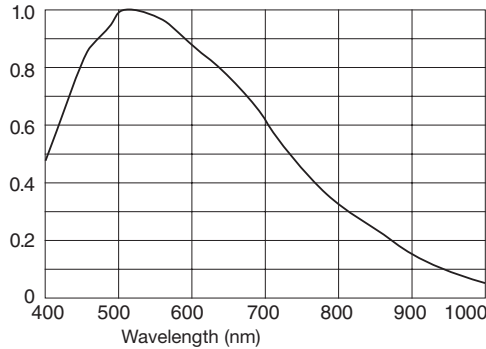
- Compact camera adaptor
 - DC-700/700CE
- 12-pin camera cable (CE standard)
 - CCXC-12P02N (2 m)
 - CCXC-12P05N (5 m)
- CCXC-12P10N (10 m)
- CCXC-12P25N (25 m)
- Tripod adaptor
 - VCT-ST70I

Spectral Sensitivity Characteristics

• XCG-5005E

(Lens characteristics and light source characteristics excluded.)

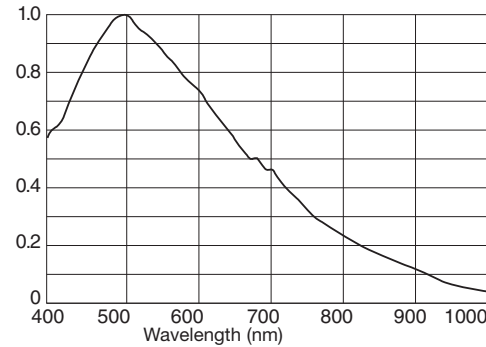
Relative sensitivity



• XCG-U100E

(Lens characteristics and light source characteristics excluded.)

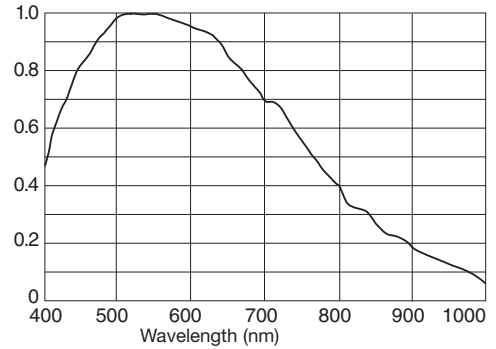
Relative sensitivity



• XCG-SX99E/SX97E

(Lens characteristics and light source characteristics excluded.)

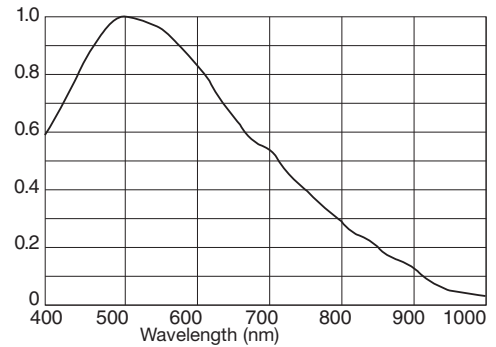
Relative sensitivity



• XCG-V60E

(Lens characteristics and light source characteristics excluded.)

Relative sensitivity



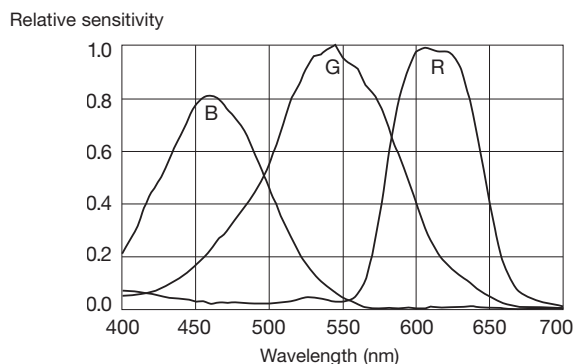
Specifications

	XCG-5005E	XCG-U100E	XCG-SX99E	XCG-SX97E	XCG-V60E
Camera					
Image sensor	2/3-type progressive scan IT CCD	1/1.8-type progressive scan IT CCD	2/3-type progressive scan IT CCD	2/3-type progressive scan IT CCD	1/3-type progressive scan IT CCD
Standard output pixels (H) × (V)	2,448 × 2,048	1,600 × 1,200	1,360 × 1,024	1,360 × 1,024	640 × 480
Frame rate	15 fps	15 fps	27 fps	16 fps	90 fps
Cell size (H) × (V)	3.45 μm × 3.45 μm	4.4 μm × 4.4 μm	6.45 μm × 6.45 μm	6.45 μm × 6.45 μm	7.4 μm × 7.4 μm
Minimum illumination	1 lx (Lens: F1.4, Gain: 18 dB)	1 lx (Lens: F1.4, Gain: 18 dB)	0.4 lx (Lens: F1.4, Gain: 18 dB)	0.2 lx (Lens: F1.4, Gain: 18 dB)	1 lx (Lens: F1.4, Gain: 18 dB)
Sensitivity	400 lx F5.6 (0 dB)	400 lx F5.6 (0 dB)	400 lx F8 (0 dB)	400 lx F11 (0 dB)	400 lx F5.6 (0 dB)
Gain	Auto / Manual: 0 to 18 dB				
SNR	1 step (Lens close, Gain: 0 dB, 8 bits)				
Shutter speed	2 sec to 1/100,000 sec				
Camera Features					
Readout modes	Normal/Binning (1 × 2, 2 × 2) / Partial scan				
Readout features	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				
Memory channel	16 channels				
User memory	16 bytes + 64 bytes × 16 channels				
Interface					
Image output	Selectable, 8 bit, 10 bit, 12 bit, digital				
Interface	Gigabit Ethernet (1000BASE-T)				
Camera specification	GigE Vision® Version 1.2 Compliant				
Others					
Lens mount	C-mount				
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	3.1 W	3.6 W	3.1 W	3.1 W
Operating temperature	-5°C to +45°C				
Performance quarantine 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 (not including projecting parts)				
Mass	145 g				
MTBF	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				
Supplied accessories	Lens mount cap (1), Operating Instructions (1)				

Spectral Sensitivity Characteristics

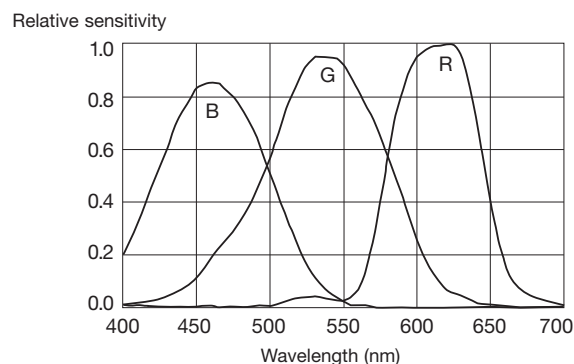
• XCG-5005CR

(Lens characteristics and light source characteristics excluded.)



• XCG-U100CR

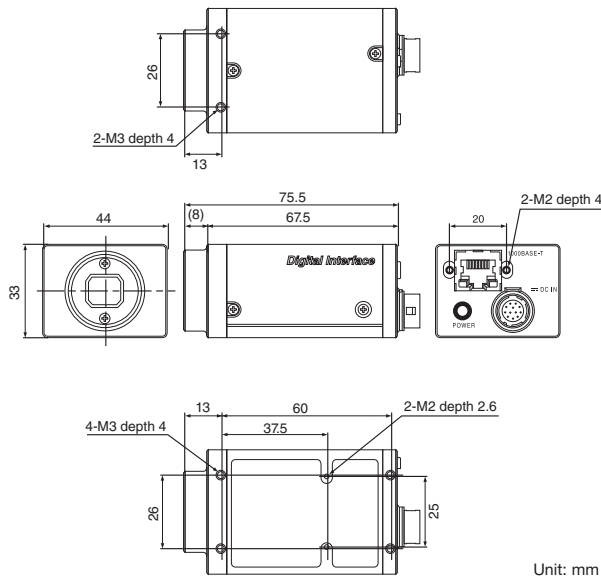
(Lens characteristics and light source characteristics excluded.)



Specifications

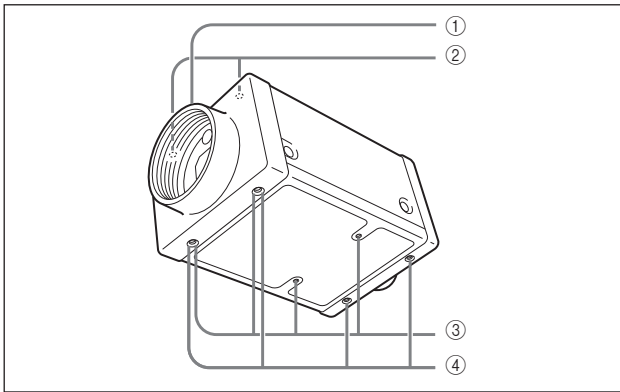
	XCG-5005CR	XCG-U100CR
Camera		
Image sensor	2/3-type PS IT CCD	1/1.8-type PS IT CCD
Cell size (H) × (V)	3.45 μm × 3.45 μm	4.4 μm × 4.4 μm
Standard output pixels (H) × (V)	2,448 × 2,048	1,600 × 1,200
Frame rate	15 fps	27 fps
Minimum illumination	6 lx (Lens: F1.4, Gain: 18 dB, Shutter: 66,570 μs)	6 lx (Lens: F1.4, Gain: 18 dB, Shutter: 36,931 μs)
Sensitivity	F8 (2000 lx, 0 dB)	F5.6 (2000 lx, 0 dB)
Gain	Auto / Manual: 0 to 18 dB	
SNR	1 step (Lens close, Gain: 0 dB, 8 bits)	
Shutter speed	2 sec to 1/100,000 sec	
Camera Features		
Readout modes	Normal/Partial scan	
Readout features	Gamma (arbitrary setting), color bar feature	
Trigger modes	Edge/Width mode, Software trigger (1000BASE-T), Bulk trigger, Sequential trigger, Trigger inhibit, Trigger/Strobe delay	
Memory channel	16 channels	
User memory	16 bytes × 16 channels	
Interface		
Image output	Selectable, 8 bit, 10 bit, 12 bit, digital	
Interface	Gigabit Ethernet (1000BASE-T)	
Camera specification	GigE Vision® Version 1.2 Compliant	
Others		
Lens mount	C-mount	
Flange focal length	17.526 mm	
Power requirements	DC +12 V (10.5 V to 15.0 V) (from 12-pin connector)	
Power consumption	4.3 W	3.5 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. 8.5 years	Approx. 9.9 years
Dimensions (W) × (H) × (D)	44 × 33 × 67.5 mm (not including projecting parts)	
Mass	145 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), Operating Instructions (1)	

Dimensions



Unit: mm

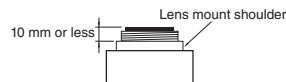
Location and Function of Parts and Controls



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)

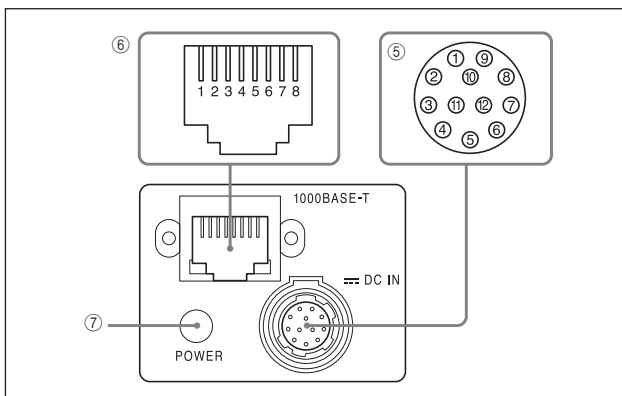
③ Guide screw holes/Tripod screw holes (at the bottom)

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 -

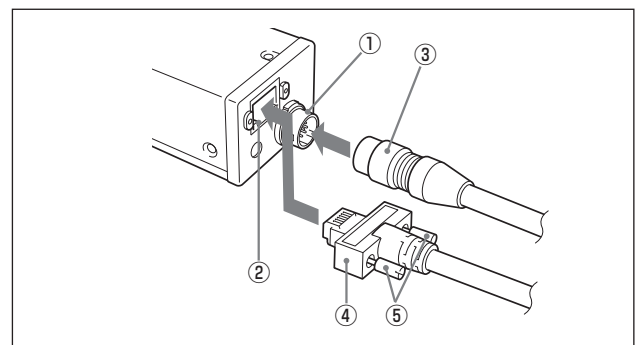
⑦ POWER LED

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.

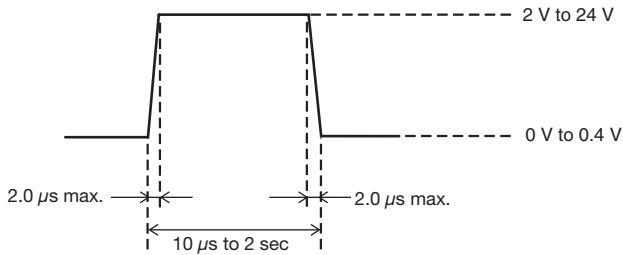
Exposure occurs according to the predetermined timing of the trigger signal, which serves as the drive signal for acquiring video images. An image is acquired whenever the drive signal is valid. This function is used for shooting simultaneous video with multiple cameras.

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



Trigger polarity – when negative polarity

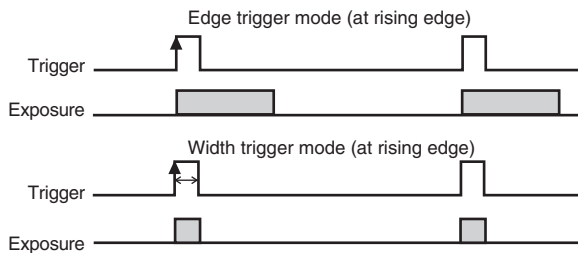
The High/Low voltage of the falling edge is the same as when polarity is positive.

Special Trigger Modes

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

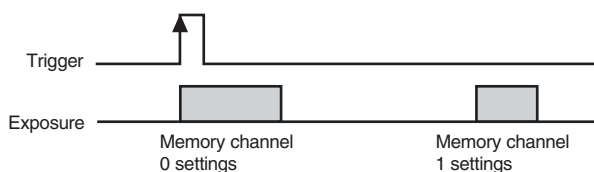
Normal trigger mode

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).



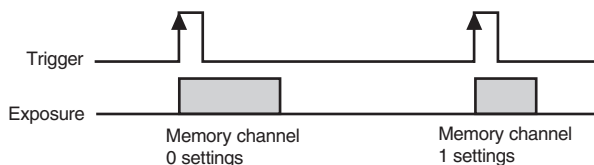
Bulk trigger mode

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

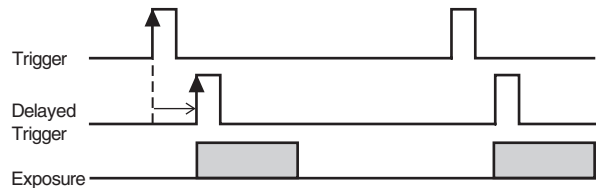
Different camera setting configurations are stored in memory channels beforehand, with the different settings applied in sequence to acquire a different image with each trigger event. In the following diagram, two images with different exposure settings are acquired in one cycle.



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 μ s to 4,000,000 μ s, in 1 μ s 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.

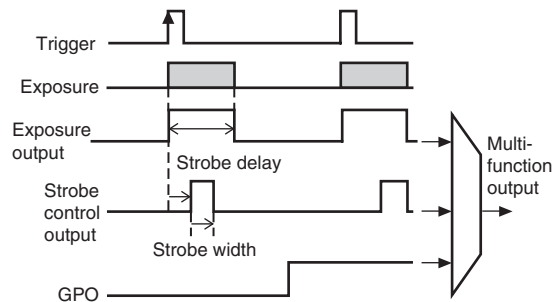
Strobe control outputs

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 μ s to 4,000 μ s (in 1 μ s units)
Strobe width: 0 μ s to 4,000 μ s (in 1 μ s 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.

Minimum area sizes for partial scan are as follows:

XCG-5005E/5005CR	64 pixels × 480 lines
XCG-U100E/U100CR	64 pixels × 120 lines
XCG-SX97E/SX99E	64 pixels × 100 lines
XCG-V60E	64 pixels × 48 lines

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

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

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.

Selectable from 0: Linear 1: Reverse 2: Binarization
3: Gamma Curve Coefficient 4: User Setting.

Digital Clamp (XCG-5005CR only)

The 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

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

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 only)

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).