BLACK-and-WHITE VIDEO CAMERA MODULE

XC-HR90

| Non-TV Output | Progressive Scan | 1/3 Type CCD | Square Pixels | C Lens Mount | VS Output | SXGA Output | Partial Scan |
| HD VD External Sync | 30/15 fps Selectable | Restart Reset | Long Exposure | Normal Shutter | Mode 1 (Non-Reset Mode) External Trigger Shutter | Mode 2 (Non-Reset Mode) External Trigger Shutter | RS232C Control |

Digital Video Camera XCG XCD XCL
Intelligent XCI
Analog Video Camera XC (Non-TV Format) XC (TV Format)
Accessories
Color Camera Module FCB
Color PTZ Camera EVI
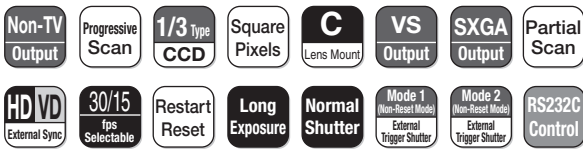
Outline

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.
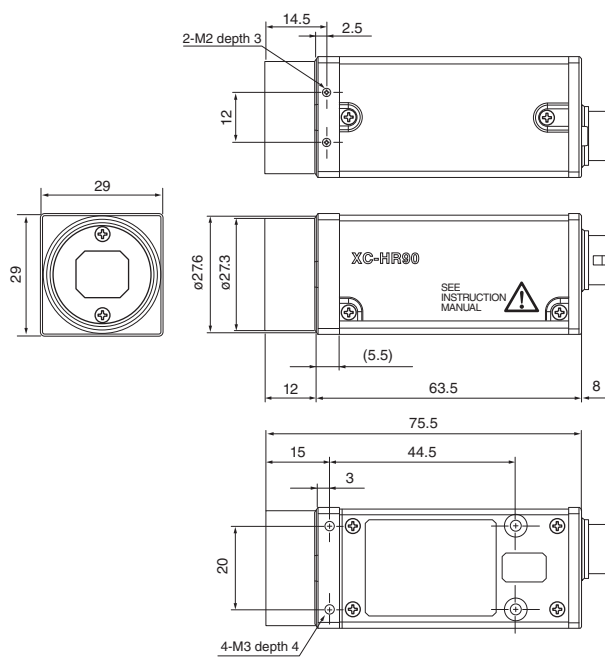
Features

■ 1/3-type high-resolution progressive scan 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 function
■ Binning function
■ 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)

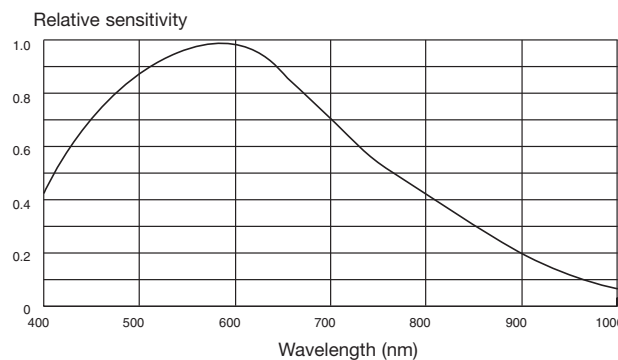■ Tripod adaptor
• VCT-55I

Dimensions

14.5   2.5
2-M2 depth 3
12
29
29
ø27.6   ø27.3
XC-HR90
SEE INSTRUCTION MANUAL
(5.5)
12   63.5   8
75.5
15   44.5
3
20
4-M3 depth 4
*1: for 3-M3 screw
*2: for 4-M2 screw

Unit: mm

Spectral Sensitivity Characteristics

• **XC-HR90**
(Typical Values)

Relative sensitivity

Wavelength (nm)

(Lens characteristics and light source characteristics excluded.)

XCG XCD XCL

Digital Video Camera

XCI

Intelligent

XC (Non-TV Format)

Analog Video Camera

XC (TV Format)

Accessories

Color Camera Module
FCB

Color PTZ Camera
EVI

Location and Function of Parts and Controls

① Lens mount (C-mount)

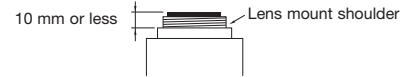② Reference screw holes (at the top)

③ Reference screw holes
(at the bottom) / tripod adaptor
screw holes
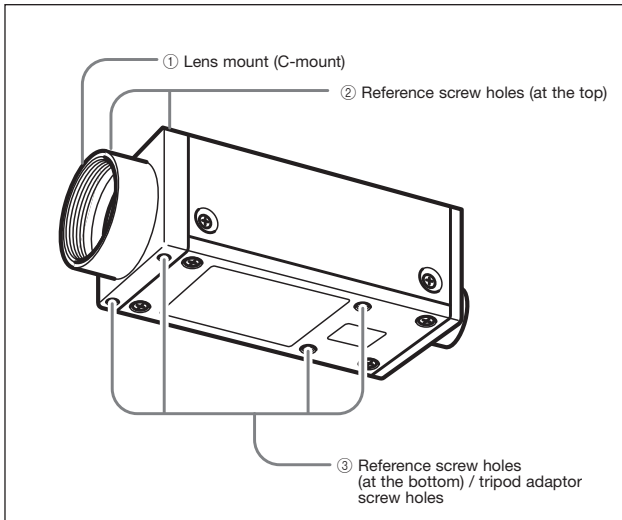
① **Lens mount (C-mount)**

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.

10 mm or less   Lens mount shoulder

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

	XC-HR90
Image device	1/3-type progressive scan IT CCD
Effective picture elements (H) × (V)	1,296 × 966
Effective lines (H) × (V)	1,280 × 960
Image size	SXGA
Cell size (H) × (V)	3.75 μm × 3.75 μm
Lens mount	C-mount
Sync system	Internal/External (auto)
External sync signal input/output	HD/VD (HD/VD level: 2.5 V to 5 Vp-p, 75 W)
External sync allowable frequency	±1% (in horizontal synchronous frequency)
Jitter	Less than 20 ns
Scanning system	Non-interlace Progressive scan
Output signal frequency	Binning: 2-line combined/Normal: 1-line sequential output
Video output	1.0 Vp-p, sync negative, 75 Ω, unbalanced
CCD vertical drive 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)
CCD horizontal drive 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=OFF, FIX GAIN (0 dB))
Minimum illumination	1 lx (F1.4, g=OFF, 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	OFF (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 scanning	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	29 (W) × 29 (H) × 63.5 (D) mm (not including projecting parts)
Mass	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)

The values for mass and dimension are approximate.

Rear Panel
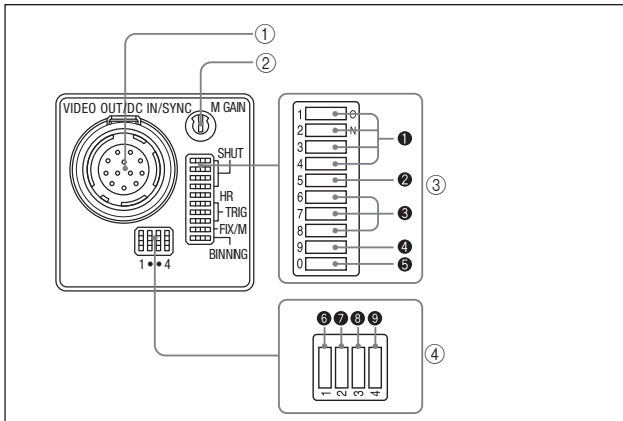
Note

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**

❶ **Shutter speed (bits 1 to 4)**

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

❷ **Partial scan mode switch (5)**

The factory setting of this switch is partial scan OFF.

❸ **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).

❹ **Gain switch (bit 9)**

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

❺ **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**

❻ **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).

❼ **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.

❽ **30 fps/15 fps switch**
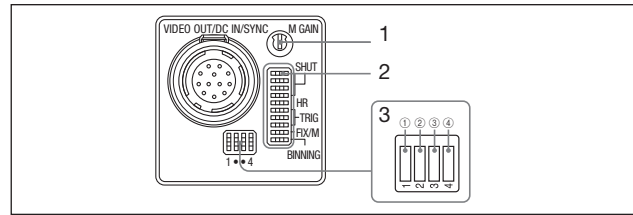
30 fps: switch down position

15 fps: switch up position

❾ **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)
3	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

Rear panel
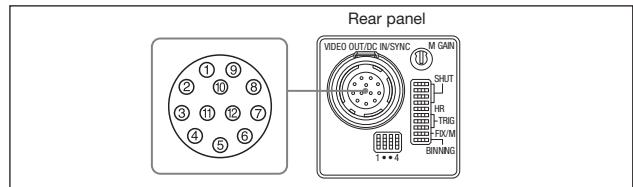
Pin No.	Camera sync output	External mode (HD/VD)	Restart/Reset	External trigger shutter
1	Ground	Ground	Ground	Ground
2	+12 V DC	+12 V DC	+12 V DC	+12 V DC
3	Video output (Ground)	Video output (Ground)	Video output 1 (Ground)	Video output (Ground)
4	Video output (Signal)	Video output (Signal)	Video output 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)) [1]	(RS-232C (Rx)) [1]	(RS-232C (Rx)) [1]	(RS-232C (Rx)) [1]
9	(RS-232C (Tx)) [1]	(RS-232C (Tx)) [1]	(RS-232C (Tx)) [1]	(RS-232C (Tx)) [1]
10	—	—	—	WEN output (Signal)
11	—	—	—	Trigger pulse input (Signal)
12	VD output (Ground)	VD input (Ground)	Reset (Ground)	VD input (Ground) [2]

[1] When communicating with RS-232C.　[2] Commom 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.

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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

30fps

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

1/125	1/250	1/500	1/1000	OFF	OFF

1/2000	1/4000	1/10000	1/20000	OFF	OFF

1/50000	1/100000	1/100		OFF

15fps

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

1/125	1/250	1/500	1/1000	OFF	OFF

1/2000	1/4000	1/10000	1/25000	OFF	OFF

1/50000	1/100		OFF	OFF

(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 ▣ 7 ▣ 8 ▣	6 ▣ 7 ▣ 8 ▣

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.

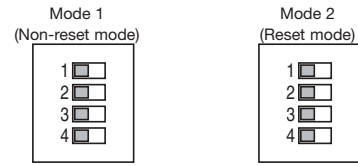## To Set the External Trigger Shutter

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 μsec to 250 msec.

Exposure time = Trigger pulse width + 5 μsec

Mode 1 (Non-reset mode)	Mode 2 (Reset mode)
1 ▣ 2 ▣ 3 ▣ 4 ▣	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

1/2000	1/4000	1/10000	1/25000

| 1/50000	1/100000	1/100	

(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	Partial scan	
R/R	OFF	ON
6 ▣ 7 ▣ 8 ▣	5 ▣	5 ▣
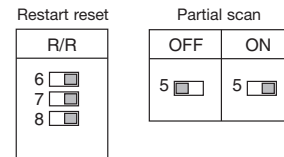
Long Exposure

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.

Example of input timing chart

EXT-HD

EXT-VD

Charge accumulation on CCD

VIDEO OUT