

SONY

CCD B/W CAMERA MODULE

XC-ES50/50CE

XC-ES30/30CE

XC-EI50/50CE

XC-EI30/30CE



User's

Guide

(Ver. 1.0) — English —

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OUTLINE

The XC-ES30/30CE, XC-ES50/50CE, XC-EI30/30CE, and XC-EI50/50CE are industrial black-and-white video camera modules, each using a 1/3- or 1/2-inch IT CCD. The 1/3- and 1/2-inch C mount commonly used in industrial applications implements compact size and lightweight. Switching of each mode on the rear panel, which has been installed from the XC-ST series, is followed to provide improved operability. The XC-EI series uses a CCD which is sensitive on a near infrared area to capture a clear image even in low-intensity illumination. As with the existing devices, the XC-ES30/30CE, XC-ES50/50CE, XC-EI30/30CE, and XC-EI50/50CE incorporate significant shock and vibration resistance to support installation on FA equipment.

MAIN FEATURES

■ 1/3" and 1/2" IT CCD

A CCD sensitive on a near infrared area is used for the XC-EI series.

■ External trigger shutter function

(XC-ES50/ES30, XC-EI50/EI30: 1/4 to 1/10,000 seconds,
XC-ES50CE/ES30CE, XC-EI50CE/EI30CE: 1/4 to 1/8,000 seconds)

■ Restart Reset (R.R) function

Inputting HD and VD signals (2 VD or more) continuously from the outside can catch one image at arbitrary time and control the stored CCD.

This function is used for long exposures and strobe with frame image output.

■ Synchronization system: Internal/external HD/VD

Inputting an HD/VD signal from the outside automatically establishes external synchronization.

This function is effective for controlling multiple cameras efficiently from the external system.

■ Setting each mode on rear panel

The setting of each mode can be changed by the DIP switch.

Almost all switches are located on the rear panel. This feature permits easy setting after equipment is installed.

■ Compact and lightweight

Compared to the existing devices, the size and weight are reduced widely.


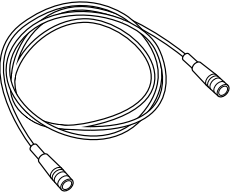
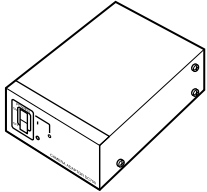
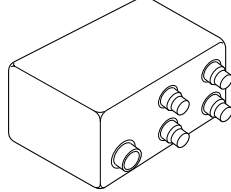
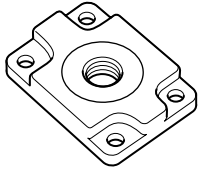
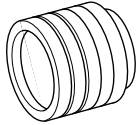
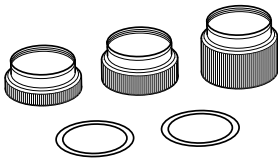
Each of the XC-ES30/30CE, XC-ES50/50CE, XC-EI30/30CE, and XC-EI50/50CE can be used in applications using two-piece cameras.

■ C-mount

■ Excellent shock and vibration resistance

SYSTEM CONFIGURATION

The components making up the system based on XC-E series video camera are as follows.

		
<p>Video camera module XC-ES50/50CE XC-ES30/30CE XC-EI50/50CE XC-EI30/30CE</p>	<p>Camera cables CCXC-12P02N (2 m) CCXC-12P05N (5 m) CCXC-12P10N (10 m) CCXC-12P25N (25 m)</p>	<p>Camera adaptor DC-700/700CE</p>
		
<p>Junction box JB-77</p>	<p>Tripod adaptor VCT-3331 (Isolated type)</p>	<p>C-mount lenses VCL-08YM VCL-12YM VCL-16Y-M VCL-25Y-M VCL-50Y-M</p>
		
		<p>Close-up ring kit LO-77ERK</p>

SPECIFICATIONS COMPARISON

	XC-ST50	XC-ES50	XC-EI50	XC-ST30	XC-ES30	XC-EI30
Image pickup device	1/2"IT CCD			1/3"IT CCD		
Number of effective pixels	768 (H) × 494 (V)			768 (H) × 494 (V)		
Lens mount	C mount			C mount		
Scanning system	2:1 interlaced			2:1 interlaced		
Sensitivity	400 lx F8 (γ =ON, 0dB)	400 lx F5, 6 (γ =ON, Min Gain IR without IR cut filter)	400 lx F11 (γ =ON, Min Gain IR without IR cut filter)	400 lx F8 (γ =ON, 0dB)	400 lx F8 (γ =ON, Min Gain IR without IR cut filter)	400 lx F8 (γ =ON, Min Gain IR without IR cut filter)
Minimum illuminance *	0.3 lx	0.3 lx	0.1 lx	0.3 lx		0.2 lx
Normal shutter	1/100 to 1/10,000 seconds			1/100 to 1/10,000 seconds		
External trigger shutter	1/4 to 1/10,000 seconds			1/4 to 1/10,000 seconds		
Dimensions	44 (W) × 29 (H) × 57.5 (D) mm	29 (W) × 29 (H) × 32 (D) mm		44 (W) × 29 (H) × 57.5 (D) mm	29 (W) × 29 (H) × 32 (D) mm	
Mass	105 g	50 g (approx.)		105 g	50 g (approx.)	
Shock resistance	10G (in the X, Y, and Z directions at 20 to 200 Hz)			10G (in the X, Y, and Z directions at 20 to 200 Hz)		

*F1.4, γ =ON, MAX GAIN

MAIN SPECIFICATIONS

Image pickup device

XC-ES50/50CE, XC-EI50/50CE:	1/2-inch interline transfer CCD
XC-ES30/30CE, XC-EI30/30CE:	1/3-inch interline transfer CCD

Number of effective pixels

XC-ES50/EI50, XC-ES30/EI30:	768 (H)×494 (V)
XC-ES50CE/EI50CE, XC-ES30CE/EI30CE:	752 (H)×582 (V)

CCD horizontal driving frequency

XC-ES50/EI50, XC-ES30/EI30:	14.318 MHz
XC-ES50CE/EI50CE, XC-ES30CE/EI30CE:	14.187 MHz

CCD vertical driving frequency

XC-ES50/EI50, XC-ES30/EI30:	15.734 kHz
XC-ES50CE/EI50CE, XC-ES30CE/EI30CE:	15.625 kHz

Signal system

EIA/CCIR

Cell size

XC-ES50/EI50:	8.4 (H)×9.8 (V) μm
XC-ES50CE/EI50CE:	8.6 (H)×8.3 (V) μm
XC-ES30/EI30:	6.35 (H)×7.4 (V) μm
XC-ES30CE/EI30CE:	6.5 (H)×6.25 (V) μm

Lens mount

C-mount

Flange back

17.526 mm

Synchronization system

Internal/external
(Selected automatically)

External sync input/output

HD/VD (2 to 5 Vp-p)
* Automatically selected according to the existence of an input signal when the selection switch on the rear panel is set to EXT.

Allowable frequency deviation of external synchronization

± 1 %
(in horizontal synchronous frequency)

Jitter

Within ± 50 nsec

Scanning system

2:1 interlacing
Non-interlacing
(during external sync input)

Horizontal resolution

XC-ES50/EI50, XC-ES30/EI30:	570 TV lines
XC-ES50CE/EI50CE, XC-ES30CE/EI30CE:	560 TV lines

Sensitivity

XC-ES50/50CE:	400 lx F5.6 (γ=ON, MIN Gain, without IR cut filter)
XC-ES30/30CE:	400 lx F4 (γ=ON, MIN Gain, without IR cut filter)
XC-EI50/50CE:	400 lx F11 (γ=OFF, MIN Gain, without IR cut filter)
XC-EI30/30CE:	400 lx F8 (γ=ON, MIN Gain, without IR cut filter)

S/N ratio

60dB

Minimum illuminance

XC-ES50/50CE, XC-ES30/30CE:	0.3 lx (F1.4 γ=ON, MAX Gain, without IR cut filter)
XC-EI50/50CE:	0.1 lx (F1.4 γ=ON, MAX Gain, without IR cut filter)
XC-EI30/30CE:	0.2 lx (F1.4 γ=ON, MAX Gain, without IR cut filter)

Gain

AGC/Manual (Can be selected using the switch on the rear panel.)

Gamma correction

ON/OFF (Can be selected using the switch on the rear panel.)

Electronic shutter

XC-ES50/EI50, XC-ES30/EI30:	1/100 to 1/10,000 seconds
XC-ES50CE/EI50CE, XC-ES30CE/EI30CE:	1/120 to 1/10,000 seconds

External trigger shutter

XC-ES50/EI50, XC-ES30/EI30:	1/4 to 1/10,000 seconds
XC-ES50CE/EI50CE, XC-ES30CE/EI30CE:	1/4 to 1/8,000 seconds

* Set using the DIP switch on the rear panel, or variable with the trigger pulse width.

Supply voltage

+12 VDC (+9.0V to 16V)

Power consumption

XC-ES30/30CE, XC-EI30/30CE:	1.4W
XC-ES50/50CE, XC-EI50/50CE:	1.6W

Operating temperature

−5 °C to +45 °C

Storage temperature

−20 °C to +60 °C

Performance assurance temperature

0 °C to +30 °C

Operating humidity

20 to 80 % (Non-condensing)

Storage humidity

20 to 95 % (Non-condensing)

Vibration resistance

10G (For 20 minutes in the X, Y, and Z directions at 20 to 200 Hz)

MAIN SPECIFICATIONS

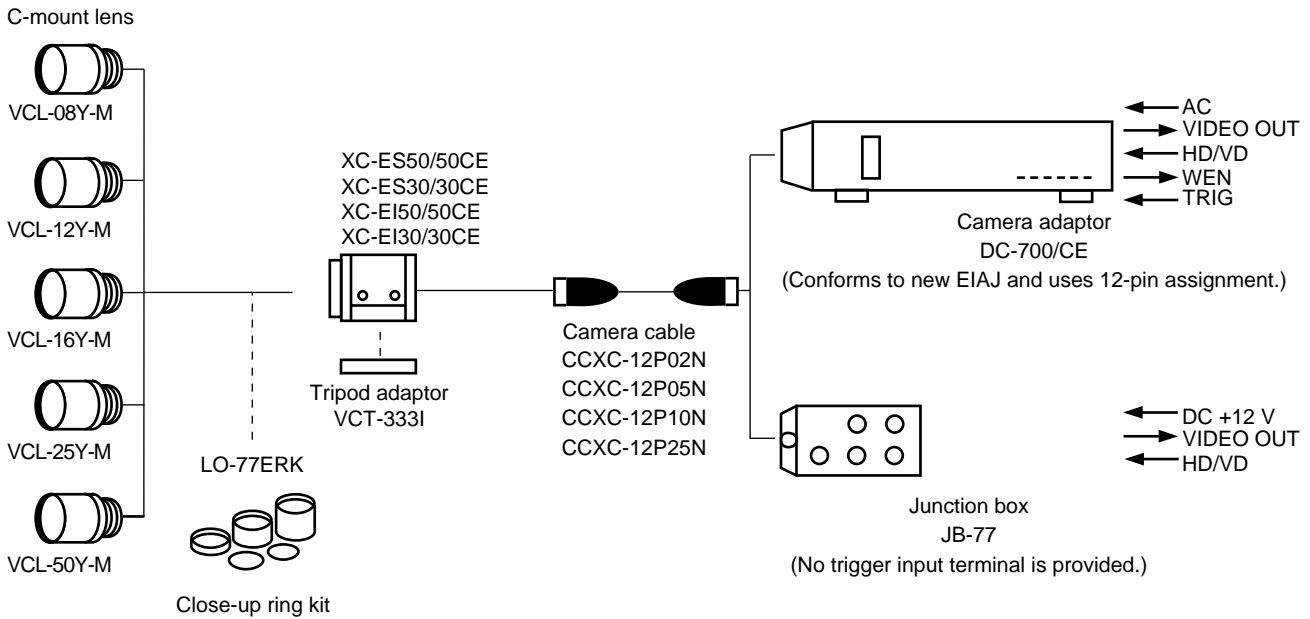
Shock resistance	70G
Outside dimensions	29 (W) × 29 (H) × 32 (D) mm
Weight	50 g
Standards	UL1492, FCC Class A Digital Device, and CE (EN50081-2 + EN50082-2)
Other	Restart Reset function Frame or field integration can be selected. Conforms to new EIAJ and uses 12-pin assignment.
Accessories	Lens mount cap (1) Instruction Manual (1)

External synchronization for each mode

Mode	Internal sync	External sync	
		HD/VD	VS
Normal	○	○	○
Normal shutter	○	○	○
External trigger shutter	Mode 1	○	×
	Mode 2	Trigger signal generates an internal VD (single) signal.	×
Restart Reset	×	○	×

○: Can be used.
×: Cannot be used.

CONNECTION DIAGRAM



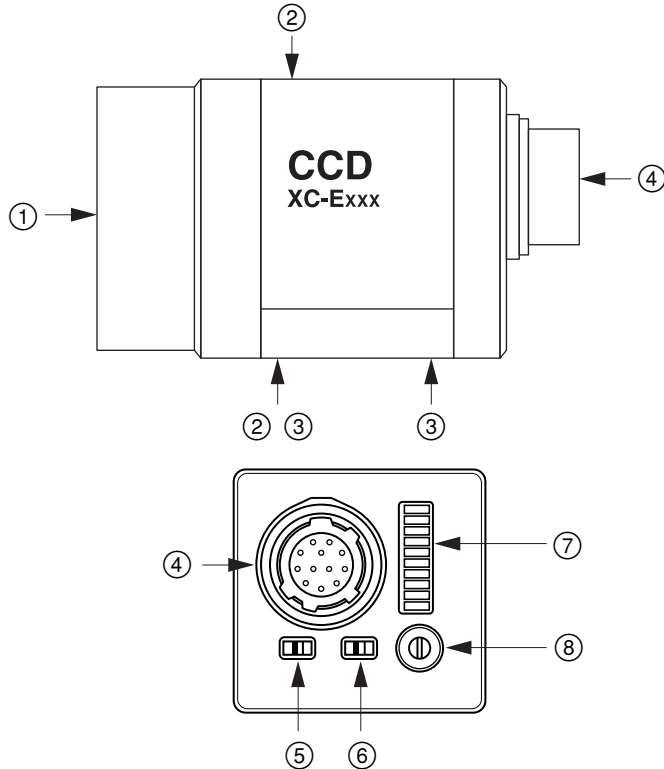
Note : All functions of the XC-ES50/50CE, XC-ES30/30CE, XC-EI50/50CE, XC-EI30/30CE cannot be used when using DC-777/CE, DC-77RR/CE, and JB-77 is used. Refer to the table shown below.

XC-ES50/50CE XC-ES30/30CE XC-EI50/50CE XC-EI30/30CE	JB-77
Normal	○
Normal shutter	○
Restart Reset (R.R)	○
Restart Reset (R.R) + shutter	○
External trigger shutter	×

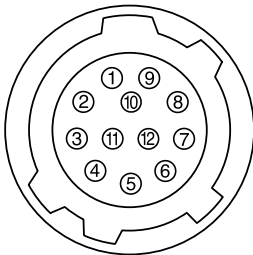
○: Can be used.
×: Cannot be used.

LOCATION OF PARTS AND OPERATION

XC-ES50/50CE · XC-ES30/30CE XC-EI50/50CE · XC-EI30/30CE



④ 12-pin multi-connector



Pin No.	External HD/VD synchronization	Internal HD/VD synchronization
1	GND	GND
2	+12 V	+12 V
3	GND	GND
4	VIDEO output	VIDEO output
5	GND	GND
6	External HD input	Internal HD output
7	*1 External VD input	Internal VD output
8	GND	GND
9	-	-
10	*2 WEN output	*2 WEN output
11	TRIG input	TRIG input
12	GND	GND

*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.

• Factory-setting mode of rear panel

Corresponding No.	Switch	Factory-setting mode
⑤	75 Ω termination selector switch	ON
⑥	HD/VD input-output selector switch	EXT
⑦	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 correction on/off.	OFF
	Switch 0: Selects the gain.	Manual
⑧	Volume control switch	Mechanical center

- ① Lens mount section (C mount)
A commercial C-mount lens as well as a Sony standard lens can be used.
- ② Camera mounting reference hole (top)
These screw holes are positioned with high precision related to CCD sensor.
- ③ Camera mounting reference hole/Screw hole for tripod adaptor mounting (bottom)
- ④ 12-pin multi-connector
DC IN/HD/VD (DC power/sync signal input) VIDEO OUT terminal
- ⑤ 75 Ω termination selector switch
- ⑥ HD/VD input-output selector switch
- ⑦ Shutter speed/mode setting DIP switch
Switches 1 to 4: Select the shutter speed.
Switch 5: Selects the frame or field integration.
Switches 6 to 8: Select the trigger shutter mode.
Switch 9: Selects γ correction on/off.
Switch 0: Selects the gain.
- ⑧ 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).

PHASE CONDITIONS OF EXTERNAL SYNCHRONIZATION

External synchronization for each mode

- **For normal video/normal shutter**

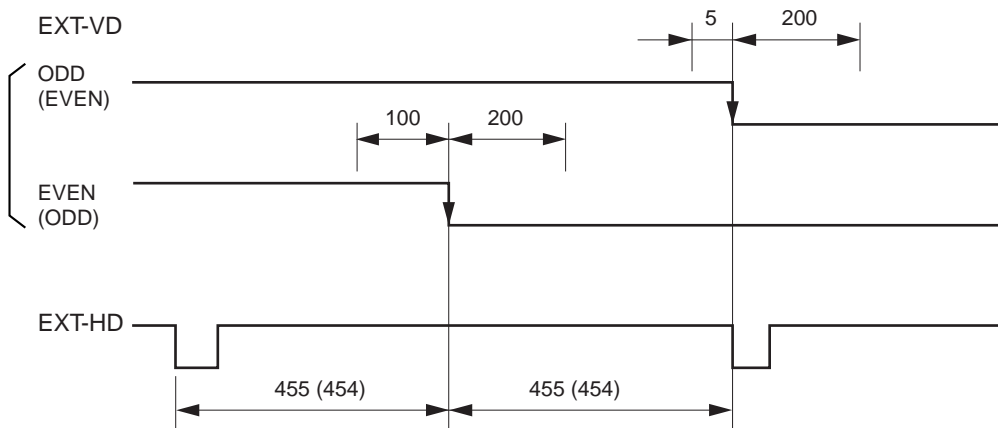
Continuous HD/VD signal (should conform to EIA and CCIR frequencies in the timing shown in the figure below.)

- **For Restart Reset (RR)/external trigger shutter**

Continuous HD signal. The phase between VD (reset) and HD signals is as specified in the figure below in any timing.

Phase conditions

The phase relation between external input HD and VD signals should be set as shown below with respect to the specified center phase.



Unit: Clock

1 CLK = 69.84 n sec

(XC-ES50/ES30, XC-EI50/EI30)

70.48 n sec

(XC-ES50CE/ES30CE, XC-EI50CE/EI30CE)

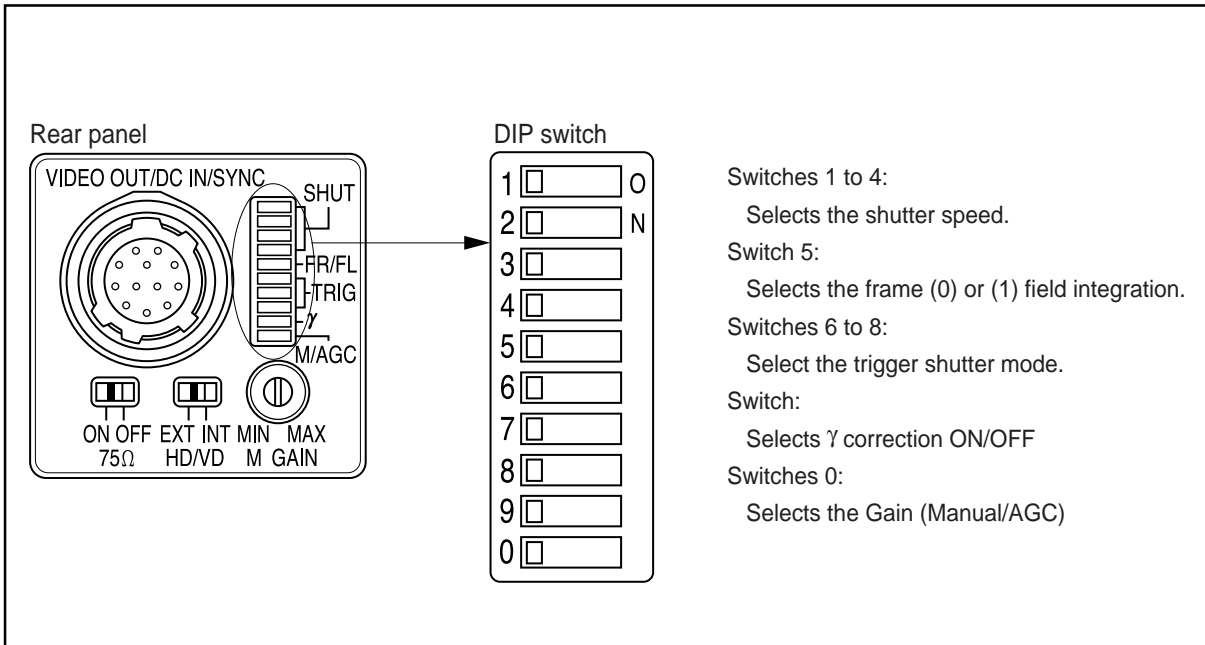
The operation in parentheses refers to XC-ES50CE/ES30CE and XC-EI50CE/EI30CE.

Note : The synchronized VD signals are delayed for 1H at HD/VD external synchronization mode, while there is no VD signal delay at VS external synchronization mode.

ELECTRONIC SHUTTER

Two types of electronic shutter are provided “normal shutter and external trigger shutter”. The electronic shutter speed and type can be set using the DIP switch on the rear panel.

■ DIP switch on the rear panel



■ 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

Switch	Shutter Off	1/125	1/250	1/500	1/1000	1/2000	1/4000	1/8000(C CIR) 1/10000(E IA)	*Flickerless
1	0	1	0	1	0	1	0	1	—
2	0	0	1	1	0	0	1	1	—
3	0	0	0	0	1	1	1	1	—
4	0	0	0	0	0	0	0	0	1
5	Frame: 0 / Field: 1								
6	—	—	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—	—	—
8	0	0	0	0	0	0	0	0	0

* 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).

1: ON
0: OFF
—: Any

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.)

ELECTRONIC SHUTTER

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.

Video sync is always fixed with odd field for XC-ST70 and even field for XC-ST70CE.

* For more details of each timing chart, refer to pages 16 to 23.

◇ Setting of external trigger shutter speed

There are two ways to set the shutter speed.

Mode 1 (Non-reset mode)

Switch	*1/100	1/125	1/250	1/500	1/1000	1/2000	1/4000	**1/10000
1	–	1	0	1	0	1	0	1
2	–	0	1	1	0	0	1	1
3	–	0	0	0	1	1	1	1
4	1	0	0	0	0	0	0	0
5	Frame: 0 / Field: 1							
6	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1
9	–	–	–	–	–	–	–	–
0	–	–	–	–	–	–	–	–

Mode 2 (Reset mode)

Switch	*1/100	1/125	1/250	1/500	1/1000	1/2000	1/4000	**1/10000
1	–	1	0	1	0	1	0	1
2	–	0	1	1	0	0	1	1
3	–	0	0	0	1	1	1	1
4	1	0	0	0	0	0	0	0
5	Frame: 0 / Field: 1							
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	1	1	1	1	1	1	1	1
9	–	–	–	–	–	–	–	–
0	–	–	–	–	–	–	–	–

* The external trigger shutter speed is set to 1/100 sec for XC-ES50/ES30, XC-EI50/EI30 (EIA) and 1/120 sec for XC-ES50CE/ES30CE, XC-EI50CE/EI30CE (CCIR).

** The external trigger shutter speed is set to 1/10000 sec for XC-ES50/ES30, XC-EI50/EI30 (EIA) and 1/8000 sec for XC-ES50CE/ES30CE, XC-EI50CE/EI30CE (CCIR).

1: ON
0: OFF
–: Any

- **Using DIP switch on the rear panel**

ELECTRONIC SHUTTER

• 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 μsec to 250 msec.

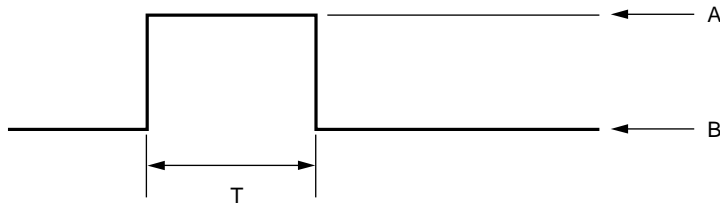
Switch	Mode 1 (Non-reset mode)	Mode 2 (Reset mode)
1	0	0
2	0	0
3	0	0
4	0	0
5	Frame: 0 / Field: 1	
6	0	0
7	1	0
8	1	1
9	0	0
0	0	0

1: ON
0: OFF

$$\text{Exposure time} = \text{Trigger pulse width} + \begin{matrix} 97 \mu\text{sec (EIA)} \\ 120 \mu\text{sec (CCIR)} \end{matrix}$$

- 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



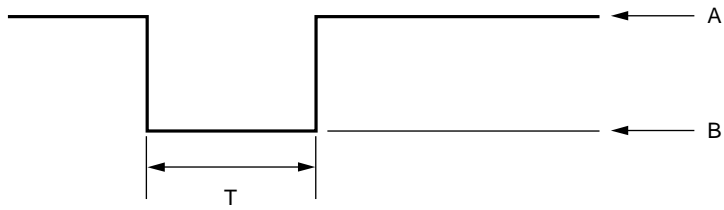
A: 4 to 5.0 V
B: 0 to 1.0 V
T: 2 μs to 1/4 s

T: 2 μs to 1/4 s, 100 μs to 1/4 s when setting the shutter speed using DIP switch

- * Input impedance: 10 kW or more
- * The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

ELECTRONIC SHUTTER

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



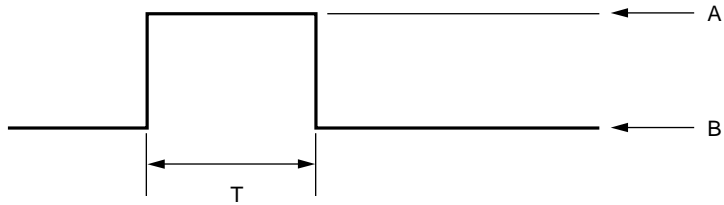
A: 4.0 to 5.0 V

B: 0 to 2.0 V

T: 2 μ s to 1/4 s, 100 μ s to 1/4 s when setting the shutter speed using DIP switch

- * Input impedance: 10 k Ω or more
- * The voltage and pulse width used are measured at pin 11 of a 12-pin multi-connector on the rear panel.

◇ Specifications of WEN (Write ENable Pulse)



A: 5.0 V

B: 0 V

T: 15.875 ms (XC-ST70), 18.752 ms (XC-ST70CE)

- * Output impedance: 10 k Ω or more

RESTART RESET (R.R)

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.

Switch	Restart Reset (R.R)
1	0
2	0
3	0
4	0
5	0
6	1
7	1
8	1
9	0
0	0

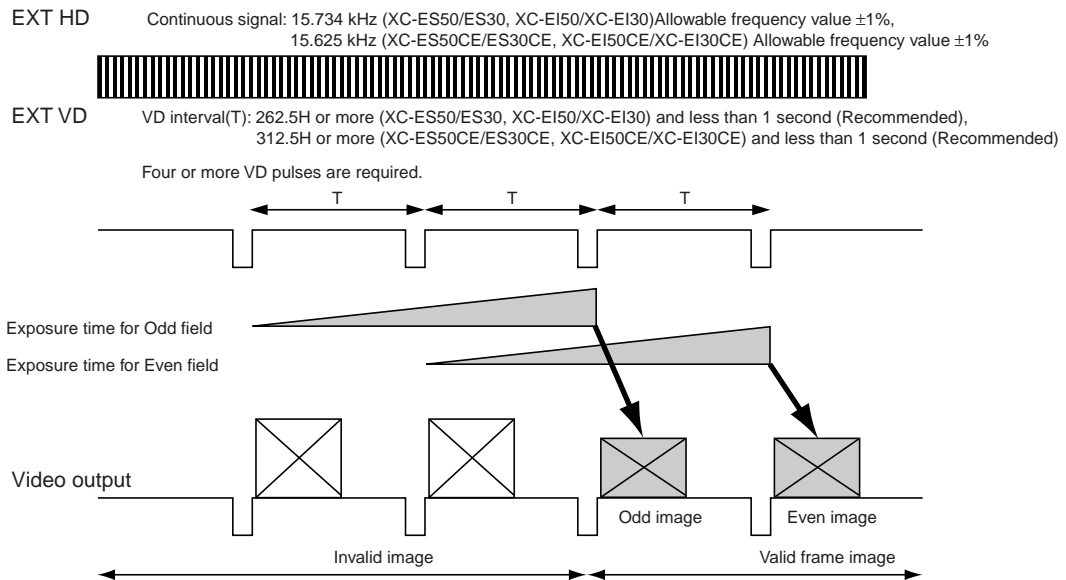
1: ON
0: OFF

◇ Long exposure

A high-sensitivity image is obtained by extending the exposure time of the CCD when satisfactory sensitivity cannot be obtained under other operating conditions or when observing the trail of a moving object. The exposure time is determined by the VD interval (T) period between external VD pulses as follows.

• Timing and conditions

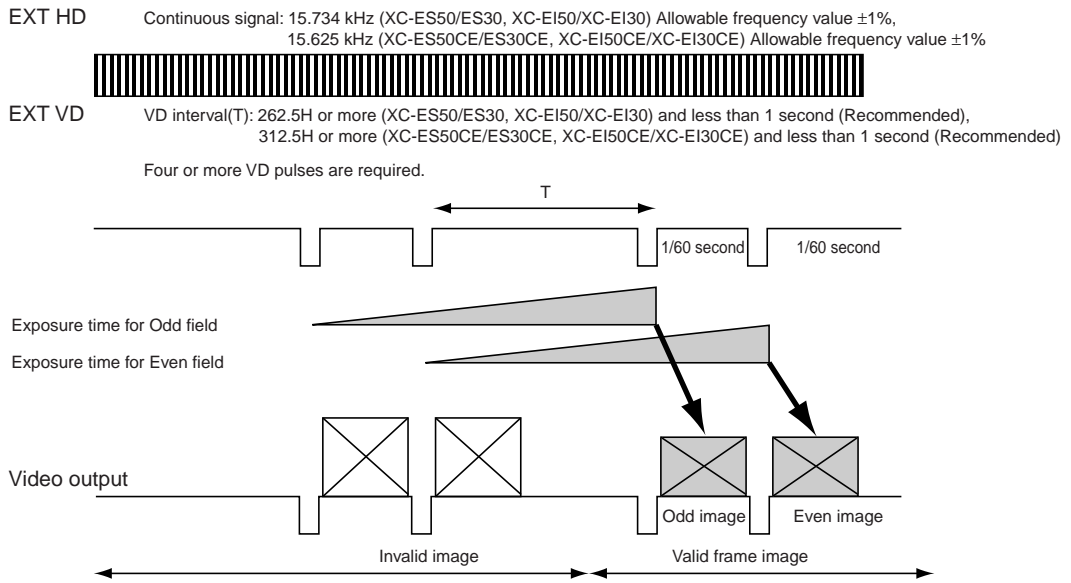
Example 1 of Long exposure



Odd and even fields are determined by the phase of the EXT HD/VD signal input from the outside.

RESTART RESET (R.R)

Example 2 of long exposure



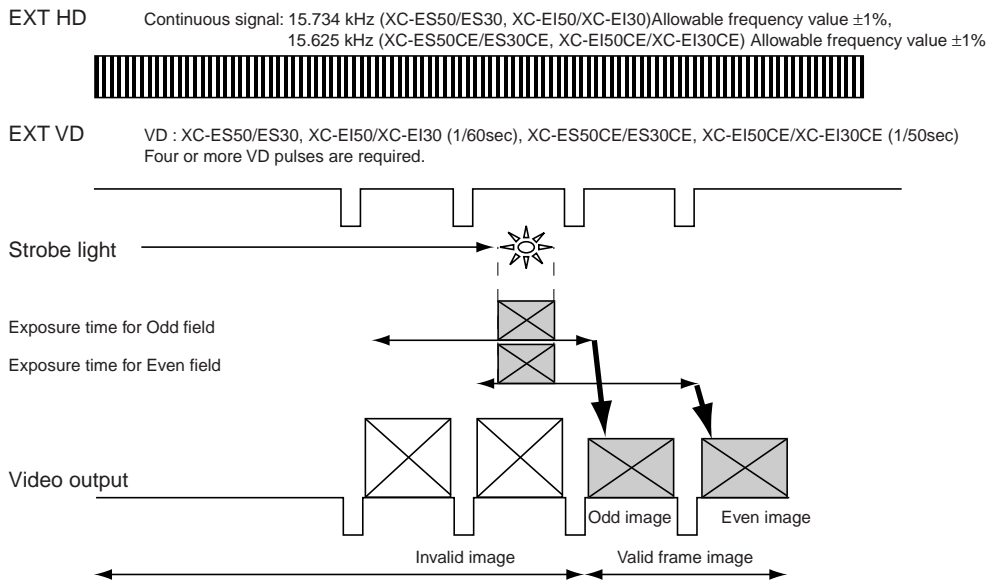
Odd and even fields are determined by the phase of the EXT HD/VD signal input from the outside.

FRAME IMAGE OUTPUT WITH STROBE LIGHT

A full frame image with vertical resolution of 485 lines (XC-ST70) or 575 lines (XC-ST70CE) can be obtained with a strobe light by firing the strobe when the exposure time of the two fields overlap.

- **Timing and conditions**

<Timing chart by restart/reset>



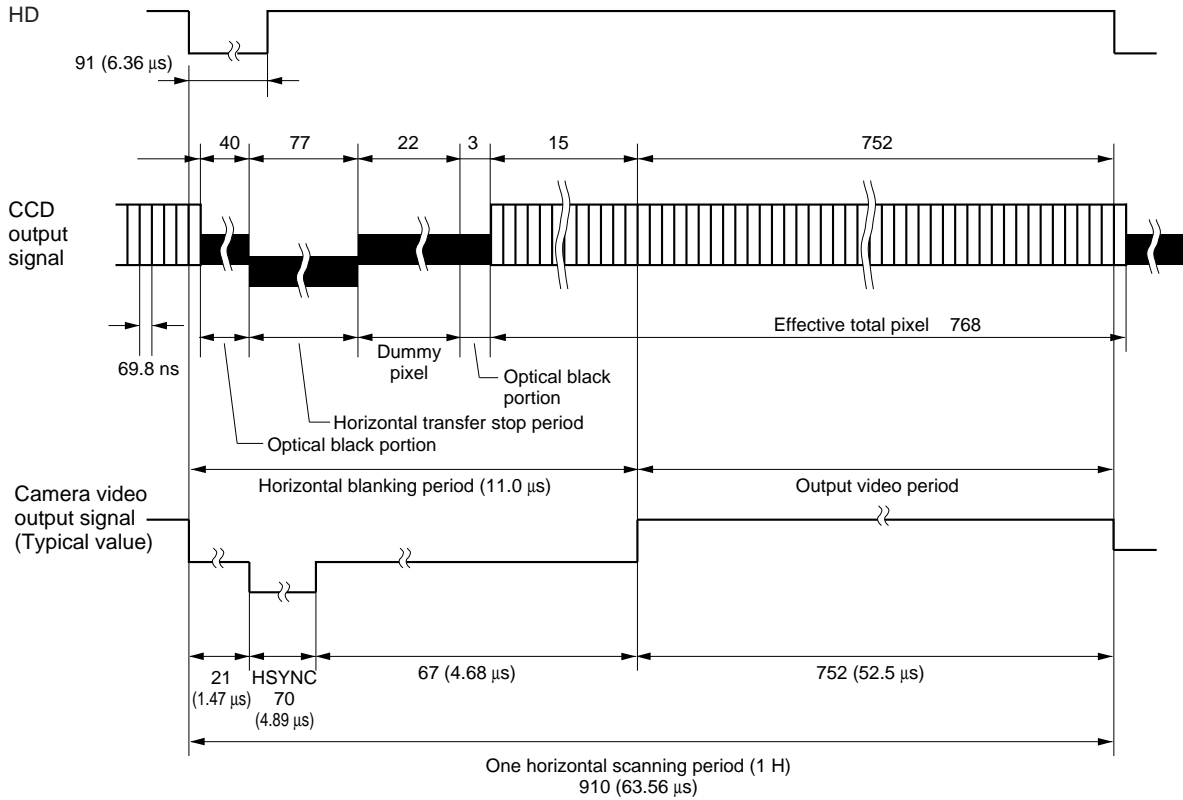
Odd and even fields are determined by the phase of the EXT HD/VD signal input from the outside.

Avoid lighting the scene during the light-emitting inhibit zone defined below. (The field is transferred to the storage area of the CCD, so it can be read out.)

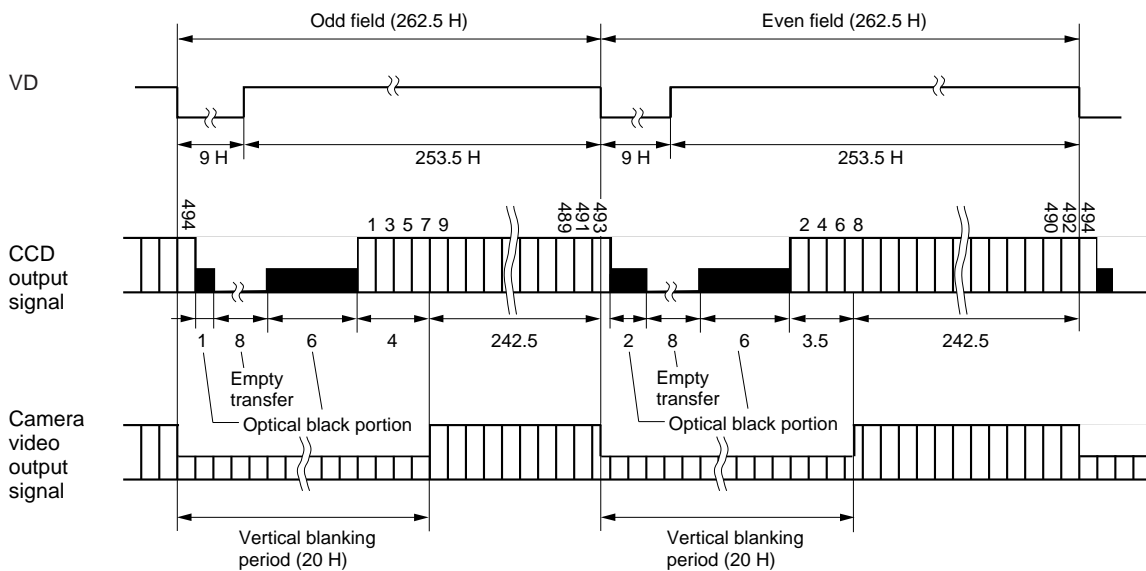
Note : For best performance, it is recommended not to flash between VD and VD + 10H (XC-ES50/ES30, XC-EI50/EI30)/
16H (XC-ES50CE/ES30CE, XC-EI50CE/EI30CE).

OUTPUT WAVEFORM TIMING CHART (XC-ES50/EI50/ES30/EI30(EIA))

◇ Timing chart of horizontal output waveform

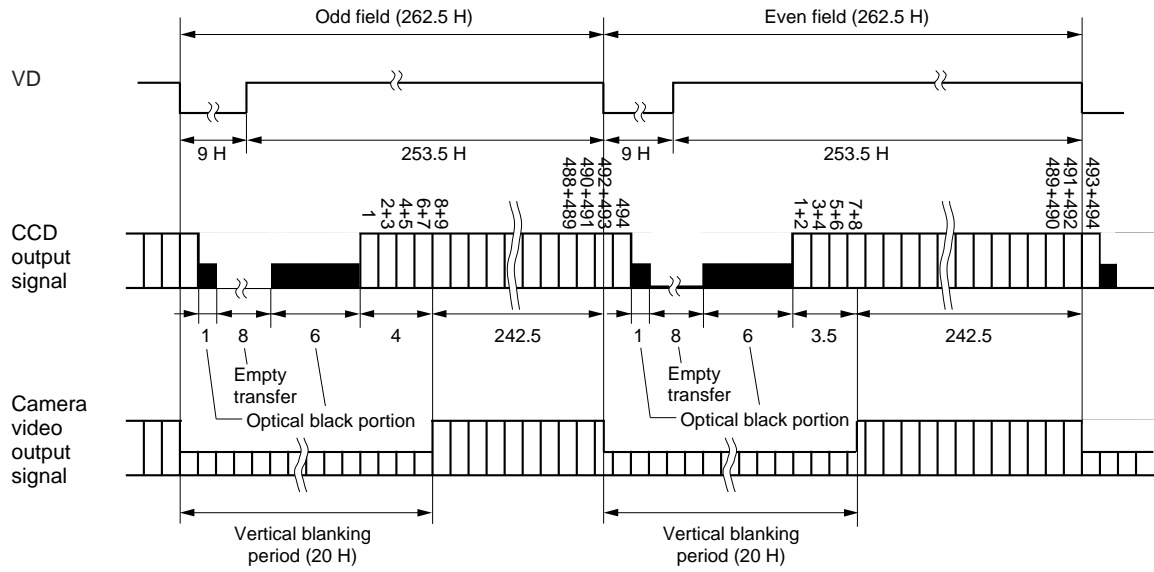


◇ Timing chart of vertical output waveform (2:1 interlaced frame integration)



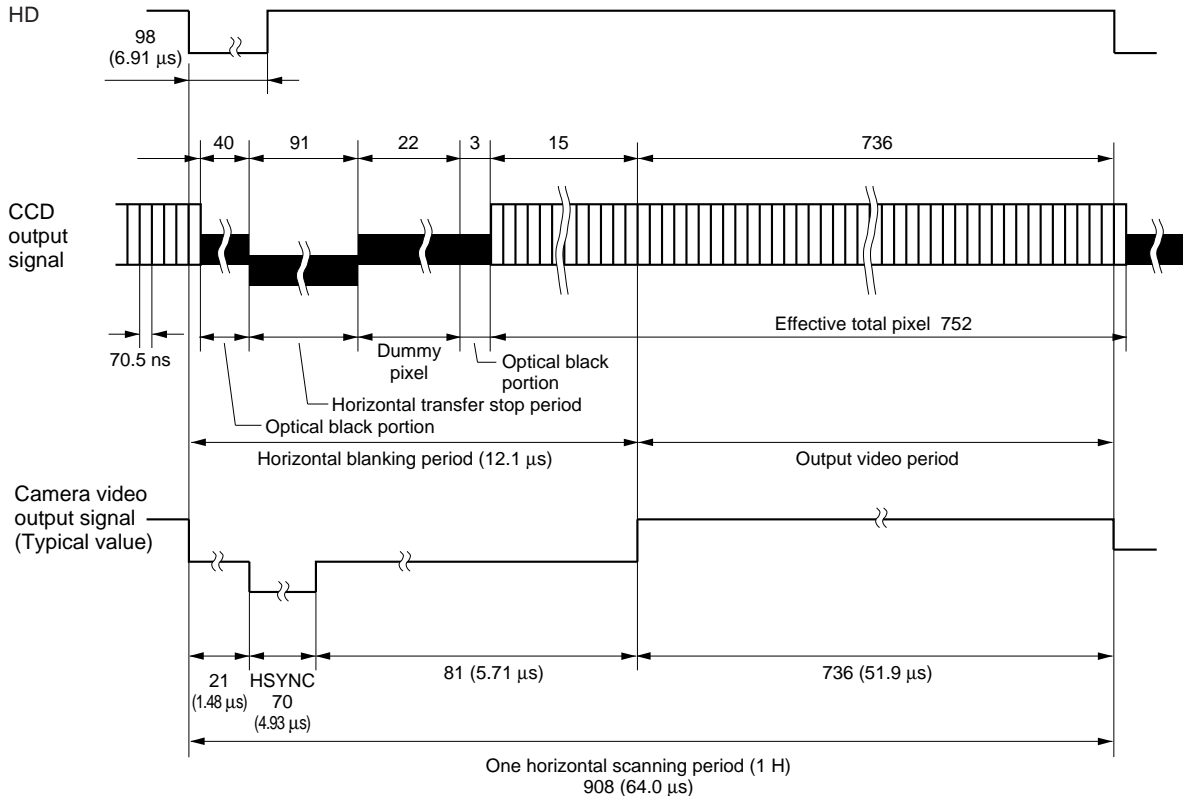
OUTPUT WAVEFORM TIMING CHART (XC-ES50/EI50/ES30/EI30(EIA))

◇ Timing chart of vertical output waveform (2:1 interlaced field integration)

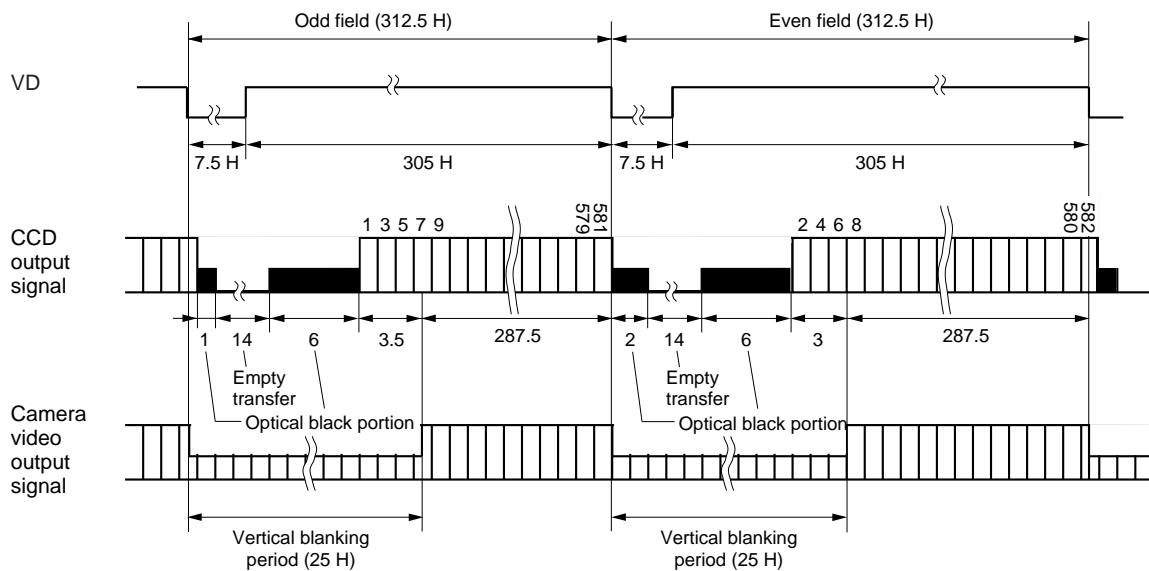


OUTPUT WAVEFORM TIMING CHART (XC-ES50CE/EI50CE/ES30CE/EI30CE (CCIR))

Timing chart of horizontal output waveform

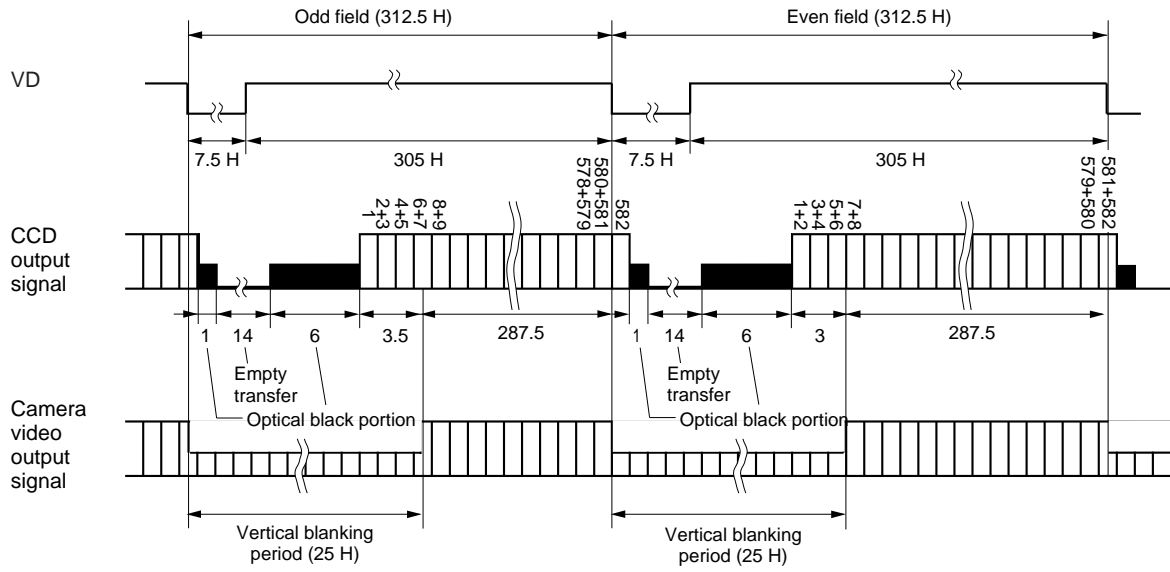


Timing chart of vertical output waveform (2:1 interlaced frame integration)



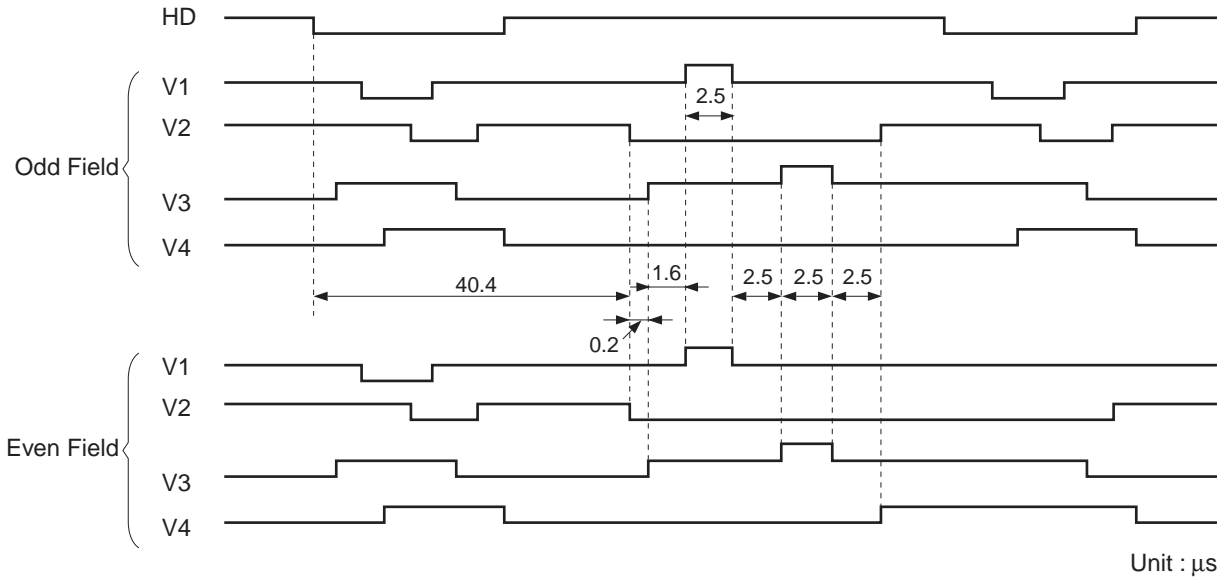
OUTPUT WAVEFORM TIMING CHART (XC-ES50CE/EI50CE/ES30CE/EI30CE (CCIR))

◇ **Timing chart of vertical output waveform (2:1 interlaced field integration)**

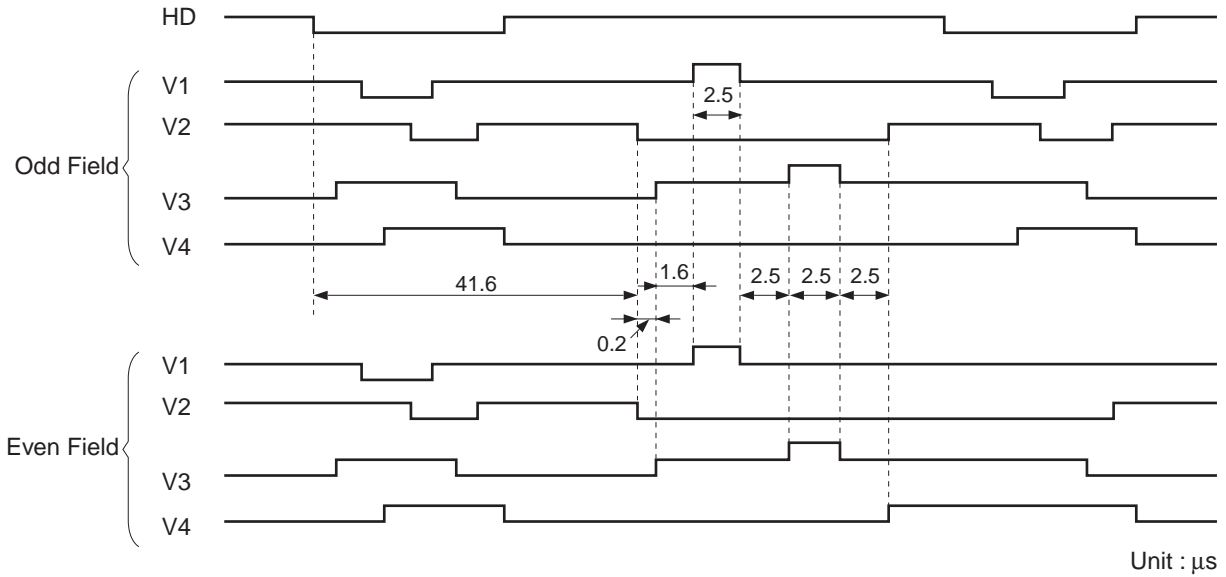


SENSOR READ CLOCK TIMING CHART

XC-ES30

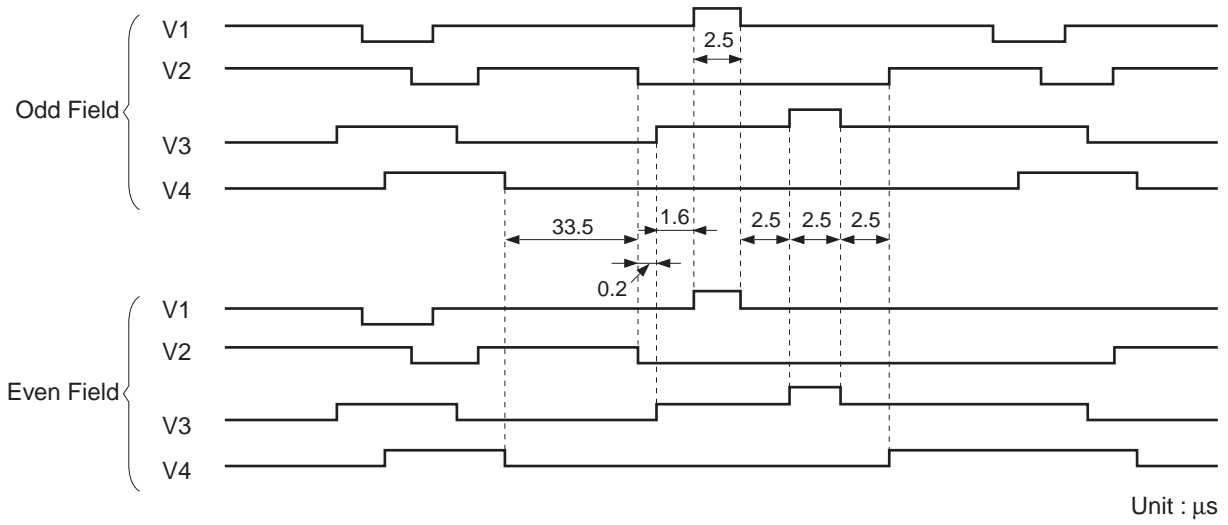


XC-ES30CE

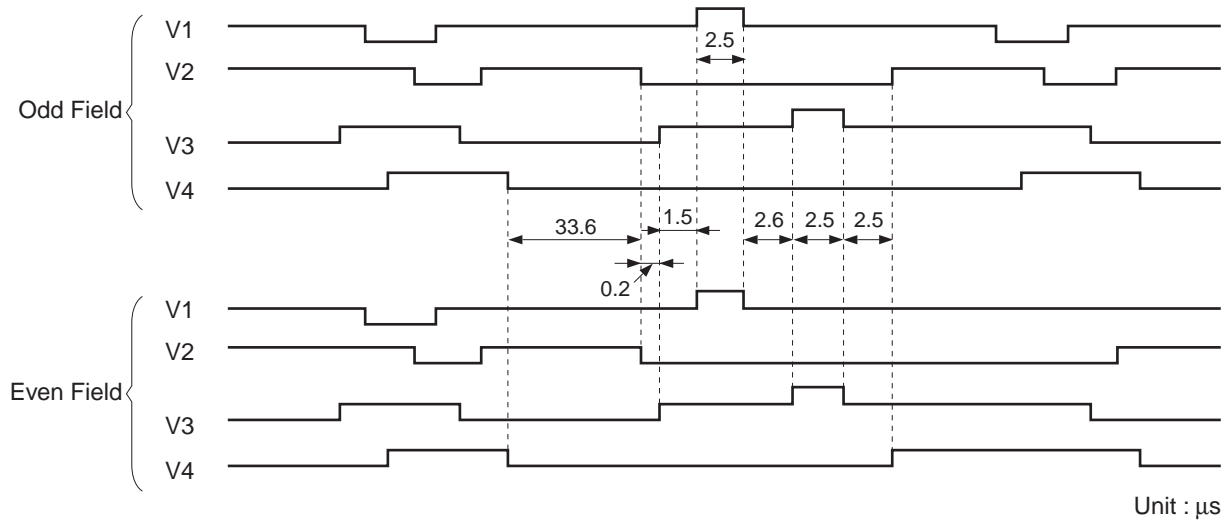


SENSOR READ CLOCK TIMING CHART

XC-ES50

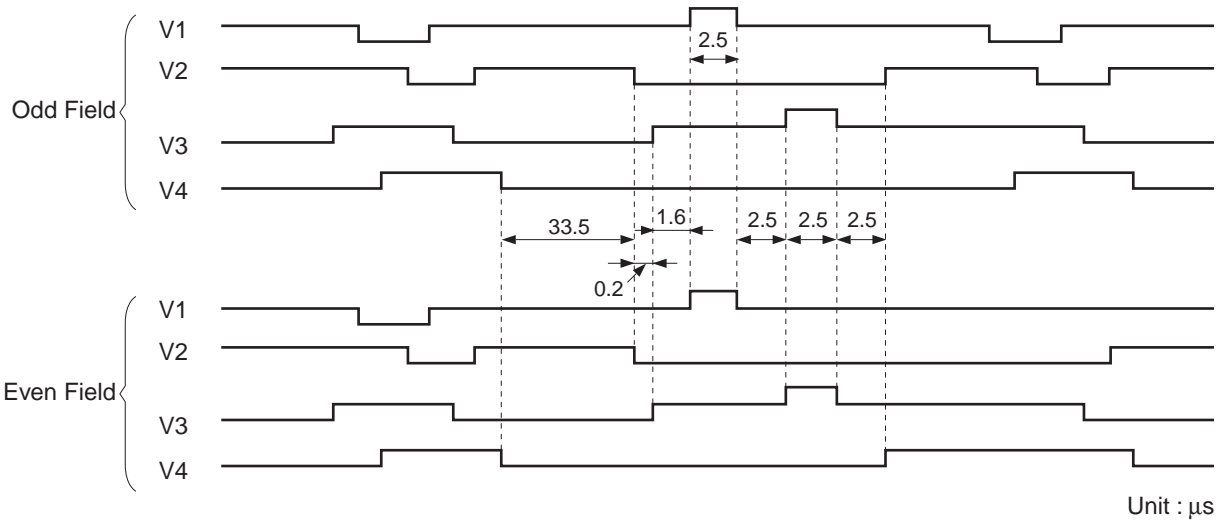


XC-ES50CE

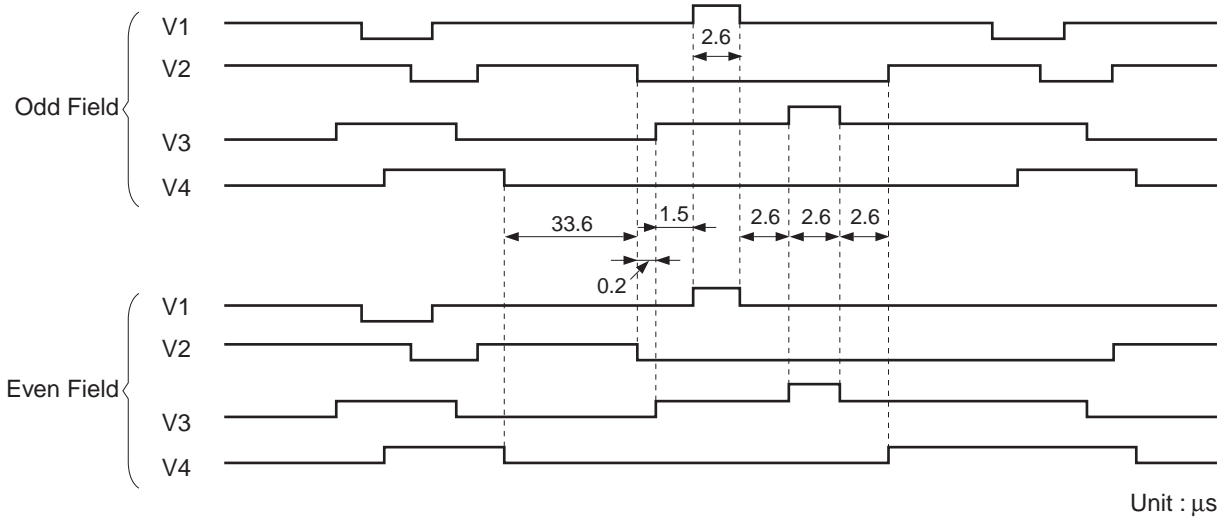


SENSOR READ CLOCK TIMING CHART

XC-EI30

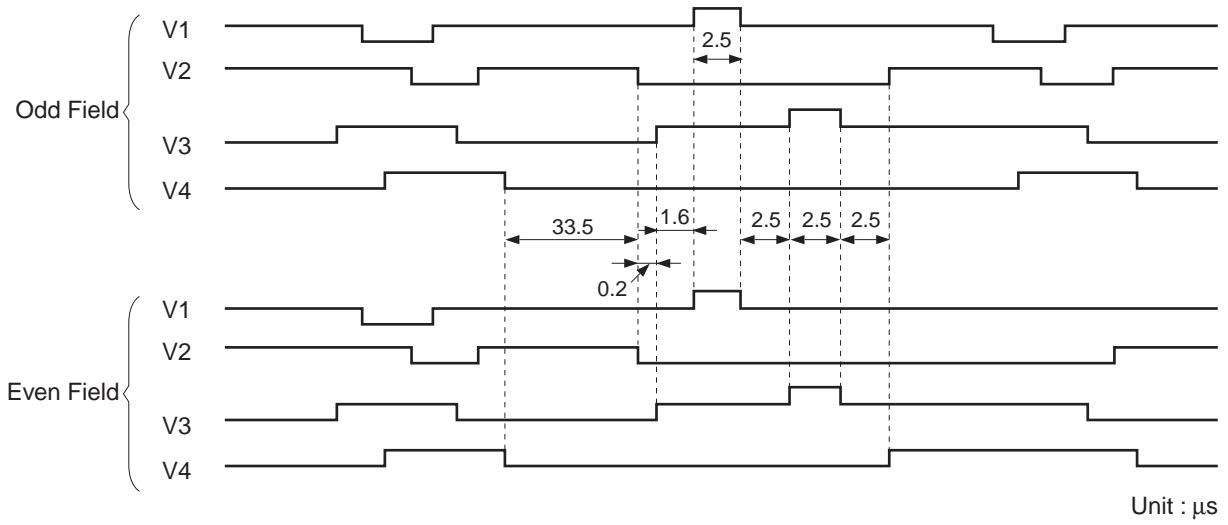


XC-EI30CE

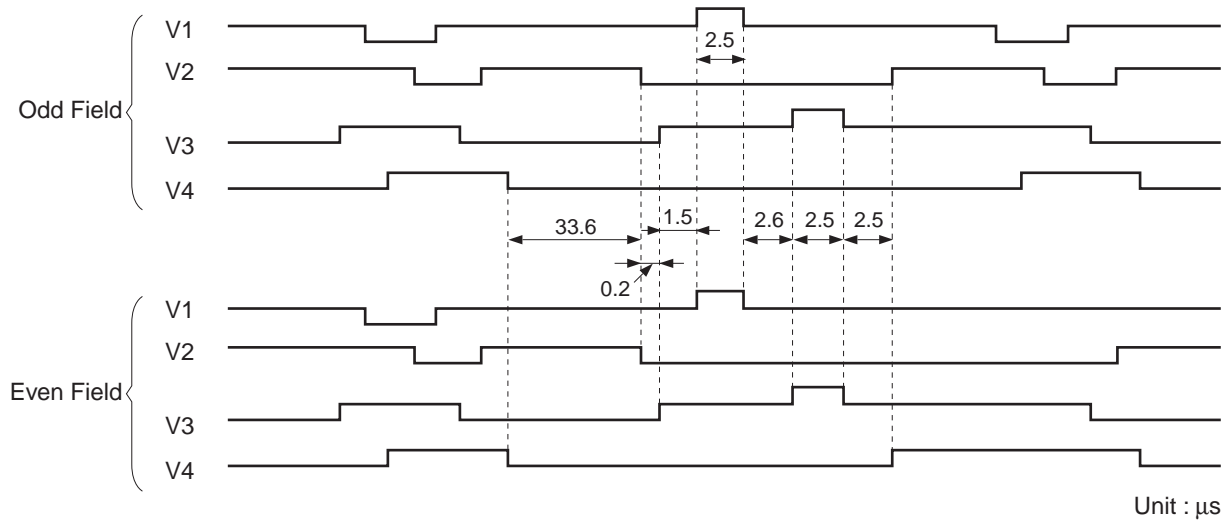


SENSOR READ CLOCK TIMING CHART

XC-EI50



XC-EI50CE

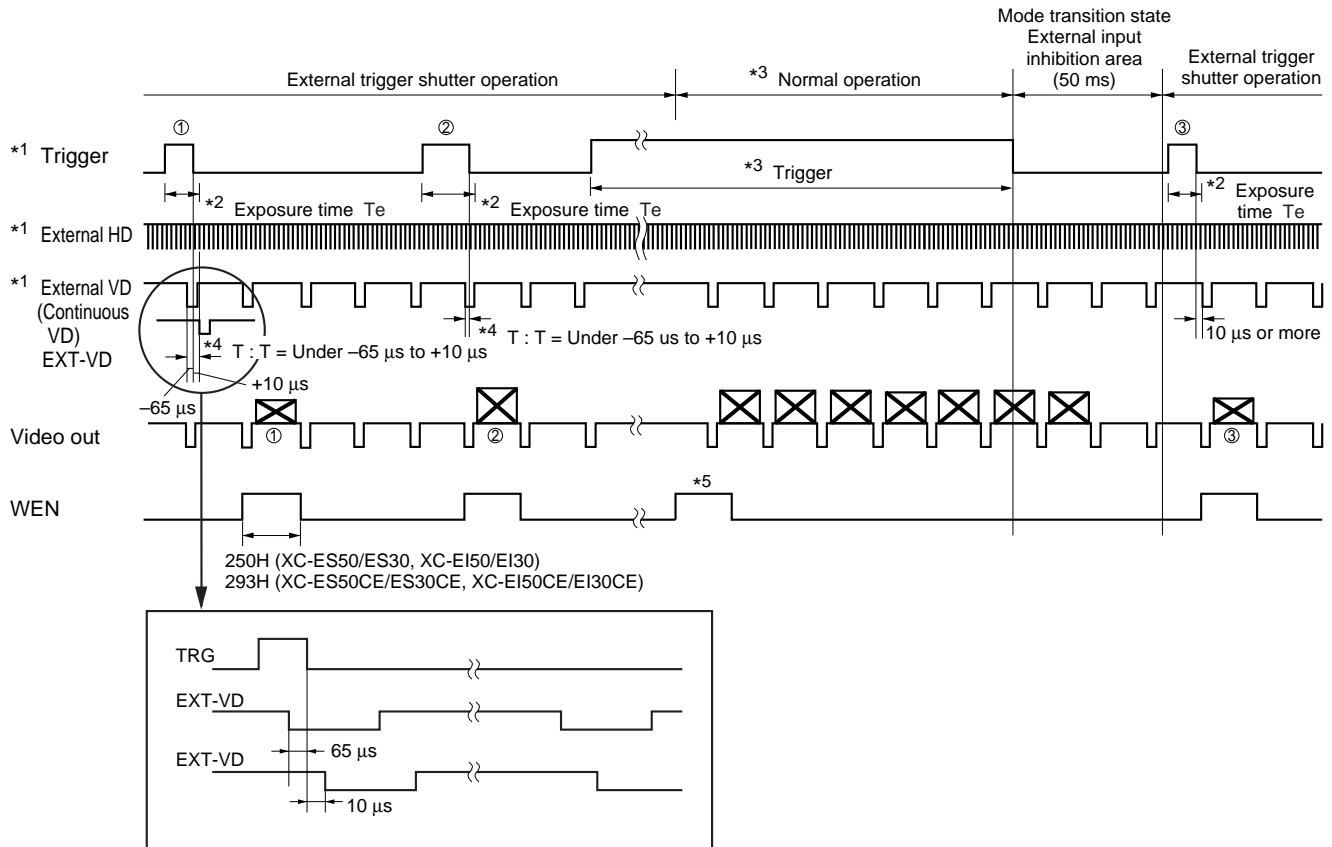


TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 1

(NON-RESET MODE)

For setting the shutter speed using TRG width

◇ HD/VD input



• Continuous HD/VD input

*1: This is a signal input from the outside. Be sure to input both HD and VD signals in this case.

*2: Exposure time T_e $T_e = \text{Trigger width} + 97 \mu\text{s}$ (XC-ES50/ES30, XC-EI50/EI30),
 $T_e = \text{Trigger width} + 120 \mu\text{s}$ (XC-ES50CE/ES30CE, XC-EI50CE/EI30CE)
 (The trigger width should be between $2 \mu\text{s}$ and $1/4 \text{ s}$)

*3: The normal operation state is engaged when the trigger high period exceeds 1/3sec. The external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external trigger input inhibition area. During the trigger inhibit period, an input trigger may be missed.

*4: In all cases the WEN signal indicates when a valid image is available. Normally, an image is output after the external falling edge. If the falling edge of the trigger is very close to the falling edge of the external VD, there may be a delay of 1VD in the output. The period of uncertainty is when the falling edge of VD is between $65 \mu\text{s}$ before or $10 \mu\text{s}$ after the falling edge of the trigger.

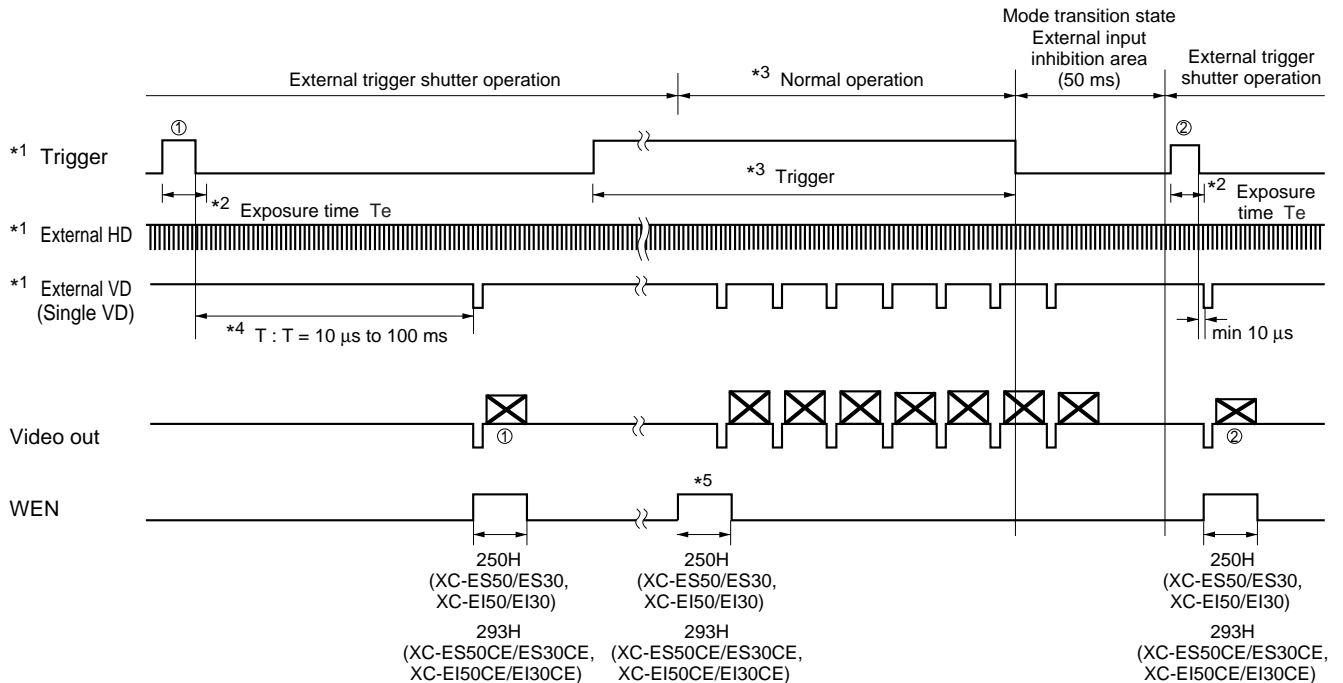
*5: When the external trigger shutter mode changes into the normal operation mode, one WEN signal is output.

Note : An image is superimposed when the next exposure ends before the previous image is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 1 (NON-RESET MODE)

■ For setting the shutter speed using TRG width

◇ HD/VD input



● Continuous HD input and single VD input

★1: This is a signal input from the outside. Be sure to input both HD and VD signals in this case. Make the phase of the VD signal coincide with the falling edge of the HD signal during input operation.

★2: Exposure time T_e $T_e = \text{Trigger width} + 97 \mu\text{s}$ (XC-ES50/ES30, XC-EI50/EI30),
 $T_e = \text{Trigger width} + 120 \mu\text{s}$ (XC-ES50CE/ES30CE, XC-EI50CE/EI30CE)
 (The trigger width should be between $2 \mu\text{s}$ and $1/4 \text{ s}$)

★3: The normal operation state is engaged when the trigger high period exceeds $1/3 \text{ sec}$. After that the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external trigger input inhibition area. During the trigger inhibit period, an input trigger may be missed.

★4: Be sure to input an external VD signal between $10 \mu\text{s}$ and 75 ms from the falling edge of a trigger pulse (as shown by ① and ② in the figure). For the input (except described above), the operation cannot be ensured. If the external VD signal is not input under the prescribed conditions, the normal operation is engaged several V after a change in input operation under the prescribed conditions.

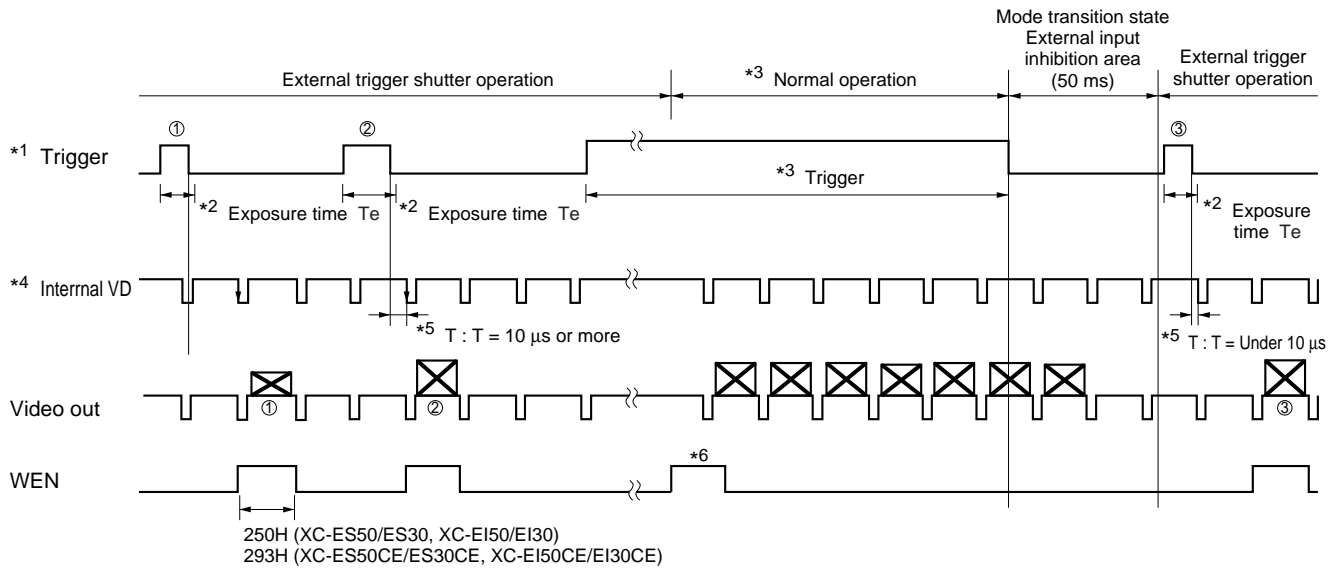
★5: When the external trigger shutter mode changes into the normal operation mode, one WEN signal is output.

Note : An image is superimposed when the next exposure ends before the previous image is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 1 (NON-RESET MODE)

For setting the shutter speed using TRG width

◇ No HD/VD input (Internal synchronization)



*1: This is a signal input from the outside.

*2: Exposure time T_e $T_e = \text{Trigger width} + 97 \mu\text{s}$ (XC-ES50/ES30, XC-EI50/EI30),
 $T_e = \text{Trigger width} + 120 \mu\text{s}$ (XC-ES50CE/ES30CE, XC-EI50CE/EI30CE)

*3: The normal operation state is engaged when the high period exceeds 1/3 sec. After that, the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external input inhibition area. During the trigger inhibit period, an input trigger may be missed.

*4: An internal VD signal is output by setting the INT/EXT switch on the rear panel to INT.

*5: During external trigger shutter operation, an image is output when an internal VD signal falls after a trigger pulse falls (as shown by ① and ② in the figure). However, if the time (T in the figure) between the falling edges of a trigger pulse and internal VD signal is under $10 \mu\text{s}$, an image is output when the internal VD signal or the next internal VD signal falls (as shown by ③ in the figure). (In this case, an image is output when the next internal VD signal falls.) An image and WEN signal are always output together. For more details, refer to the WEN signal. (The falling edge of an internal VD signal is the same in phase as the beginning of an equalizing pulse in a SYNC V area.)

*6: When the external trigger shutter mode changes into the normal operation mode, one WEN signal is output.

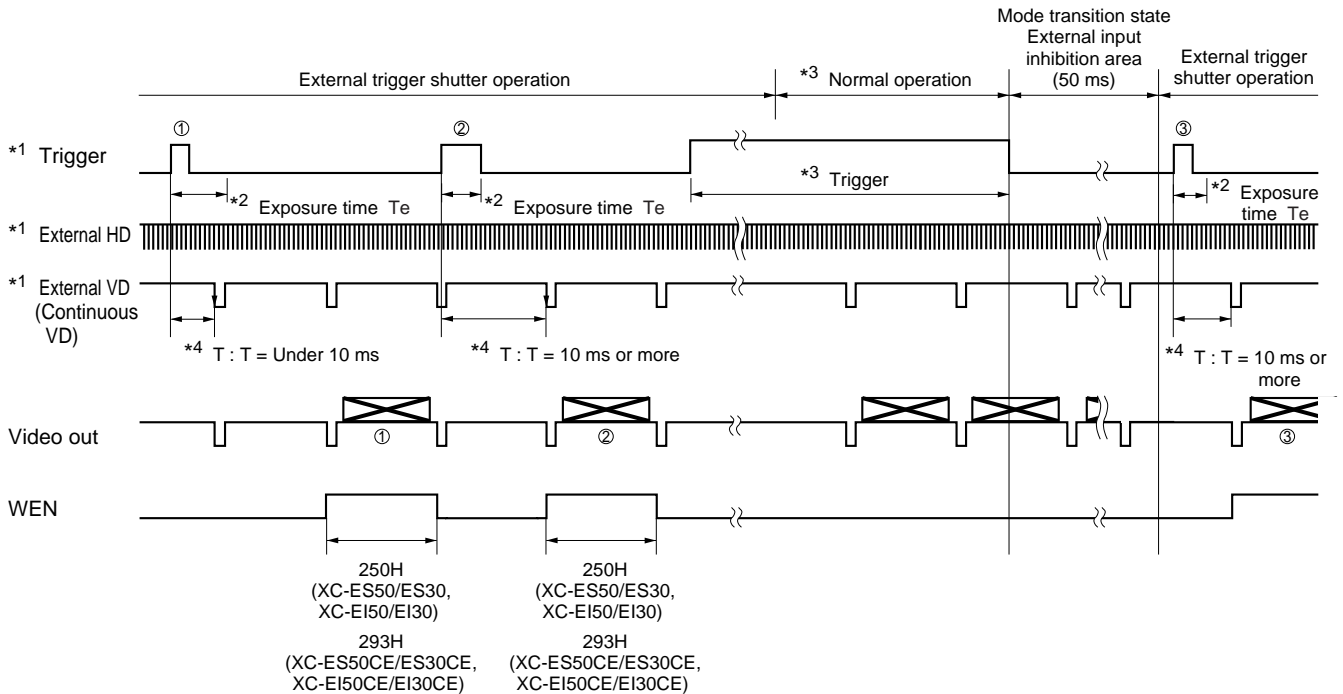
Note : An image is superimposed when the next exposure ends before the previous image is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 1 (NON-RESET MODE)

For setting the shutter speed using DIP switch

◇ HD/VD input

• Continuous HD/VD input



- *1: This is a signal input from the outside. The period of a continuous VD signal is prescribed as one field. Be sure to input both HD and VD signals.
- *2: As shown in the table on page 7, exposure time T_e is determined by the setting of a DIP switch.
- *3: The normal operation state is engaged when the high period exceeds 1/3 sec. After that, the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external input inhibition area. During the trigger inhibit period, an input trigger may be missed.
- *4: An image is output when an external VD signal falls 10 ms or more after a trigger pulse rises (shown by ② and ③ in the figure). If the time (T in the figure) between the falling edges of a trigger pulse and external VD signal is under 10 ms, an image is output when the external VD signal or the next external VD signal falls (as shown by ① in the figure). (In this case, an image is output when the next external VD signal falls.) An image and WEN signal are always output together. For more details, refer to the WEN signal.

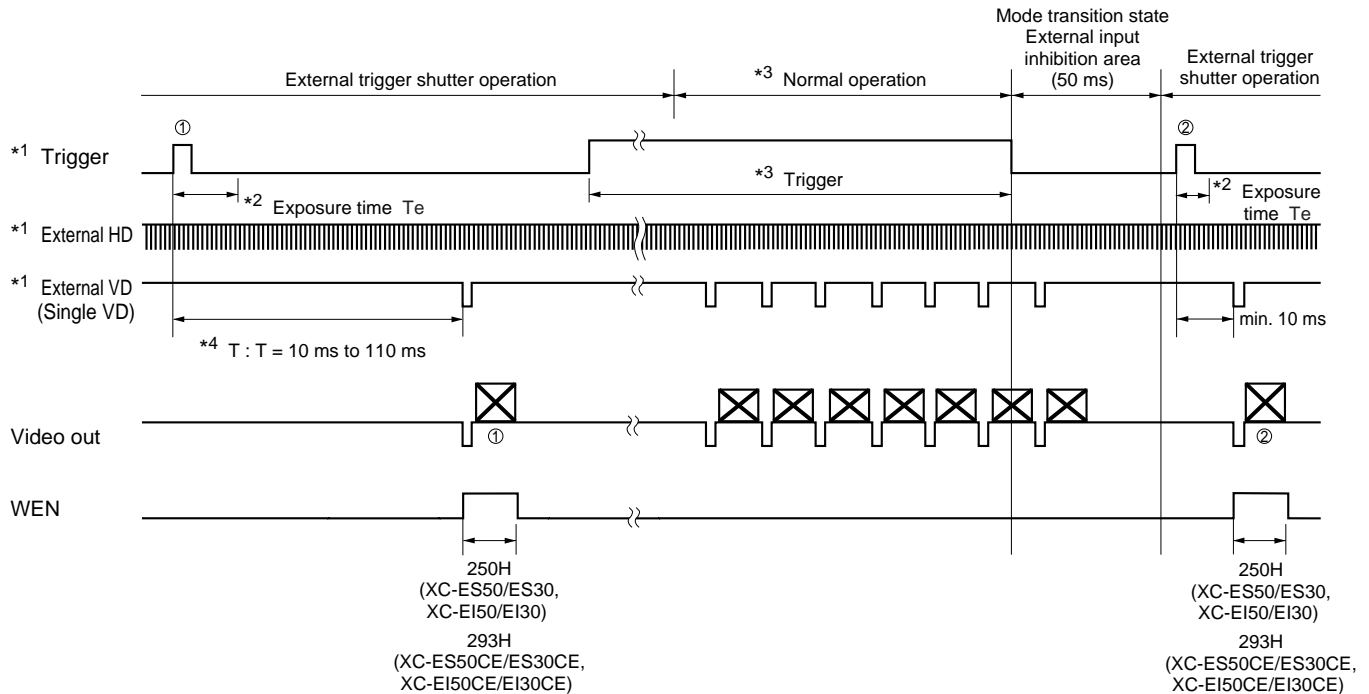
Note : An image is superimposed when the next exposure ends before the previous image is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 1 (NON-RESET MODE)

For setting the shutter speed using DIP switch

◇ HD/VD input

- Continuous HD input and single VD input



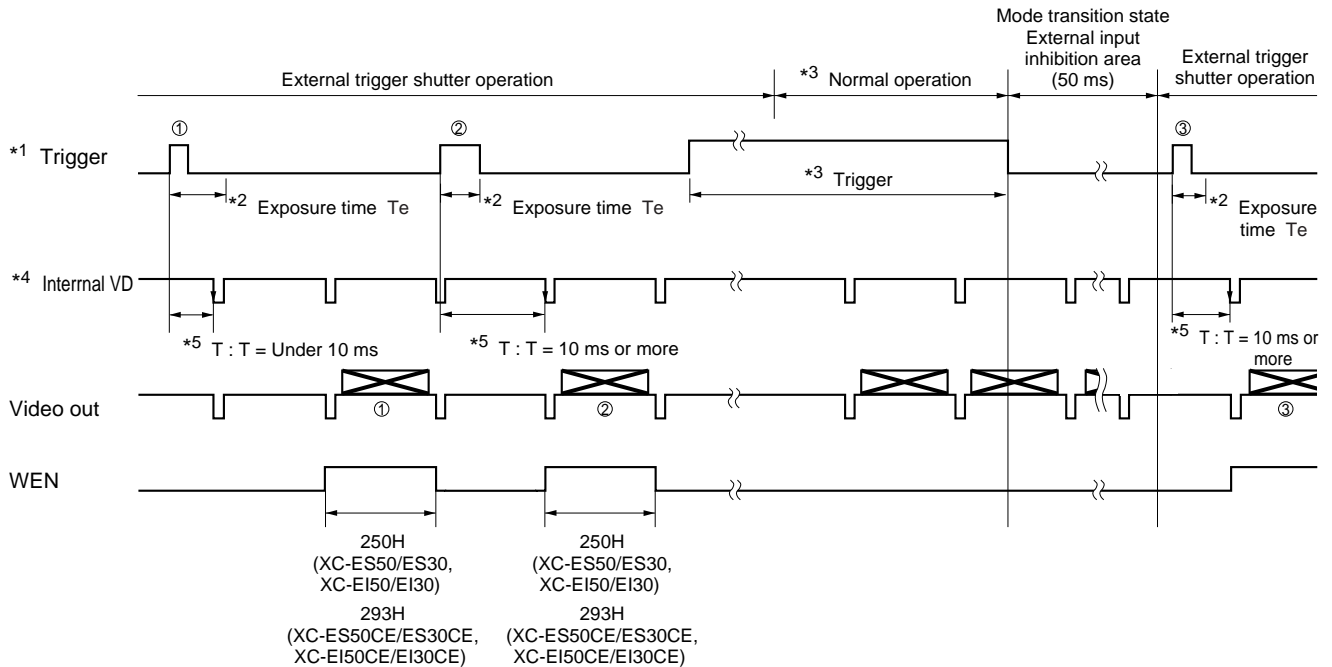
- *1: This is a signal input from the outside. Be sure to input both HD and VD signals. Make the phase of the VD signal coincide with the falling edge of the HD signal.
- *2: As shown in the table on page 7, exposure time T_e is determined by the setting of a DIP switch.
- *3: The normal operation state is engaged when the high period exceeds 1/3 sec. After that, the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external input inhibition area. During the trigger inhibit period, an input trigger may be missed.
- *4: Be sure to input an external VD signal for 10 ms to 75 ms from the rising edge of a trigger pulse (as shown by ① and ② in the figure). For the input except described above, the operation cannot be ensured. If the external VD signal is not input under the prescribed conditions, the normal operation is engaged several V after a change in input operation under the prescribed conditions.

Note : An image is superimposed when the next exposure ends before the previous image is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 1 (NON-RESET MODE)

■ For setting the shutter speed using DIP switch

◇ No HD/VD input (Internal synchronization)



★1: This is a signal input from the outside.

★2: As shown in the table on page 7, exposure time T_e is determined by the setting of a DIP switch.

★3: The normal operation state is engaged when the high period exceeds 1/3 sec. After that, the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external input inhibition area. During the trigger inhibit period, an input trigger may be missed.

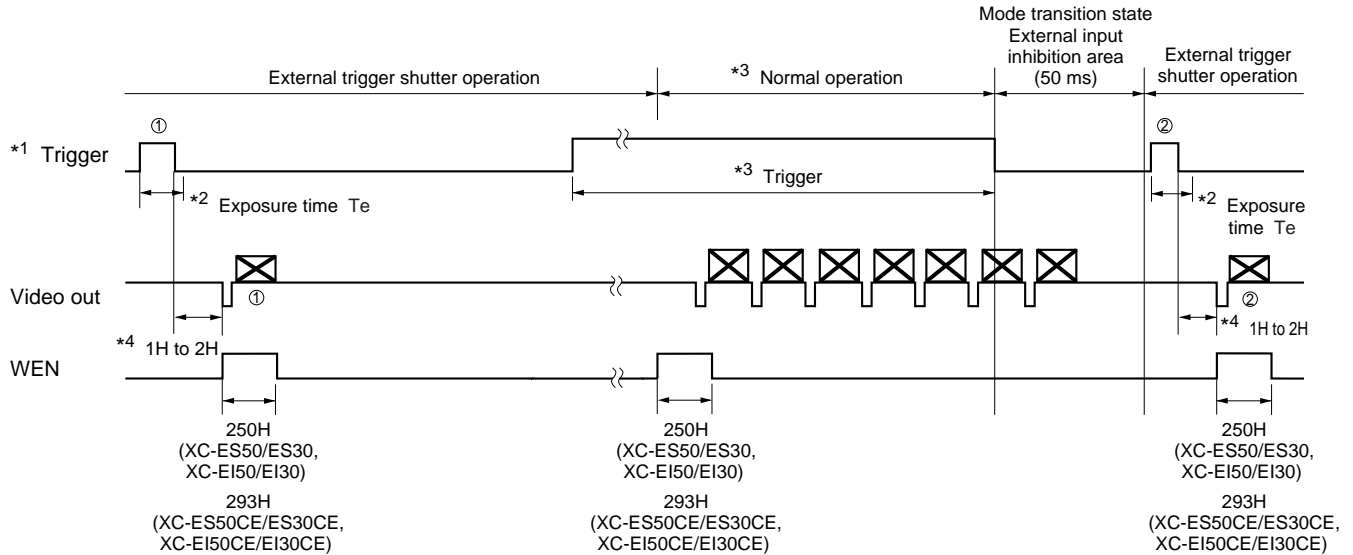
★4: An internal VD signal is output by setting the INT/EXT switch on the rear panel to INT.

★5: An image is output when an internal VD signal falls 10 ms or more after a trigger pulse rises (as shown by ② and ③ in the figure). If the time (T in the figure) between the falling edges of a trigger pulse and internal VD signal is under 10 ms, an image is output when the internal VD signal or the next internal VD signal falls (as shown by ① in the figure). In this case, an image is output when the next internal VD signal falls. An image and WEN signal are always output together. For more details, refer to the WEN signal. (The falling edge of an internal VD signal is the same in phase as the beginning of an equalizing pulse in a SYNC V area.)

Note : An image is superimposed when the next exposure ends before the previous image is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 2 (RESET MODE)

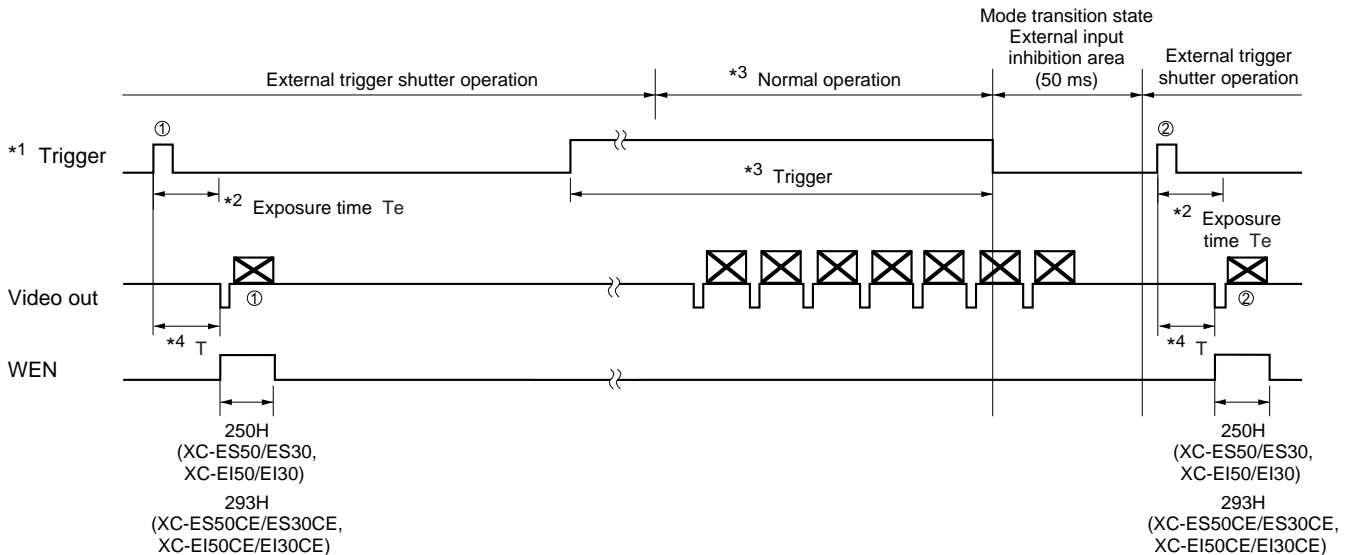
■ For setting the shutter speed using TRG width



- *1: This is a signal input from the outside. The trigger interval should be trigger pulse width + 1 field + 2H period or more. The trigger interval shorter than described above cannot be ensured. If a trigger pulse is not input under the prescribed conditions, the normal operation is ensured several V after a change in input operation under the prescribed conditions.
- *2: Exposure time T_e $T_e = \text{Trigger width} + 97 \mu\text{s}$ (XC-ES50/ES30, XC-EI50/EI30),
 $T_e = \text{Trigger width} + 120 \mu\text{s}$ (XC-ES50CE/ES30CE, XC-EI50CE/EI30CE)
 (The trigger width should be between 2 μs and 1/4 s)
- *3: The normal operation state is engaged when the high period exceeds 1/3 sec. After that, the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external input inhibition period. During the trigger inhibit period, an input trigger may be missed.
- *4: A VD signal is generated 1H to 2H after a trigger pulse falls, and an image is output in synchronization with the VD signal.
- *5: When the external trigger shutter mode changes into the normal operation mode, a WEN signal is output.

TIMING CHART OF EXTERNAL TRIGGER SHUTTER - MODE 2 (RESET MODE)

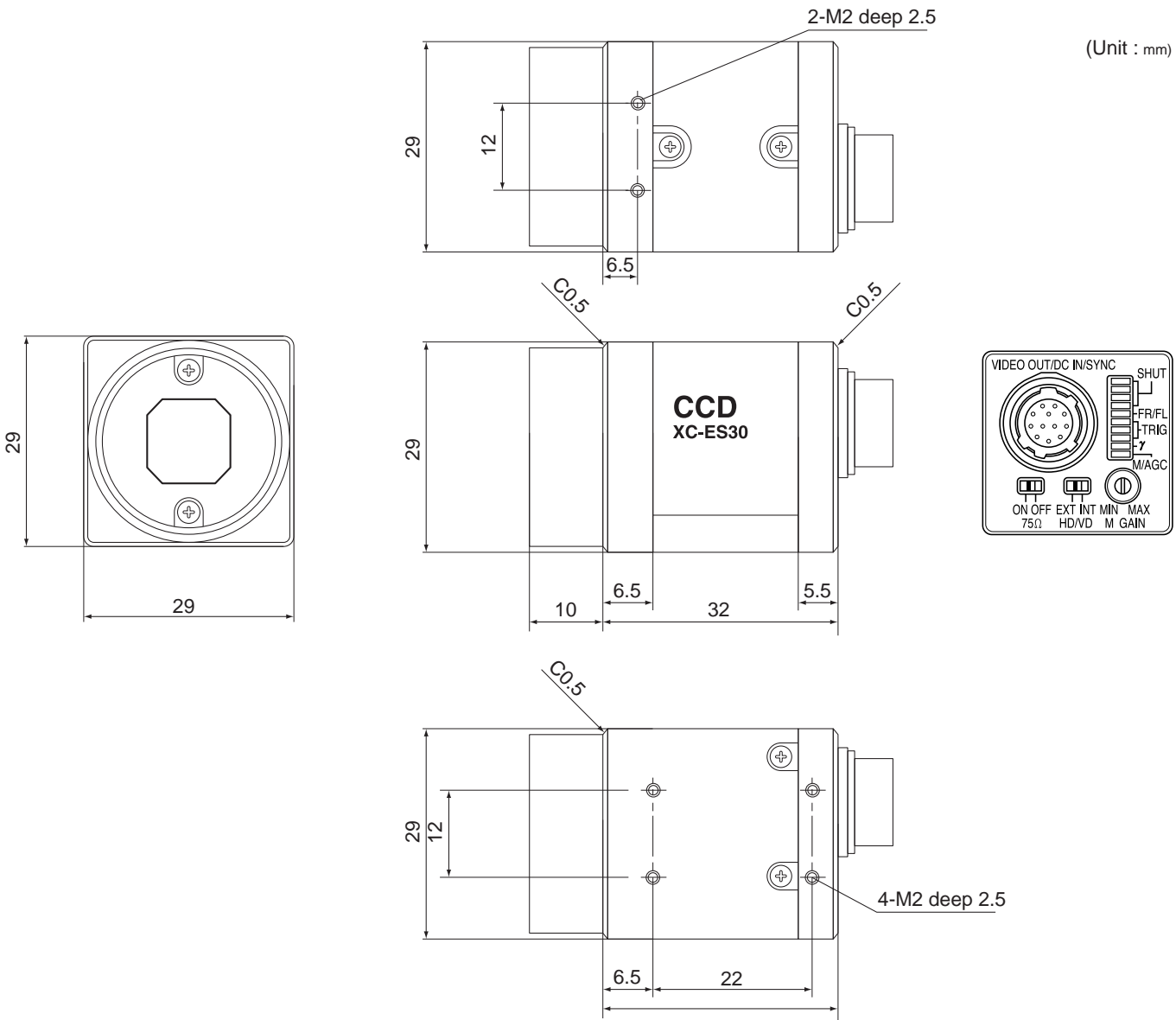
■ For setting the shutter speed using DIP switch



- *1: This is a signal input from the outside. The trigger interval should be shutter speed (DIP switch) + 1 field + 2H period or more. The trigger interval shorter than described above cannot be ensured. If a trigger pulse is not input under the prescribed conditions, the normal operation is engaged several V after a change in input operation under the prescribed conditions.
- *2: As shown in the table on page 7, exposure time T_e is determined by the setting of a DIP switch.
- *3: The normal operation state is engaged when the high period exceeds 1/3 sec. After that, the external trigger shutter operation is engaged when the trigger pulse goes "low". In this case, the area between the falling edge of a trigger pulse and the subsequent 50 ms period is an external input inhibition area. During the trigger inhibit period, an input trigger may be missed.
- *4: After a period set by a DIP switch from the rising edge of the trigger, an image is output.

DIMENSIONS

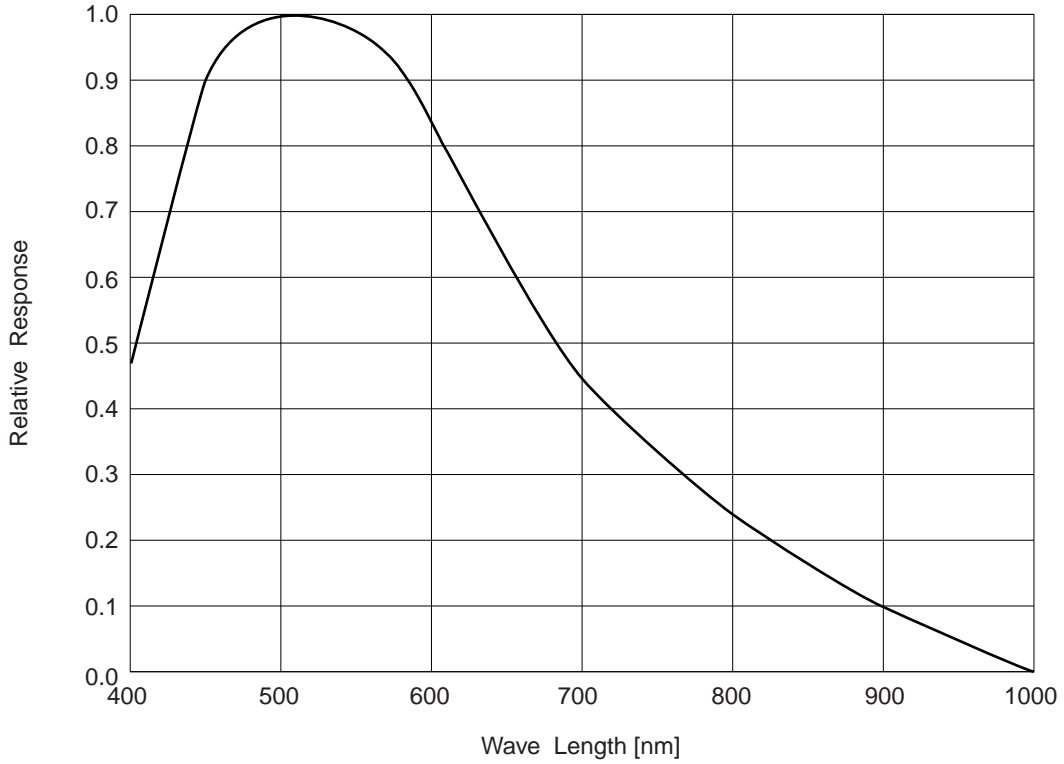
■ XC-ES50/50CE, XC-EI50/EI50CE
 XC-ES30/30CE, XC-EI30/EI30CE
 (XC-ES30 model)



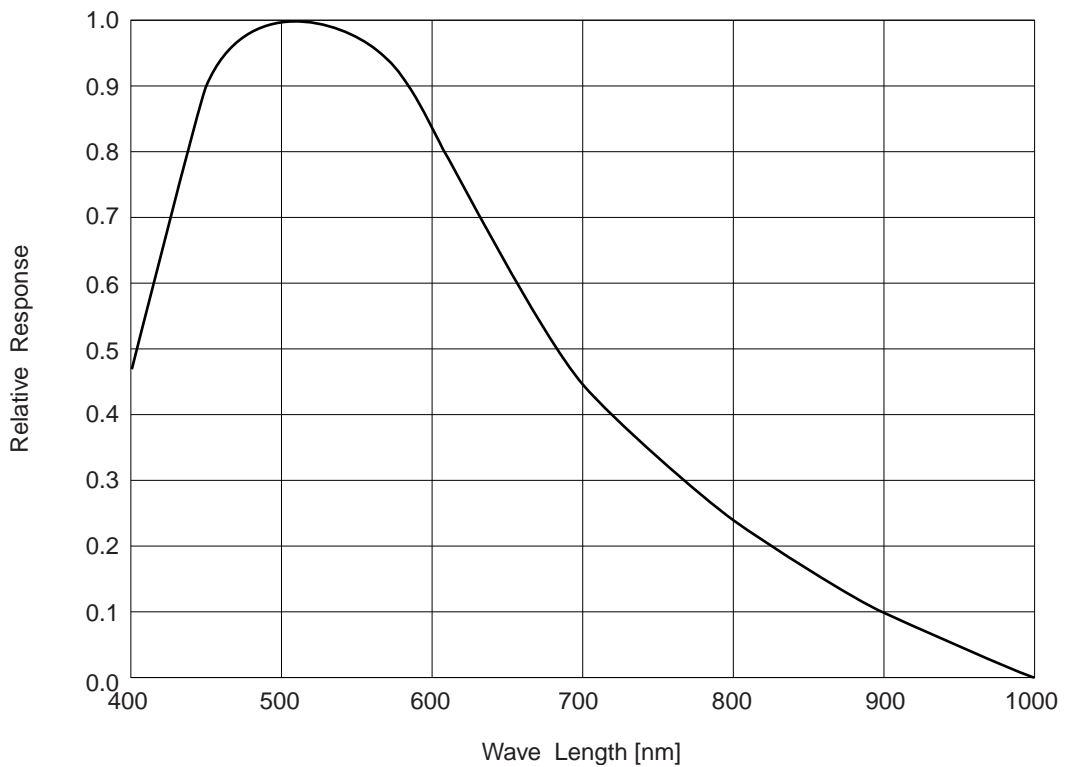
SPECTRAL RESPONSE CHARACTERISTICS

(Typycal Value)

XC-ES30



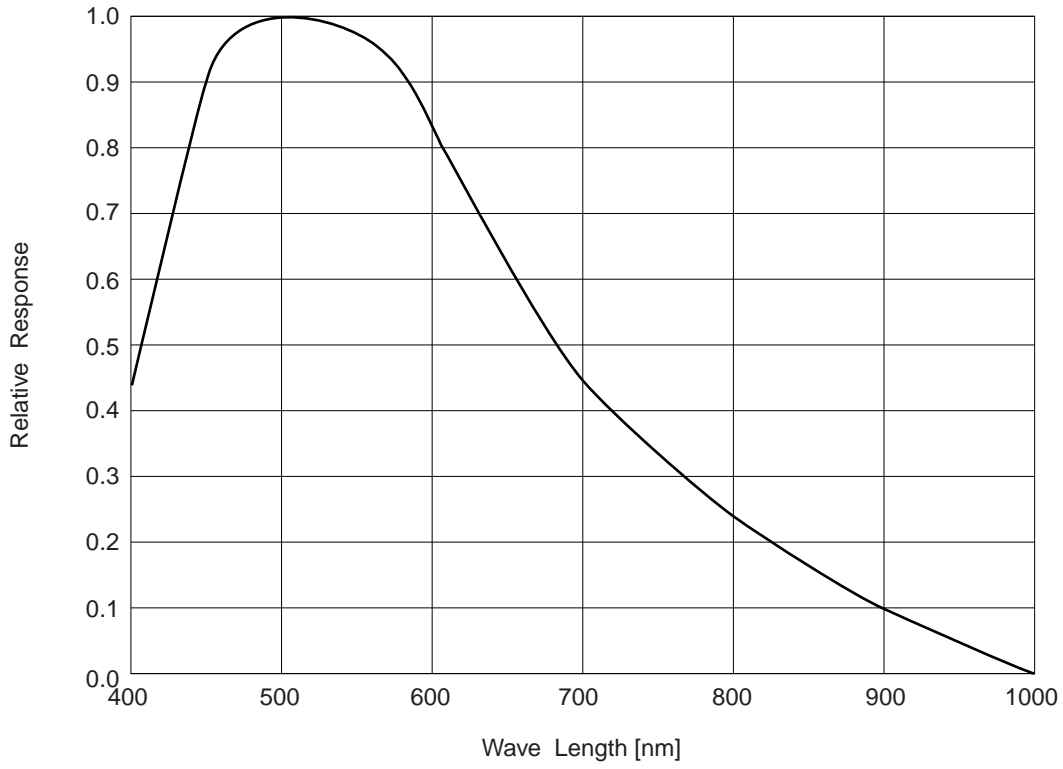
XC-ES30CE



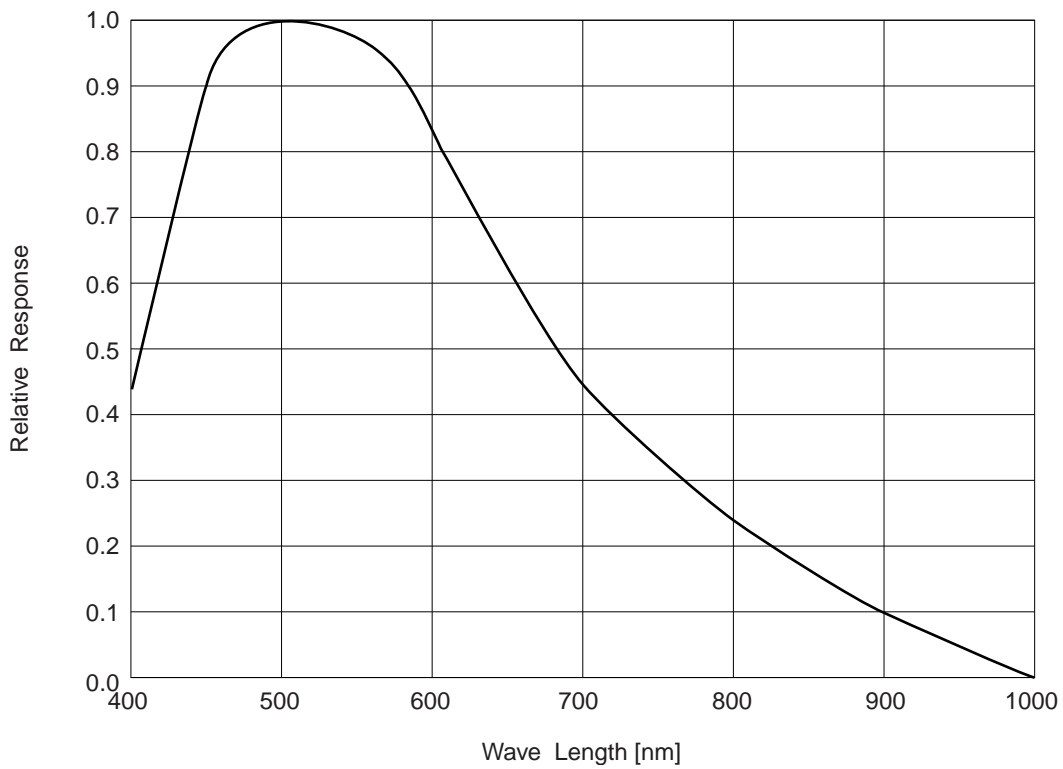
SPECTRAL RESPONSE CHARACTERISTICS

(Typycal Value)

XC-ES50



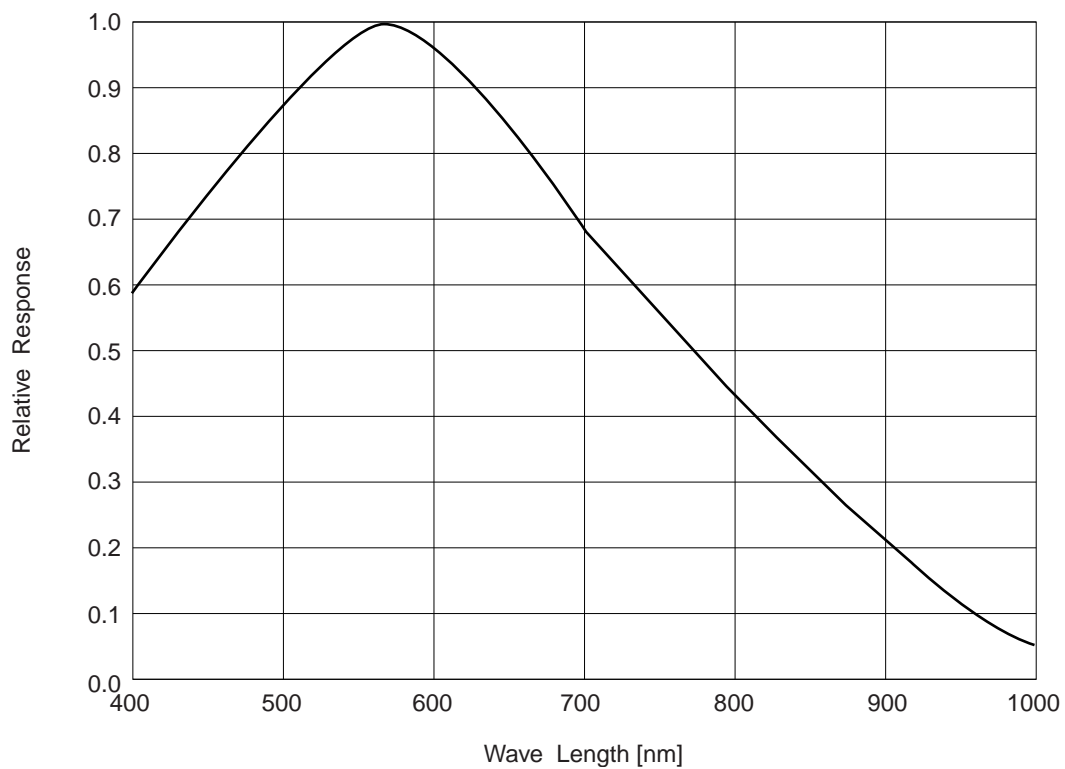
XC-ES50CE



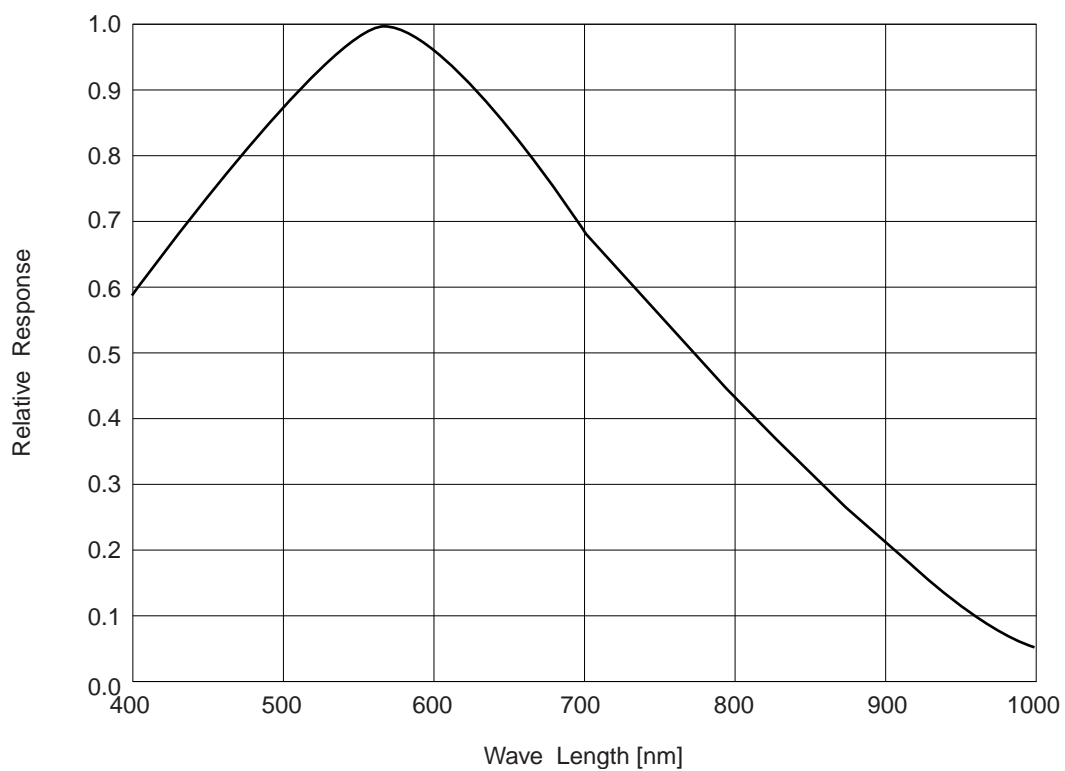
SPECTRAL RESPONSE CHARACTERISTICS

(Typycal Value)

XC-EI30



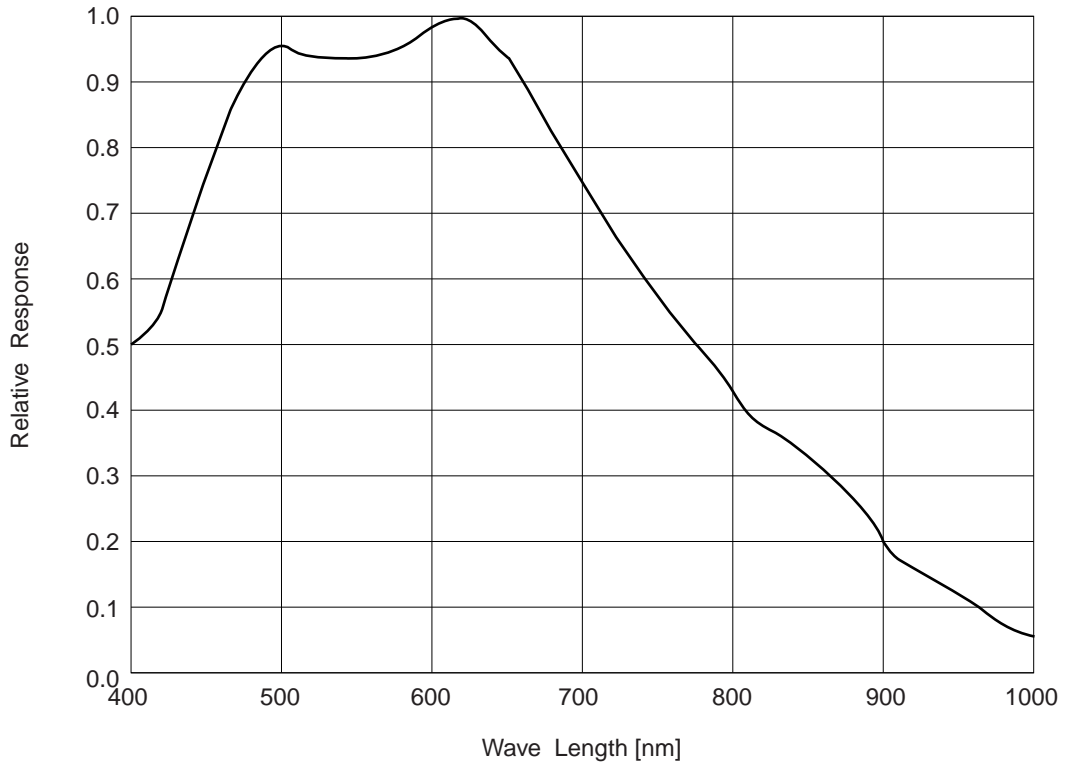
XC-EI30CE



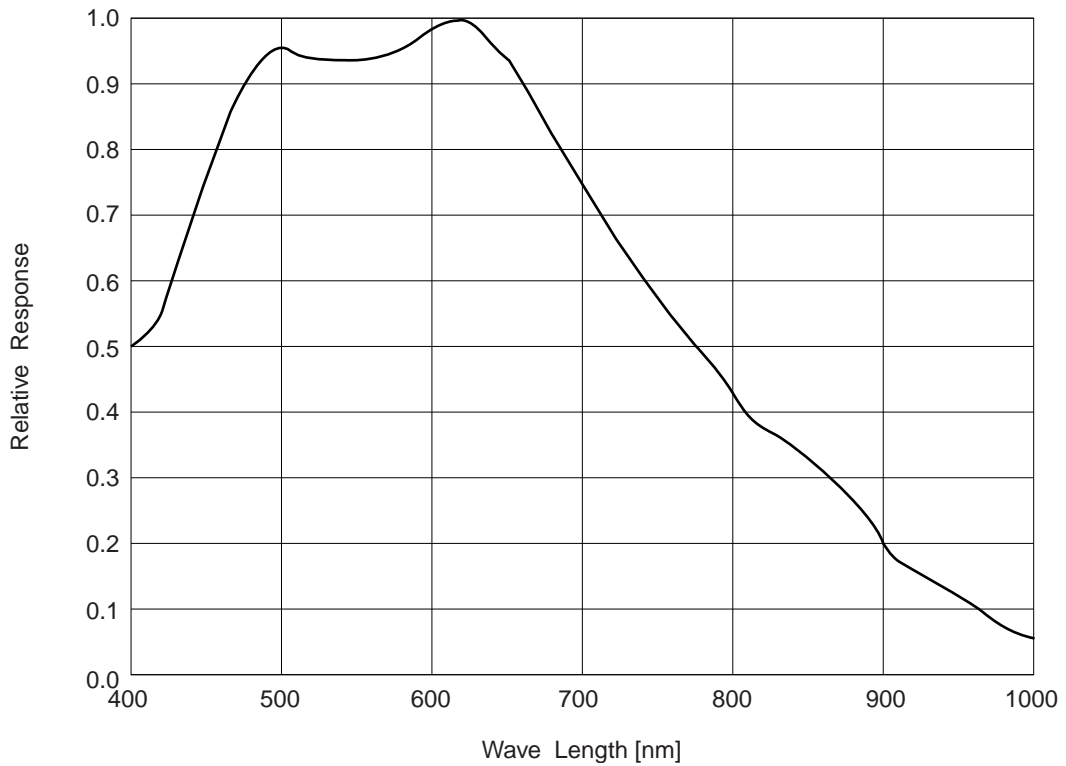
SPECTRAL RESPONSE CHARACTERISTICS

(Typycal Value)

XC-EI50



XC-EI50CE



VARIOUS LENS SELECTION

The following shows the various lens specifications of the accessories available.

■ XC-ES50/50CE, XC-ES30/30CE XC-EI50/50CE, XC-EI30/30CE compatibility

List of C-Mount Lens

Model name		VLC-08YM	VLC-12YM	VLC-16Y-M	VLC-25Y-M	VLC-50Y-M
Focal distance (mm)		8	12	16	25	50
Maximum aperture ratio		1: 1.4	1: 1.8	1: 1.4	1: 1.6	1: 2.8
Operation	Iris	Manual	Manual	Manual	Manual	Manual
	Focus	Manual	Manual	Manual	Manual	Manual
Field angle (Horizontal x vertical)	1/2" CCD	42.6°×32.6°	29.6°×22.4°	22.6°×17.0°	14.6°×11.0°	7.3°×5.5°
	1/3" CCD	32.6°×24.8°	22.4°×16.9°	17.0°×12.8°	11.0°×8.2°	5.5°×4.1°
MOD (mm)		207	208	289	204	438
Image pickup range during maximum proximity (horizontal × vertical) (mm)	XC-ES50/EI50	181×132.8	125.2×92.1	119.4×88.5	52.1×38.8	49.2×37
	XC-ES50CE/EI50CE	181.3×133.3	125.5×92.5	119.6×88.8	52.1×38.9	49.7×37.1
	XC-ES30/EI30	136.8×100	94.7×69.6	90×66.8	39.4×29.3	37.2×27.9
	XC-ES30CE/EI30CE	137×100.3	94.8×69.6	90.4×66.9	39.4×29.3	37.5×27.9
Back focus (mm)		11.54	10.99	12.50	11.60	22.10
Flange back (mm)		17.526	17.526	17.526	17.526	17.526
Mass (g)		40	40	50	42	50

MOD: Minimum object distance between the tip of the lens body and the object

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Sales Office :

XC-ES50/50CE
XC-ES30/30CE
XC-EI50/50CE
XC-EI30/30CE



Japan <http://www.sony.co.jp/ISP/>
Sony Corporation
4-14-1 Asahi-cho, Atsugi-shi, Kanagawa, 243-0014 Japan
Tel: +81-46-227-2346 Fax: +81-46-227-2347
Tel: +81-46-230-5873 Fax: +81-46-230-6243

USA <http://www.sony.com/professional>
Sony Electronics Inc.
HQ
1 Sony Drive Park Ridge, NJ 07656
Tel: +1-800-686-7669

Canada
Sony of Canada Ltd.
115 Gordon Baker Rd, Toronto, Ontario M2H 3R6
Tel: +1-416-499-1414 Fax: +1-416-497-1774

Europe <http://www.pro.sony-europe.com/ISP>

Sony Broadcast & Professional
HQ
15, rue Floreal 75831 Paris Cedex 17, France
Tel: +33-1-55-90-35-11 Fax: +33-1-55-90-35-17

Germany
Hugo-Eckener-Str. 20, 50829 Koln
Tel: +49-221-5966-322 Fax: +49-221-5966-491

France
15, rue Floreal 75831 Paris Cedex 17
Tel: +33-1-55-90-41-62 Fax: +33-1-55-90-13-57

UK
The Heights, Brooklands, Weybridge, Surrey KT13 0XW
Tel: +44-1932-816-340 Fax: +44-1932-817011

Nordic
Per Albin Hanssons vag 20 S-214 32 Malmo Sweden
Tel: +46-40-190-800 Fax : +46-40-190-450

Italy
Via Galileo Galilei 40 I-20092 Cinisello Balsamo, Milano
Tel: +39-02-618-38-431 Fax : +39-02-618-38-402