

CCD Black-and-White Video Camera Module

Technical Manual



XC-HR300

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Overview

Ideal for high speed image processing, the XC-HR300 is a small black and white camera featuring a 1/2 type progressive scan CCD. The XC-HR300 can capture excellent quality images at high speeds. By doubling the drive frequency of CCD, full frame SVGA images can be obtained at 50 frames/s on 1 output (progressive 1N MODE) or 100 frames/s on 2 outputs (Interlaced 2I MODE). Further speed increase up to four times can be achieved by reducing the number of transmitted lines (Partial images). In addition, excellent vibration and shock characteristics make the camera also suitable for Machine vision application.

Main Features

High image quality

The interline transfer CCD provides a high-resolution image with 782×582 pixels.

Various mode settings

Rear panel switches allow the following mode settings.

- Gain: Fixed/Manual
- Synchronized input/output
- Read mode: 2I mode: 1/100 sec. (interlace) or 1N mode: 1/50 sec. (non-interlace)
- 75Ω termination
- Shutter speed: Adjustable Partial scanning/Trigger shutter

External synchronization

The camera module automatically determines whether to operate in interlace or non-interlace mode from the HD (horizontal drive) and VD (vertical drive) signals input for external synchronization.

Internal sync signal output

You can output the HD and VD signals from the 12-pin connector by changing the setting of the rear panel switch.

External trigger shutter function (1/4 to 1/25000 sec.)

You can obtain a freeze picture by inputting an external trigger. This function is useful for shooting a fast-moving object clearly.

Body fixing

Mounting screw holes are provided in the reference plane on the lower surface of the body, allowing mounting with the absolute minimum deviation of the optical axis.

The connector complies with the new EIAJ 12-pin pin assignment

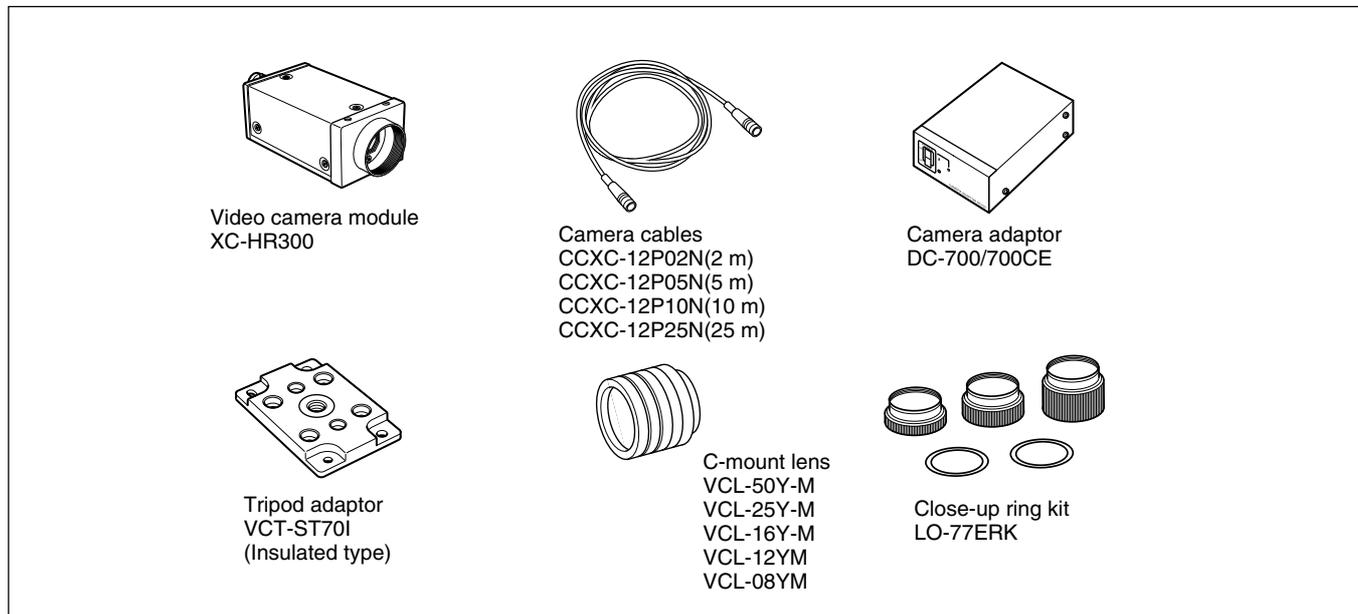
The new pin arrangement allows the connector to accept a trigger pulse and a WEN signal.

Partial scanning function

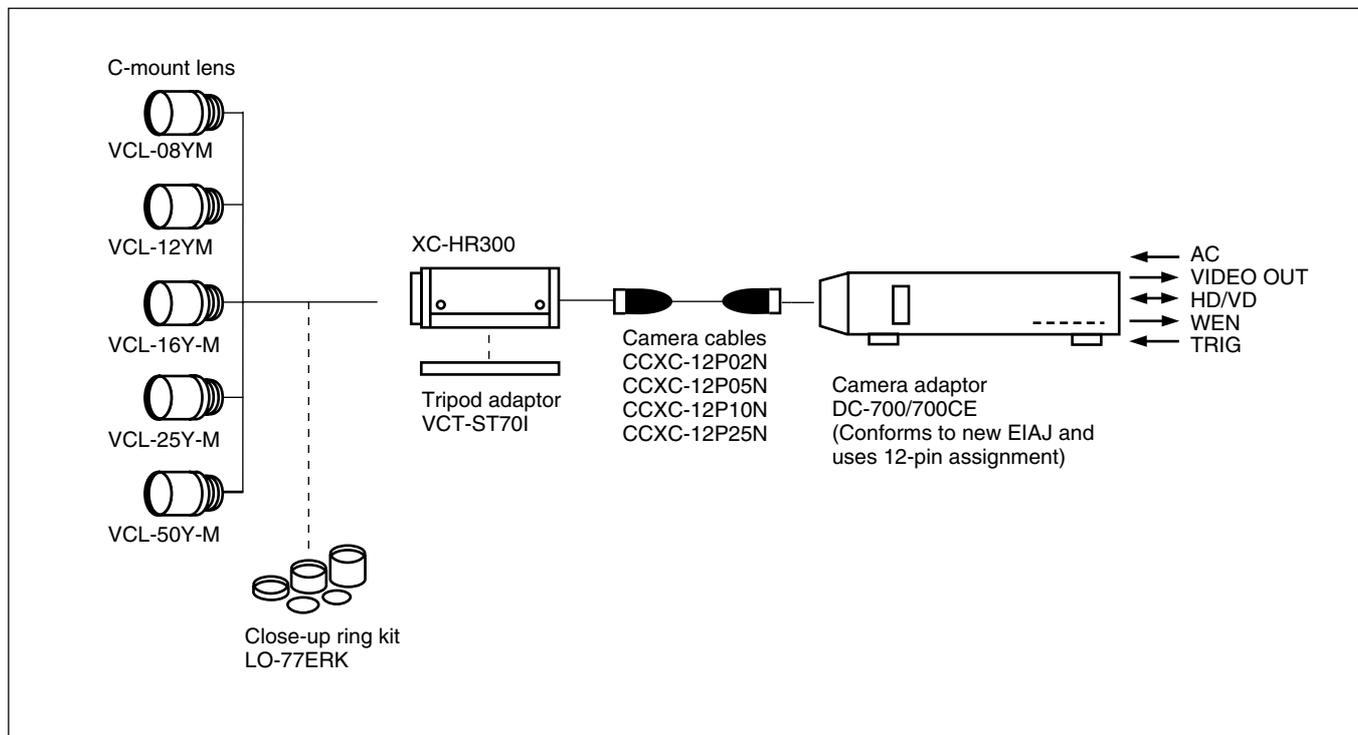
Reading frequency in the vertical direction has been improved. The unit can capture partial images at up to 400 frames/sec in 2I mode or up to 200 frames/sec in 1N mode.

System Components

The XC-HR300 Video Camera Module system comprises the following components.

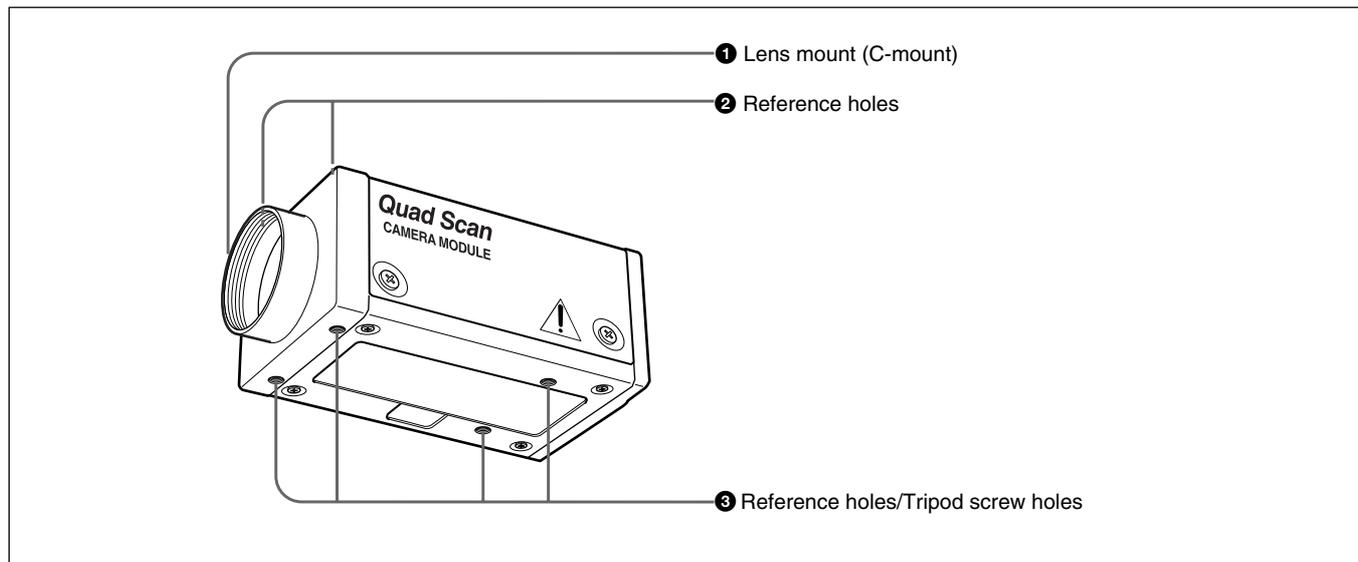


Connection Diagram



Location of Parts and Operation

Front/Top/Bottom



1 Lens mount (C-mount)

Attach any C-mount lens such as the VCL-12YM standard lens or other optical equipment.

2 Reference holes (Top)

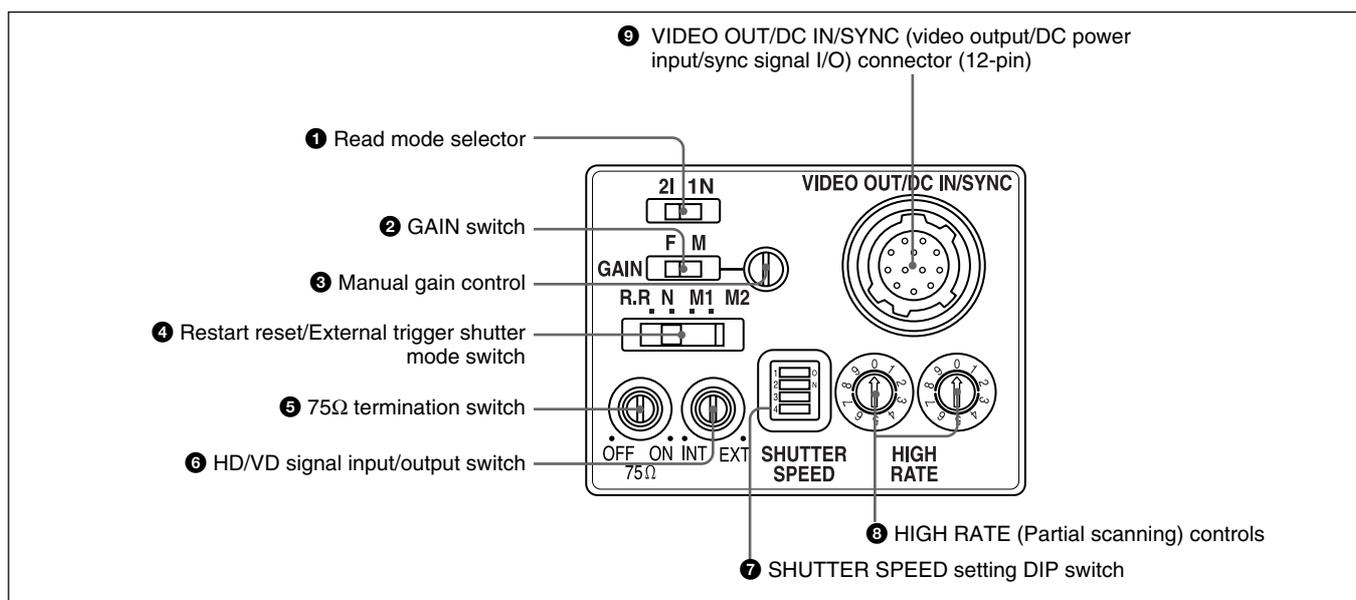
These precision screw holes are for locking the camera module. Locking the camera module into these holes secures the optical axis alignment.

3 Reference holes/Tripod screw holes (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.

Rear Panel



Note

When you do switch settings, make sure the unit is off.

1 Read mode selector

This switch selects either the 2I mode (interlace) or the 1N mode (non-interlace).

2 GAIN switch

This switch selects fixed gain (F) or manual gain control (M). (Factory setting: F)

3 Manual gain control

When the GAIN switch 2 is set to M (Manual), adjust the gain using this control.

4 Restart reset/External trigger shutter mode switch

The factory setting is N (Normal).

5 75Ω termination switch

Turn this to OFF when not terminated. (Factory setting: ON)

6 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)

7 SHUTTER SPEED setting DIP switch

Set an appropriate shutter speed when you have set the restart reset/external trigger shutter mode switch 4 to external trigger shutter mode M1 or M2. (Factory setting: shutter OFF)

8 HIGH RATE (Partial scanning) controls

These controls operate when you have set the restart reset/external trigger shutter mode switch 4 to R.R, M1 or M2.

Increasing the number by one with the ten's digit control (left side) decreases the effective video output lines by 50 ~ 60 lines*. Increasing the number by one with the first's digit control (right side) decreases the effective video output lines by 5 ~ 6 lines*.

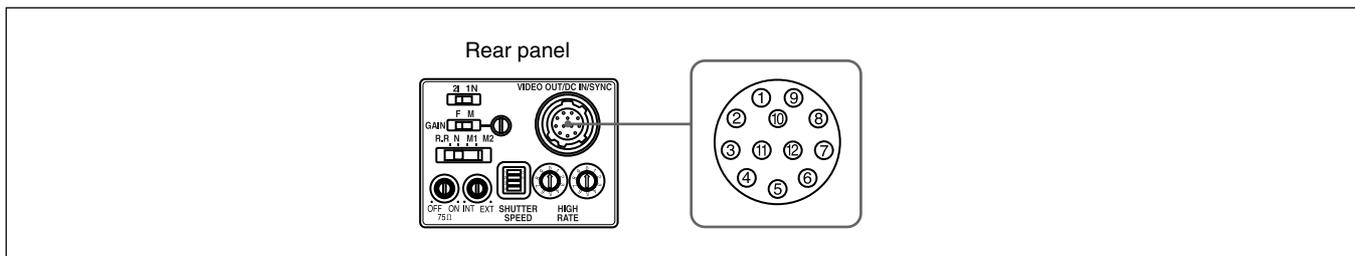
The partial scanning operation is turned off when both controls are set to 0.

* For details of the relation between effective pixels and BLKG, see "Example of Usage of the Partial Scanning Mode (Restart/Reset)", page 12 and 13, or "Example of Usage of the Partial Scanning Mode (Trigger shutter)", page 15 and 16.

9 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 +12V 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).

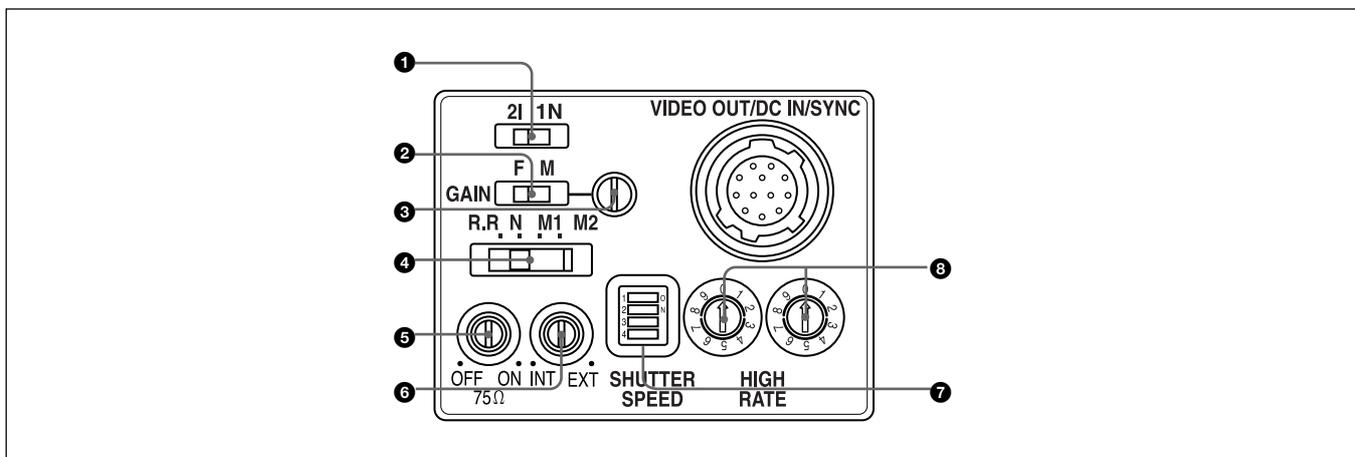
VIDEO OUT/DC IN/SYNC connector pin assignment



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

* The common grounds for 7, 10 and 11 pins.

Factory setting mode of rear panel

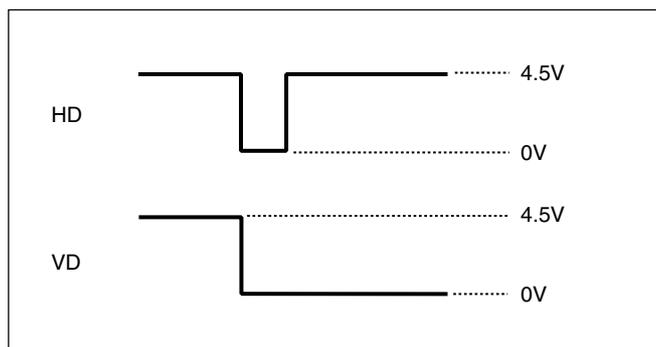


Number	Switch name	Factory-setting mode
①	Read mode selector	2I
②	GAIN switch	F
③	Manual gain control	—**
④	Restart reset/External Trigger Shutter mode switch	N
⑤	75Ω termination switch	ON
⑥	HD/VD signal input/output switch	EXT
⑦	SHUTTER SPEED setting DIP switch	OFF (All set to the left)
⑧	HIGH RATE (Partial scanning) controls	0

** The factory setting is set to constant sensitivity for a standard subject.

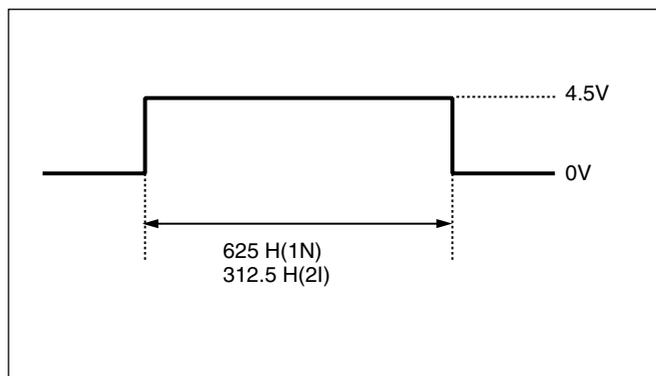
When the GAIN switch is set to “M” (Manual), you can change the gain level in a range from 0 to 18 dB.

Specifications of the External HD/VD Outputs



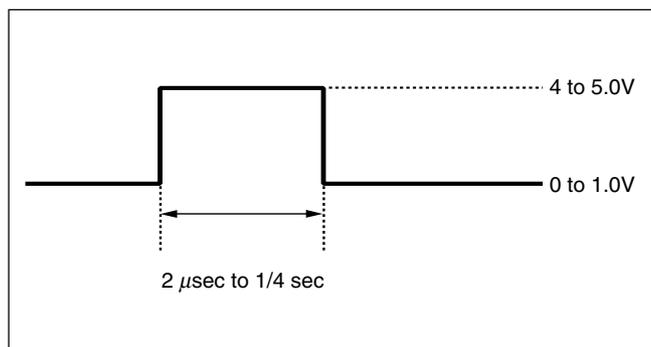
The amplitude level is the typical value when terminated with 10 k Ω . The external HD and VD can be output when you set the INT/EXT switch to INT.

Specifications of the WEN Output



The amplitude level is the typical value when terminated with 10 k Ω . When the partial scanning is used, the pulse width is less than the above value.

Specifications of the Trigger Pulse



- 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.

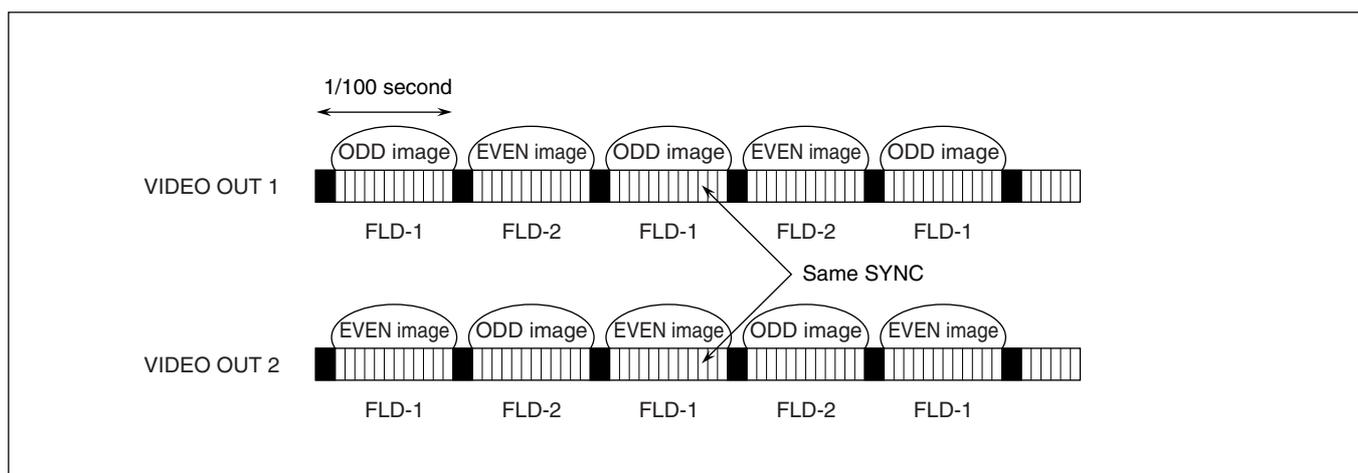
Image Output Mode

The unit has two image signal output modes. Select the mode by setting the read mode switch on the rear panel.

2I Mode (Factory Default)

The VIDEO OUT 1 and VIDEO OUT 2 connectors output ODD/EVEN interlaced images every 1/100 second. The SYNC signals are the same for the VIDEO OUT 1 and VIDEO OUT 2 connectors.

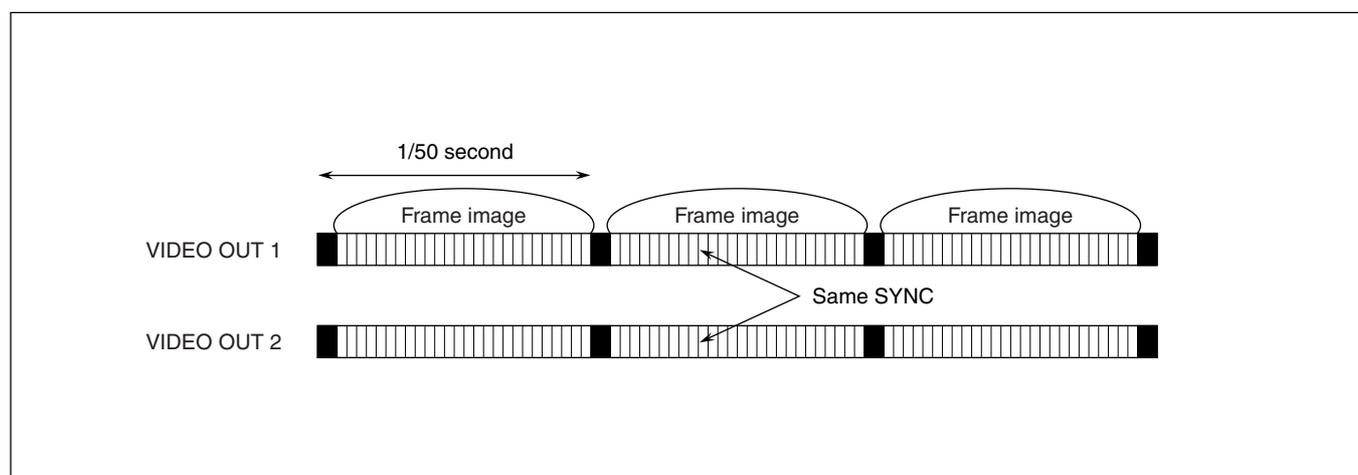
- External synchronization: EXT-HD/VD is allowed.



1N Mode

Only the VIDEO OUT 1 connector outputs non-interlaced 1/50 second images. The VIDEO OUT 2 connector does not output any images.

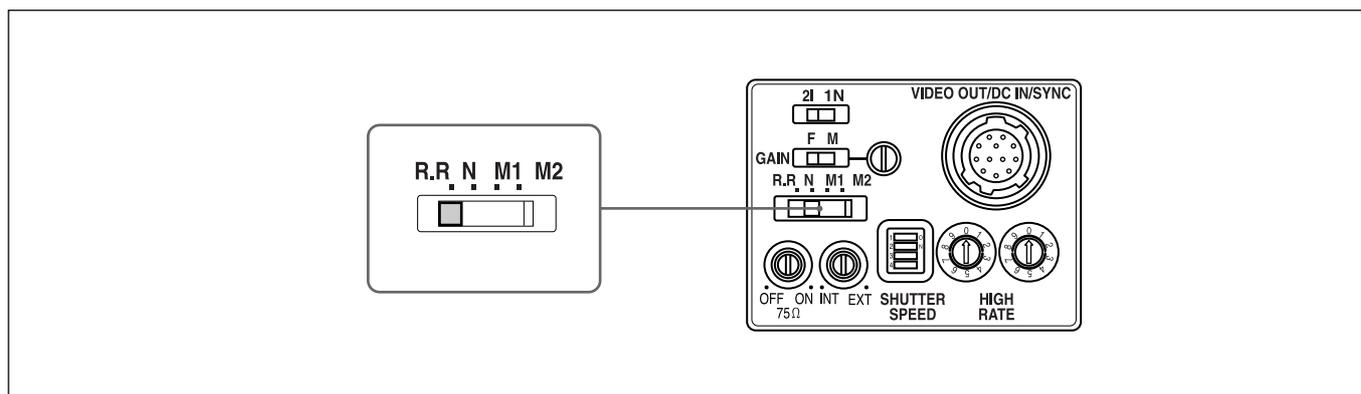
- External synchronization: EXT-HD/VD is allowed.



Restart/Reset

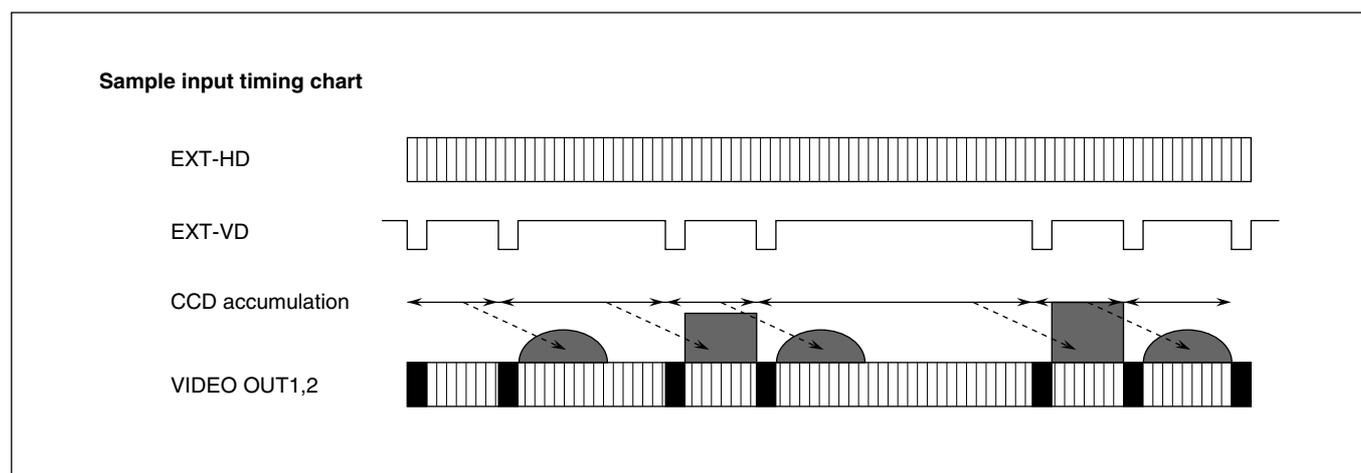
To set Restart/Reset mode

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 the Restart reset/ External trigger shutter mode switch on the rear panel of the camera as shown in the figure below. The setting is especially effective for the following operation.



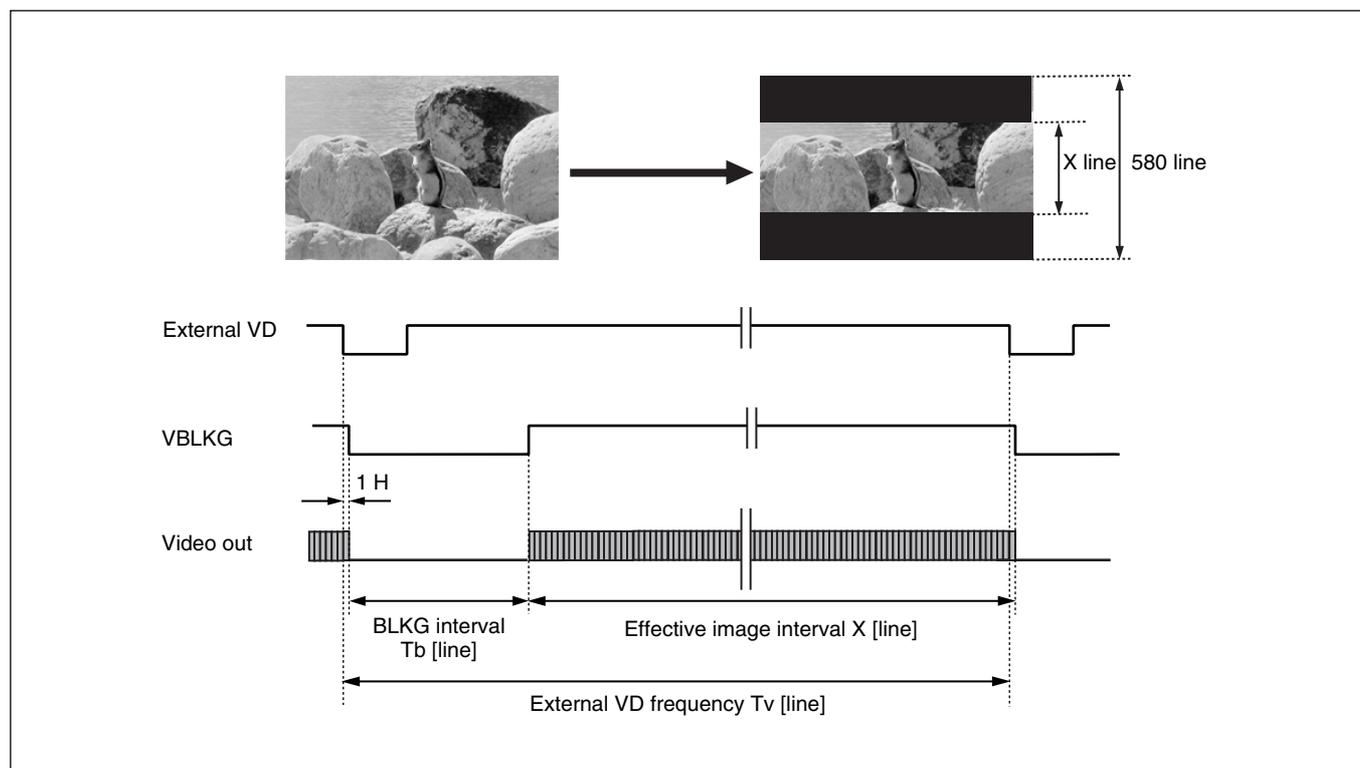
Long exposure

A highly-sensitive image is obtained by extending the exposure time of the CCD when satisfactory sensitivity cannot be obtained under other operating conditions. Extend the VD interval (T) period between external VD pulses.



Example of Usage of the Partial Scanning Mode

As shown in the table on the next page, you can increase the frame rate by setting the partial scanning mode switch and the external VD frequency. The image obtained is centered as shown below.



Note

In the Restart/Reset mode, the video out signals are output about 1H later than the external VD.

1N mode

External VD interval Tv [line]	Partial scanning setting		Effective lines X [line]	BLKG interval Tb [line]	Frame rate [frame/s]
	10th digit	First digit			
625 (20.0 ms)	0	0	580 (18.6 ms)	45 (1.44 ms)	50
312 (9.98 ms)	2	6	267 (8.54 ms)	45 (1.44 ms)	100
208 (6.65 ms)	3	6	157 (5.02 ms)	51 (1.63 ms)	150
156 (4.99 ms)	4	0	101 (3.23 ms)	55 (1.76 ms)	200

BLKG interval $T_b = 15 + n$ (n stands for the partial scanning setting value. When the 10th digit is 2 and the first digit is 6, $n=26$. The maximum value of n is 99, and the minimum value of T_b is 45. When $T_b \leq 45$, the BLKG interval is 45H, the constant value.

Effective lines $X = T_v - T_b$

2I mode

External VD interval Tv [line]	Partial scanning setting		Effective lines* X [line]	BLKG interval Tb [line]	Frame rate [frame/s]
	10th digit	First digit			
312.5 (10.0 ms)	0	0	287.5 (9.2 ms)	25 (0.80 ms)	100
156 (5.00 ms)	1	3	128 (4.10 ms)	28 (0.90 ms)	200
104 (3.32 ms)	1	7	72 (2.30 ms)	32 (1.02 ms)	300
78 (2.50 ms)	2	0	43 (1.38 ms)	35 (1.12 ms)	400

BLKG interval $T_b = 15 + n$ (n stands for the partial scanning setting value. When the 10th digit is 1 and the first digit is 3, $n=13$. The maximum value of n is 49, and the minimum value of T_b is 25. When $T_b \leq 25$, the BLKG interval is 25H, the constant value.

Effective lines $X = T_v - T_b$

* The number of effective lines in the 2I mode indicates the number of lines output from the Video 1 and 2 connectors.
– Determine and input each value for the colored columns.

External Trigger Shutter

By inputting an external trigger pulse, the camera is able to capture fast-moving objects clearly.

Set the Restart reset/External Trigger Shutter mode switch 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 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.

For details of each timing chart, see pages 17 to 24.

Setting of the External Trigger Shutter

There are two ways to set the shutter speed.

Using the DIP switches on the rear panel

Mode 1 (Non-reset mode)

1/120	1/250	1/500	1/1000
1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>
2 <input checked="" type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	2 <input type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>
3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input checked="" type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>
4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input checked="" type="checkbox"/>
1/2000	1/4000	1/8000	1/25000
1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>
2 <input checked="" type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	2 <input type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>
3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input checked="" type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>
4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input checked="" type="checkbox"/>

(Unit: second)

Mode 2 (Reset mode)

1/120	1/250	1/500	1/1000
1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>
2 <input checked="" type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	2 <input type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>
3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input checked="" type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>
4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input checked="" type="checkbox"/>
1/2000	1/4000	1/8000	1/25000
1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	1 <input type="checkbox"/> <input type="checkbox"/>
2 <input checked="" type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	2 <input type="checkbox"/> <input type="checkbox"/>	2 <input type="checkbox"/> <input checked="" type="checkbox"/>
3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input checked="" type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>
4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input type="checkbox"/>	4 <input type="checkbox"/> <input checked="" type="checkbox"/>

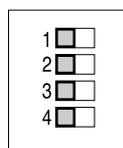
(Unit: second)

Using trigger pulse width

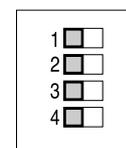
Set all DIP switches (1 to 4 on the rear panel) to 0.

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

Mode 1 (Non-reset mode)



Mode 2 (Reset mode)



Exposure time = Trigger pulse width + 31 μ sec

Note

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.

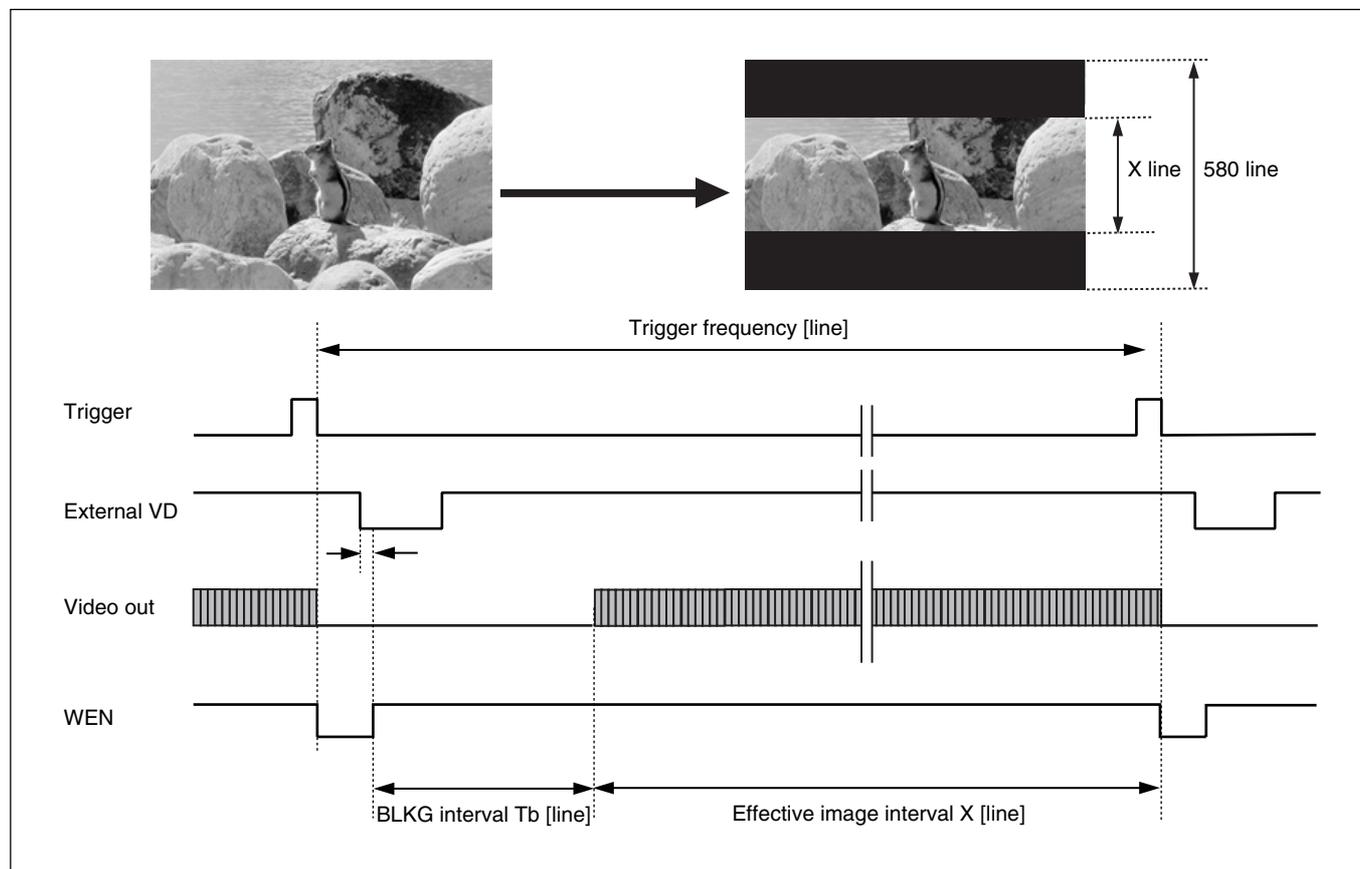
Example of Usage of the Partial Scanning Mode

Increase the frame rate by setting the shutter speed to the trigger pulse width in external trigger modes 1 and 2, and then set the partial scanning mode adjustment switch and the trigger frequency (as shown in the table on the next page). The image is centered on as shown

below.

Inputting the trigger falling edge terminates the image output.

If a new trigger rising edge is input within the effective image interval, the image will not be output correctly.



Note

In the trigger shutter mode, the video out signals are output about 1H later than the external VD.

1N mode

Trigger interval T [line]	Partial scanning setting		Effective lines X [line]	BLKG interval Tb [line]	Frame rate [frame/s]
	10th digit	First digit			
625 (20.0 ms)	0	0	578 (18.5 ms)	45 (1.44 ms)	50
312 (9.98 ms)	2	6	265 (8.48 ms)	45 (1.44 ms)	100
208 (6.65 ms)	3	6	155 (4.96 ms)	51 (1.63 ms)	150
156 (4.99 ms)	4	0	99 (3.17 ms)	55 (1.76 ms)	200

BLKG interval $T_b = 15 + n$ (n stands for the partial scanning setting value. When the 10th digit is 2 and the first digit is 6, $n=26$. The maximum value of n is 99, and the minimum value of T_b is 45. When $T_b \leq 45$, the BLKG interval is 45H, the constant value.

Effective lines $X = T - (T_b + 2H)$

2I mode

Trigger interval T [line]	Partial scanning setting		Effective lines* X [line]	BLKG interval Tb [line]	Frame rate [frame/s]
	10th digit	First digit			
312.5 (10.0 ms)	0	0	285 (9.14 ms)	25 (0.80 ms)	100
156 (4.99 ms)	1	3	126 (4.03 ms)	28 (0.90 ms)	200
104 (3.33 ms)	1	7	70 (2.24 ms)	32 (1.02 ms)	300
78 (2.50 ms)	2	0	41 (1.31 ms)	35 (1.76 ms)	400

BLKG interval $T_b = 15 + n$ (n stands for the partial scanning setting value. When the 10th digit is 1 and the first digit is 3, $n=13$. The maximum value of n is 49, and the minimum value of T_b is 25. When $T_b \leq 25$, the BLKG interval is 25H, the constant value.

Effective lines $X = T - (T_b + 2H)$

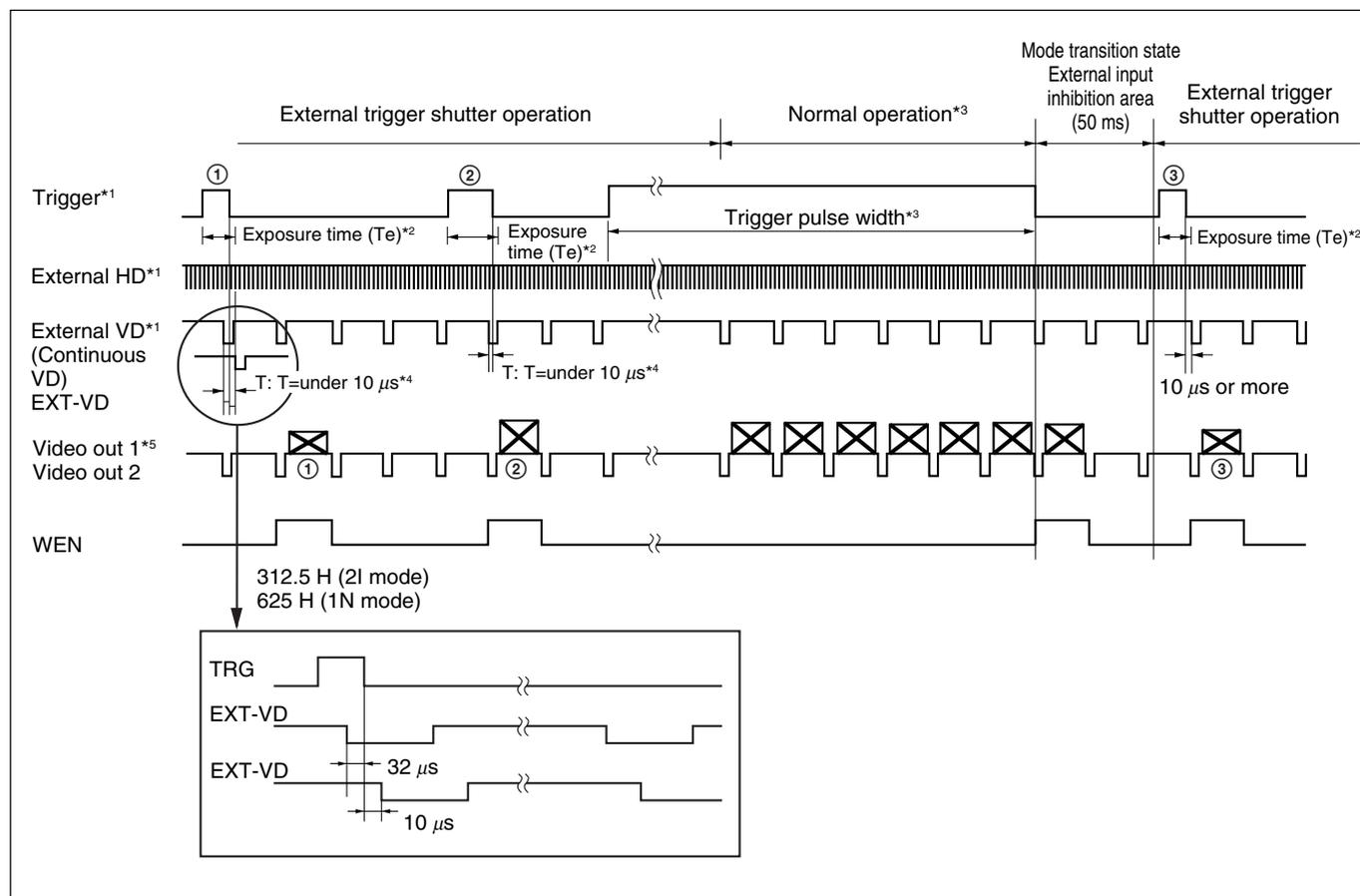
- * The number of effective lines in the 2I mode indicates the number of lines output from the Video 1 and 2 connectors.
- Determine and input each value for the colored columns.
 - The above table shows an example values of the partial scanning mode. These values are measured by setting the trigger pulse width to 100 μ s and the time interval between the trigger falling edge and the external VD falling edge to about 1H (32 μ s). Mode 2 shows almost the same values as Mode 1. In this case, the trigger input affects the image output on about the last 3 lines of the effective image interval.

Timing Chart

When set to Mode 1 (M1)

For setting the shutter speed using trigger pulse width

- ◆ HD/VD input
 - Continuous VD input



- *1 This is a signal input from outside. Make sure to input both HD and VD signals.
- *2 Exposure time (Te)
 $Te = \text{Trigger pulse width} + 31 \mu\text{sec}$
 (The effective trigger pulse width for the external trigger shutter operation is between $2 \mu\text{s}$ and $1/4 \text{ s}$.)
- *3 The normal operation state is carried out when the trigger pulse width is $1/3 \text{ s}$ or more. The trigger falling edge restores the external trigger shutter operation. 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. There is no guarantee of operation for any trigger input selected in this period.

- *4 If there is a falling edge on the external VD within a period of $+10 \mu\text{s}$ from the falling trigger edge (① and ② in the figure), it is not defined whether the image is output for the external VD falling edge or the image is output for the next external VD falling edge. (① in the figure shows that the image is output for the next external VD. ② shows the image for the external VD.) In this case, see WEN since output of the image and WEN make up a pair. In any other cases, the image is output for the external VD falling edge after the trigger falling edge (③ in the figure).

- *5 Video out 2 is output only in the 2I mode.

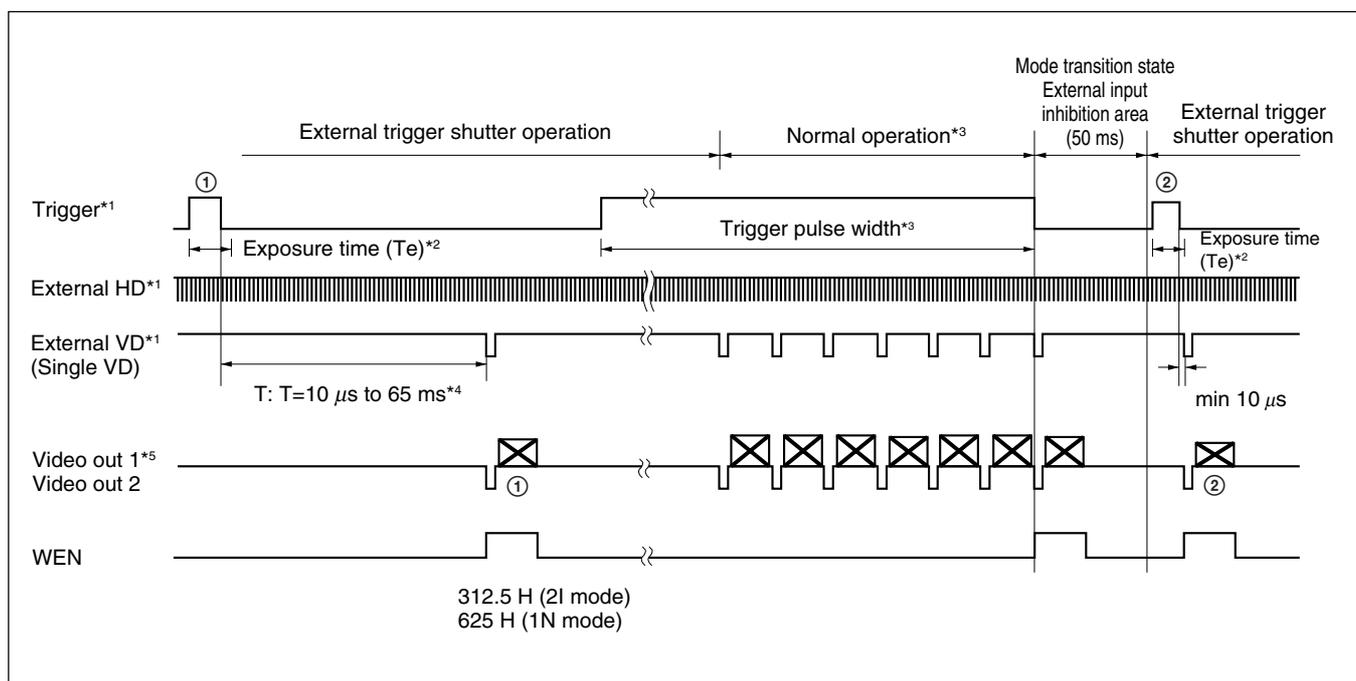
Note

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

For setting the shutter speed using trigger pulse width

◆ HD/VD input

• Continuous HD input/Single VD input



*1 This is a signal input from outside. Make sure to input both HD and VD signals in this case. Input the signal so that the VD phase aligns with the HD falling edge.

*2 Exposure time (Te)
 $Te = \text{Trigger pulse width} + 31 \mu\text{sec}$
 (The effective trigger pulse width for the external trigger shutter operation is between $2 \mu\text{s}$ and $1/4 \text{ s}$.)

*3 The normal operation state is carried out when the trigger pulse width is $1/3 \text{ s}$ or more. The trigger falling edge restores the external trigger shutter operation. 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. There is no guarantee of operation for any trigger input selected in this period.

*4 Input the external VD within the period of $10 \mu\text{s}$ to 65 ms after the trigger falling edge (① and ② in the figure). There is no guarantee of operation when any other input is selected. If an invalid signal is input, the input is changed to a valid signal and, after several V signals, normal operation will resume.

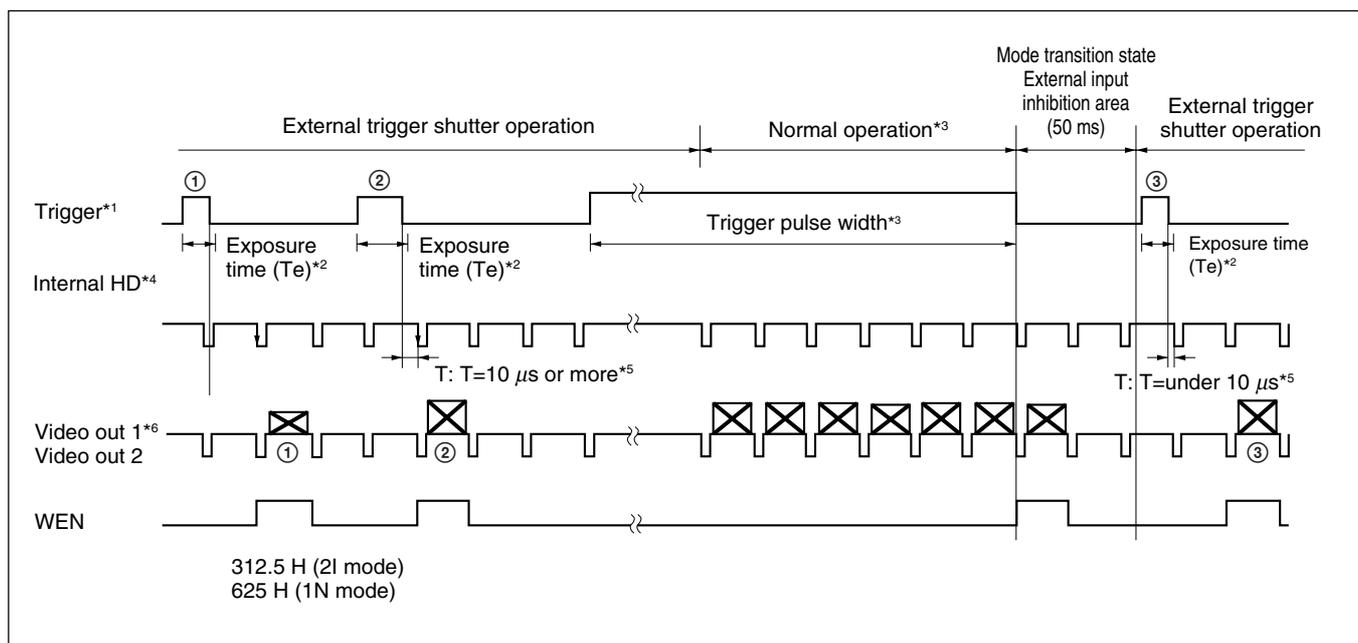
*5 Video out 2 is output only in the 2I mode.

Note

Make sure that the trigger signal and the VD signal make up a pair. An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

For setting the shutter speed using trigger pulse width

◆ No HD/VD input (Internal synchronization)



*1 This is a signal input from outside.

*2 Exposure time (Te)
 $T_e = \text{Trigger pulse width} + 31 \mu\text{sec (EIA)}$
 (The effective trigger pulse width for the external trigger shutter operation is between $2 \mu\text{s}$ and $1/4 \text{ s}$.)

*3 The normal operation state is carried out when the trigger pulse width is $1/3 \text{ s}$ or more. The trigger falling edge restores the external trigger shutter operation. 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. There is no guarantee of operation for any triggers input in this period.

*4 The internal VD signals are output as long as there is no external input and the HD/VD signal I/O switch on the rear panel is set to INT.

*5 In the external trigger operation, the image is output for the internal VD falling edge after the trigger falling edge (① and ② in the figure). If the period from the trigger falling edge to the internal VD falling edge (T in the figure) is under $10 \mu\text{s}$, there may be a delay of 1 VD in the output. (③ in the figure shows that the image is output for the next internal VD). In this case, see WEN since the image and WEN make up a pair. (The internal VD falling edge and the beginning of the equivalent pause in the V period of the SYNC have the same phase.)

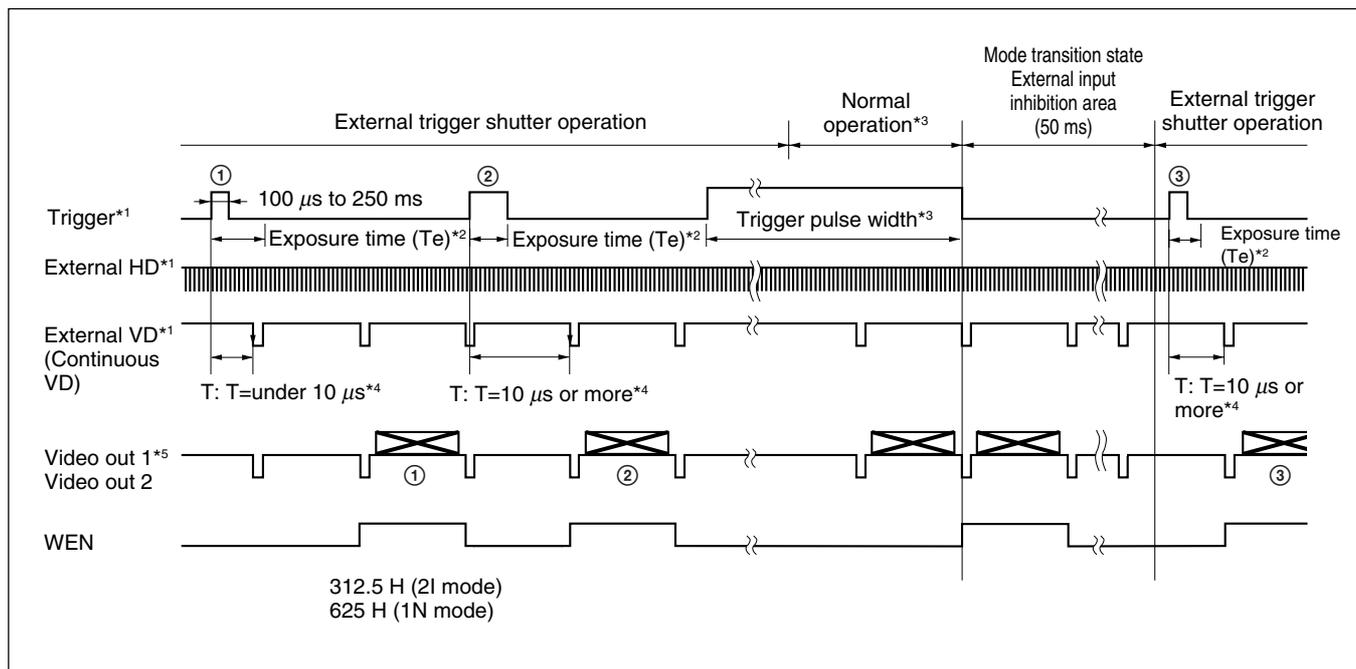
*6 Video out 2 is output only in the 2I mode.

Note

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

For setting the shutter speed using DIP switches

- ◆ HD/VD input
 - Continuous VD input



*1 This is a signal input from outside. Make sure to input both HD and VD signals.

*2 The exposure time (T_e) is determined by the setting of DIP switches.
For details, see Page 14.

*3 The normal operation state is carried out when the trigger pulse width is $1/3$ s or more. The trigger falling edge restores the external trigger shutter operation. 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. There is no guarantee of operation for any triggers input in this period.

*4 An image is output when an external VD signal falls 10 ms or more after a trigger pulse rises (② and ③ in the figure). If the period from the trigger rising edge to the external VD falling edge (T in the figure) is under 10 ms, there may be a delay of 1 VD in the output. (① in the figure shows that the image is output for the next external VD). In this case, see WEN since the image and WEN make up a pair.

*5 Video out 2 is output only in the 2I mode.

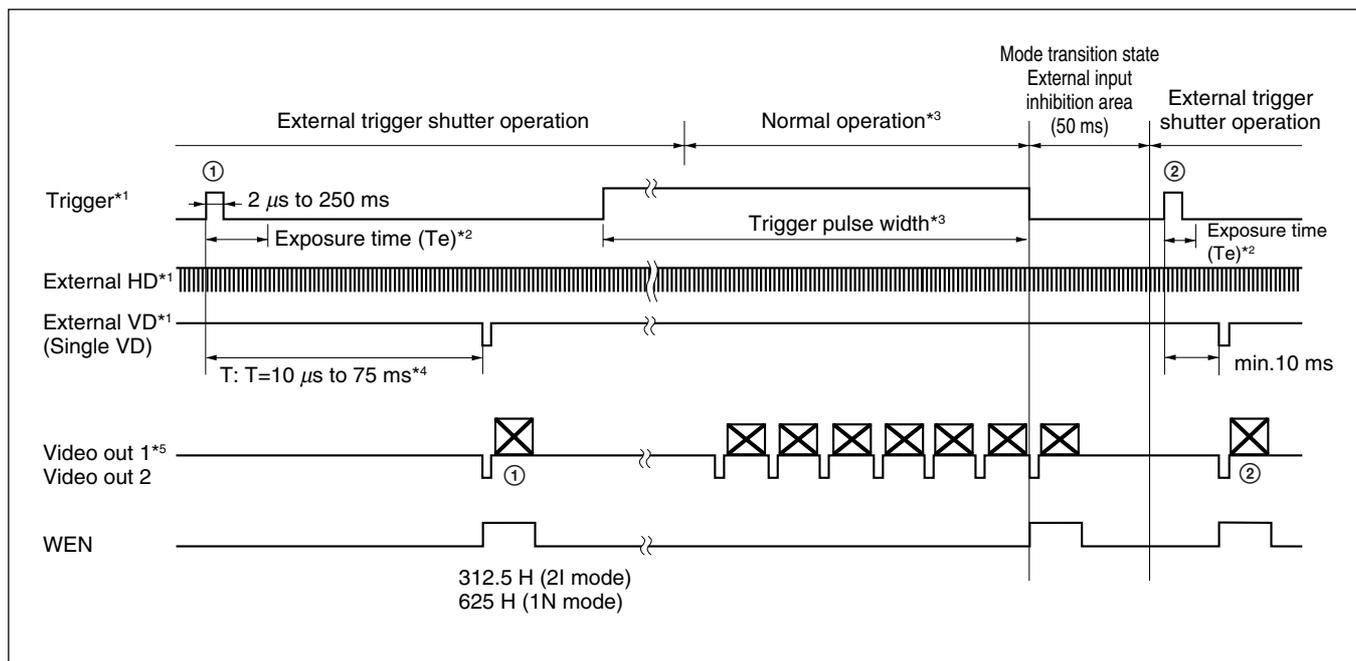
Note

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

For setting the shutter speed using DIP switches

◆ HD/VD input

• Continuous HD input/Single VD input



*1 This is a signal input from outside. Make sure to input both HD and VD signals in this case. Input the signal so that the VD phase aligns with the HD falling edge.

*2 The exposure time (T_e) is determined by the setting of the DIP switches.
For details, see Page 14.

*3 The normal operation state is carried out when the trigger pulse width is $1/3\ \text{s}$ or more. The trigger falling edge restores the external trigger shutter operation. In this case, the area between the falling edge of a trigger pulse and the subsequent $50\ \text{ms}$ period is an external trigger input inhibition area. There is no guarantee of operation for any triggers input in this period.

*4 Input the external VD within the period of $10\ \text{ms}$ to $75\ \text{ms}$ after the trigger rising edge (① and ② in the figure). There is no guarantee of operation when any other input is selected. If an invalid signal is input, the input is changed to a valid signal, and after several V signals, normal operation will resume.

*5 Video out 2 is output only in the 2I mode.

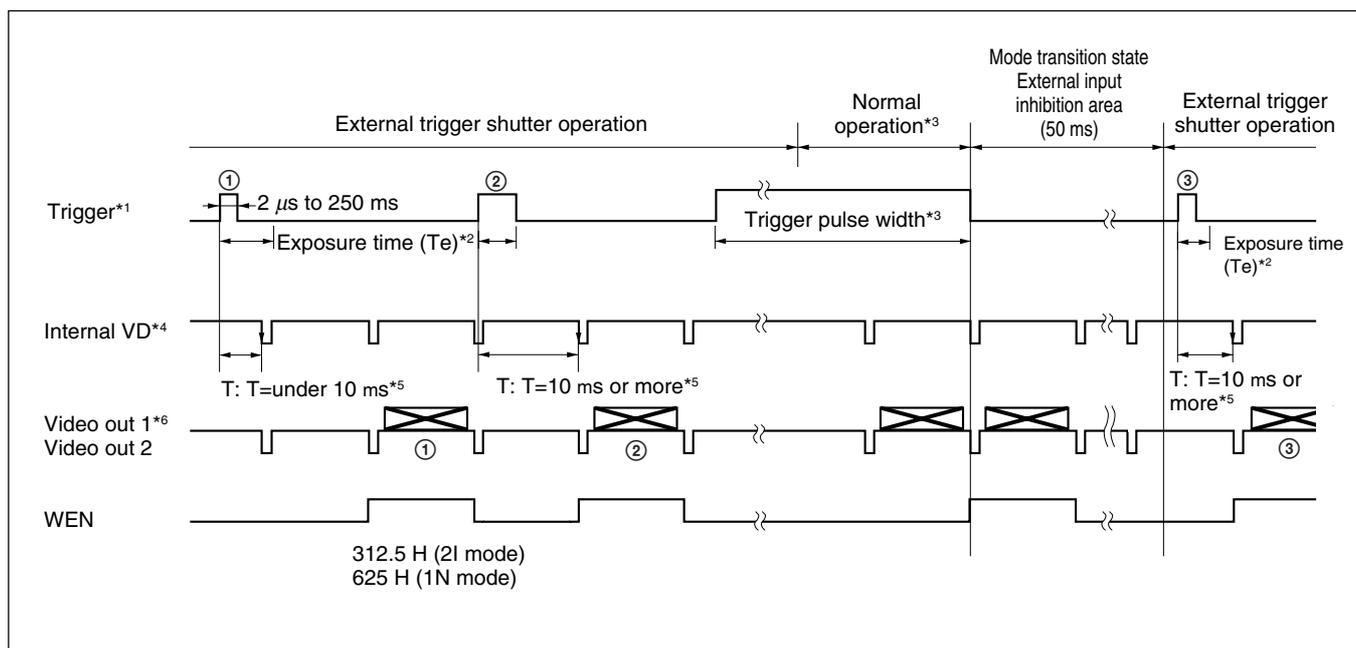
Note

Make sure that the trigger signal and the VD signal make up a pair.

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

For setting the shutter speed using DIP switches

◆ No HD/VD input (Internal synchronization)



*1 This is a signal input from outside.

*2 The exposure time (T_e) is determined by the setting of the DIP switches.
For details, see Page 14.

*3 The normal operation state is carried out when the trigger pulse width is $1/3\ \text{s}$ or more. The trigger falling edge restores the external trigger shutter operation. In this case, the area between the falling edge of a trigger pulse and the subsequent $50\ \text{ms}$ period is an external trigger input inhibition area. There is no guarantee of operation for any triggers input in this period.

*4 The internal VD signals are output as long as there is no external input and the HD/VD signal input/output switch on the rear panel is set to INT.

*5 An image is output when an internal VD signal falls $10\ \text{ms}$ or more after a trigger pulse rises (2 and 3 in the figure). If the period from the trigger rising edge to the internal VD falling edge (T in the figure) is under $10\ \text{ms}$, it is not defined whether the image is output for the external VD falling edge or the image is output for the next external VD falling edge. (1 in the figure shows that the image is output for the next internal VD). In this case, see WEN since the image and WEN make up a pair. (The internal VD falling edge and the beginning of the equivalent pause in the V period of the SYNC have the same phase.)

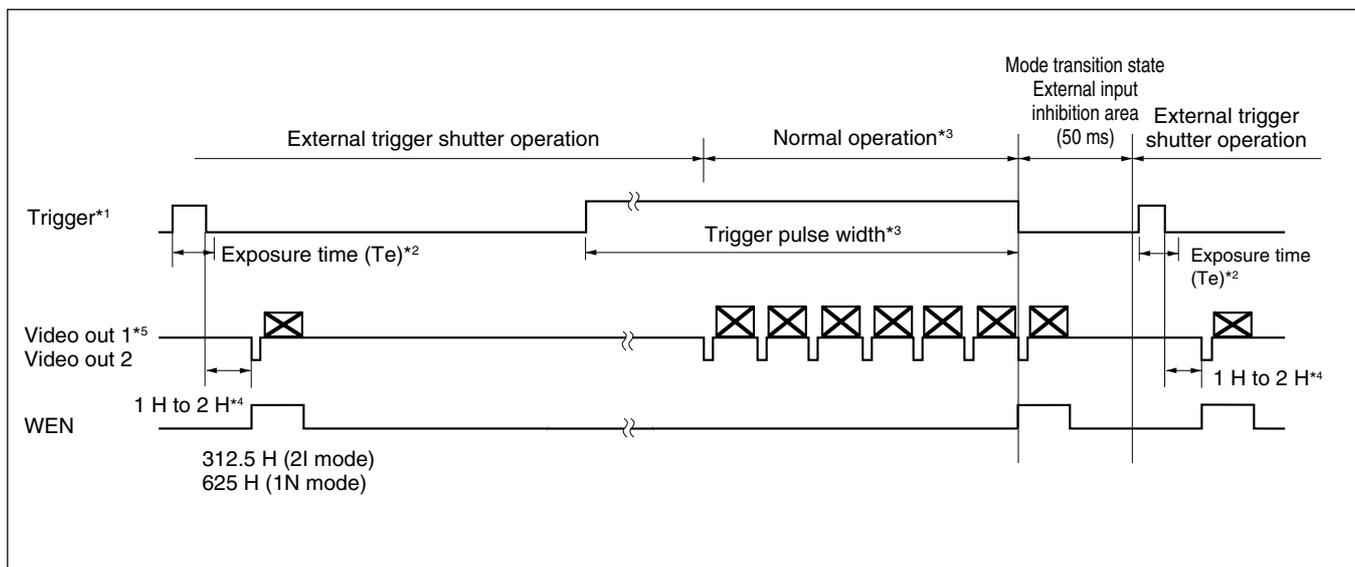
*6 Video out 2 is output only in the 2I mode.

Note

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

When set to Mode 2 (M2)

For setting the shutter speed using trigger pulse width



*1 This is a signal input from outside.

*2 Exposure time (Te)

$$Te = \text{Trigger pulse width} + 31 \mu\text{sec}$$

(The effective trigger pulse width for the external trigger shutter operation is between 2 μs and 1/4 s.)

*3 The normal operation state is carried out when the trigger pulse width is 1/3 s or more. The trigger falling edge restores the external trigger shutter operation. In this case, the area between the falling edge of a trigger pulse and the subsequent 50ms period is an external trigger input inhibition area. There is no guarantee of operation for any triggers input in this period.

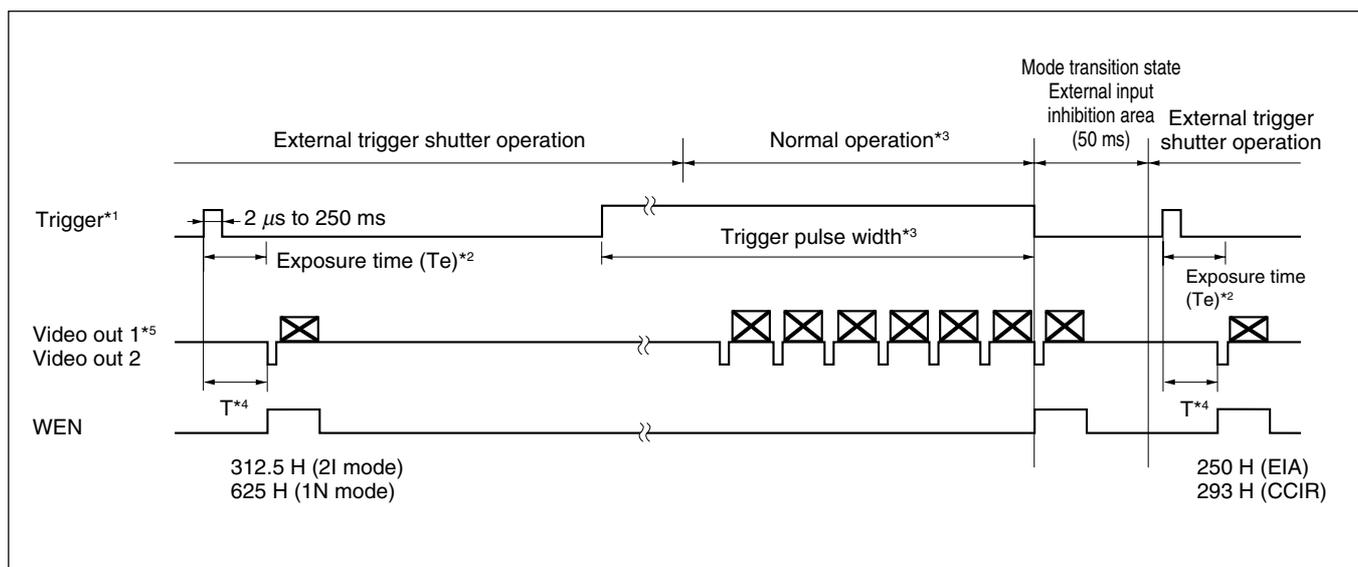
*4 A VD signal is generated after 1 H to 2 H from the trigger falling edge, then the image is output synchronized with the VD generation.

*5 Video out 2 is output only in the 2I mode.

Note

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

For setting the shutter speed using the DIP switches



*1 This is a signal input from outside.

*2 The exposure time (T_e) is determined by the setting of the DIP switches.

For details, see Page 14.

*3 The normal operation state is carried out when the trigger pulse width is $1/3\ \text{s}$ or more. The trigger falling edge restores the external trigger shutter operation. In this case, the area between the falling edge of a trigger pulse and the subsequent $50\ \text{ms}$ period is an external trigger input inhibition area. There is no guarantee of operation for any triggers input in this period.

*4 The image is output at the shortest timing from the trigger rising edge according to the DIP switch setting.

*5 Video out 2 is output only in the 2I mode.

Note

An image is not output correctly when the next trigger is input before the image for the previous trigger is output.

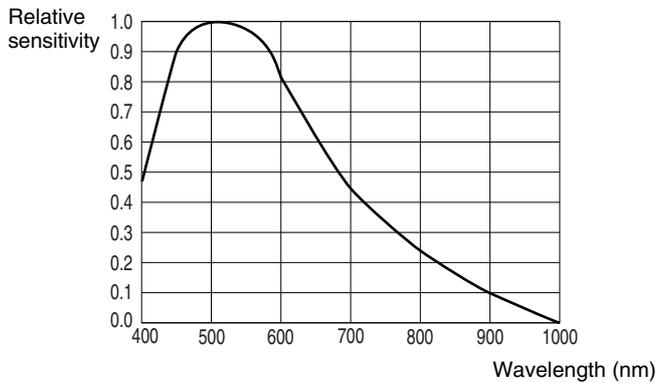
Specifications

Main Specifications

Image pickup device:	1/2type interline transfer PS CCD	Horizontal resolution	600 TV lines
Number of effective pixels:	782 (H) × 582 (V)	Sensitivity	400 lx F4 (γ correction OFF, 0 dB)
Cell size:	8.3 (H) × 8.3 (V) μ m	S/N ratio	58 dB
Chip size:	8.10 mm (H) × 6.33 mm (V) (¹¹ / ₃₂ (H) × ¹ / ₄ (V) inches)	Minimum illumination	6 lx (Manual gain – Maximum adjustment, F1.4, γ correction: OFF)
Effective sensing area:	6.4 mm (H) × 4.8 mm (V) (⁹ / ₃₂ (H) × ⁷ / ₃₂ (V) inches)	GAIN	Fixed/Manual (Can be selected using the switch on the rear panel)
CCD horizontal driving frequency	29.5 MHz	Gamma compensation	OFF (Fixed only)
CCD vertical driving frequency	31.25 kHz	External trigger shutter	1/4 to 1/25,000 second * Can be changed using the trigger pulse width or set using the DIP switches on the rear panel.
Lens mount	C-mount	Power requirement	DC +12V (+10.5 V to 15 V)
Flange back	17.526 mm (²³ / ₃₂ inches)	Power consumption	4.0 W
Synchronization system	Internal/External (Selected automatically)	Operating temperature	-5 °C to +45 °C (23 °F to 113 °F)
External synchronization 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 has been set to EXT.	Storage temperature	-30 °C to +60 °C (-22 °F to 140 °F)
External synchronization frequency	HD: 31.5 kHz VD: 50 Hz (1N mode) : 100 Hz (2I mode)	Performance assurance temperature	0 °C to +40 °C (32 °F to 104 °F)
Allowable frequency deviation of external synchronization	±1% (in horizontal synchronous frequency)	Operating humidity	20 to 80 % (Non-condensing)
Jitter	Within 35 nsec	Storage humidity	20 to 95 % (Non-condensing)
Scanning system	2 line simultaneous scanning (2I mode) 1 line sequential scanning (1N mode)	Vibration resistance	10 G (For 20 minutes in the X,Y and Z directions at 20 to 200Hz)
		Shock resistance	70 G
		Outside dimensions	44 (W) × 33 (H) × 75 (D)mm (1 ³ / ₄ (W) × 1 ⁵ / ₁₆ (H) × 3 (D) inches)
		Weight	175 g (6 oz)

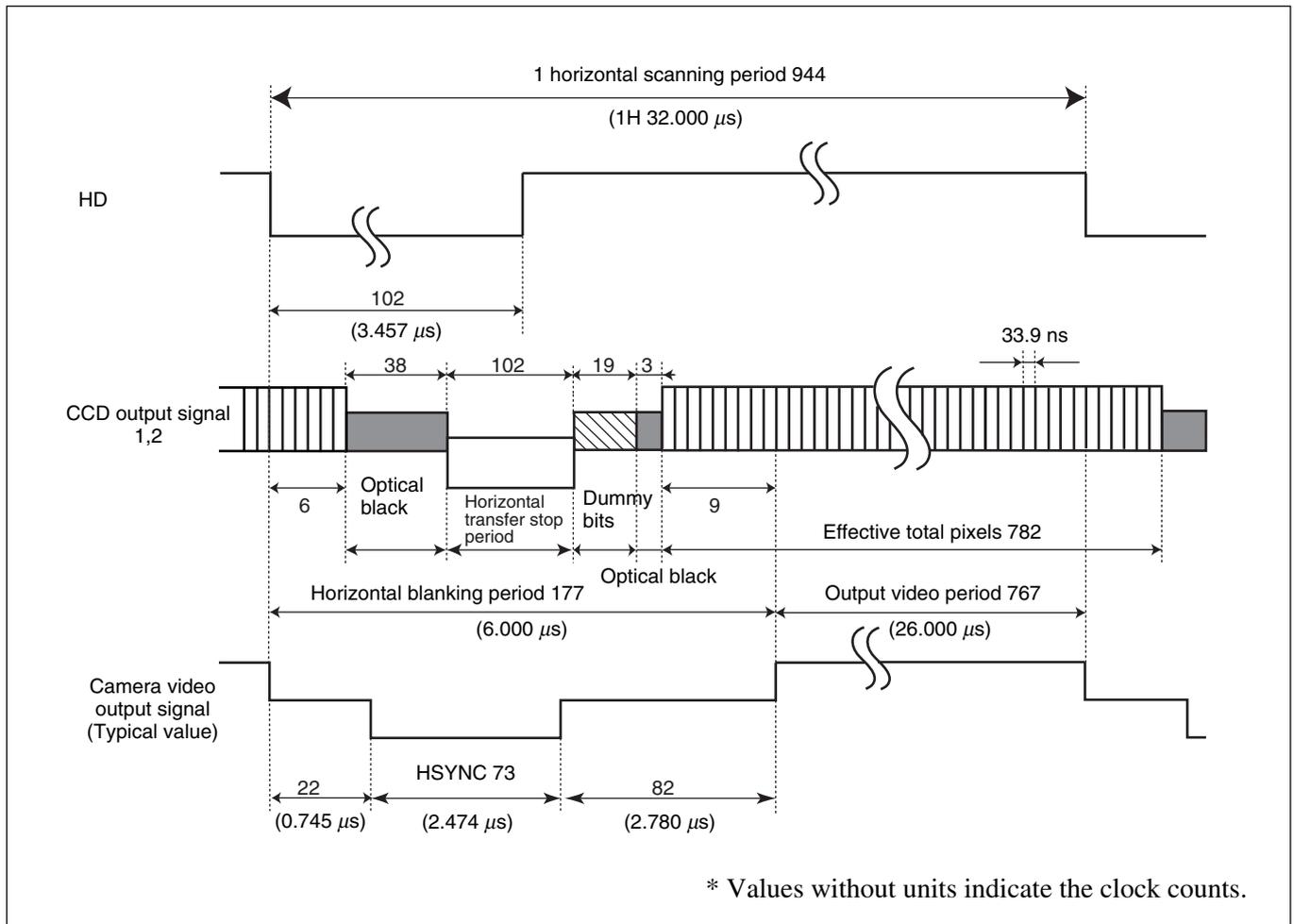
Standards	UL1492, FCC Class A Digital Device, CE (EN50081-2 +EN50082-2)
Other	Restart/Reset function External trigger shutter Partial scanning New EIAJ compliance 12-pin connector pin assignment
Accessories	Lens mount cap (1) Operating Instructions (1)

Spectral Sensitivity Characteristics (Typical Value)

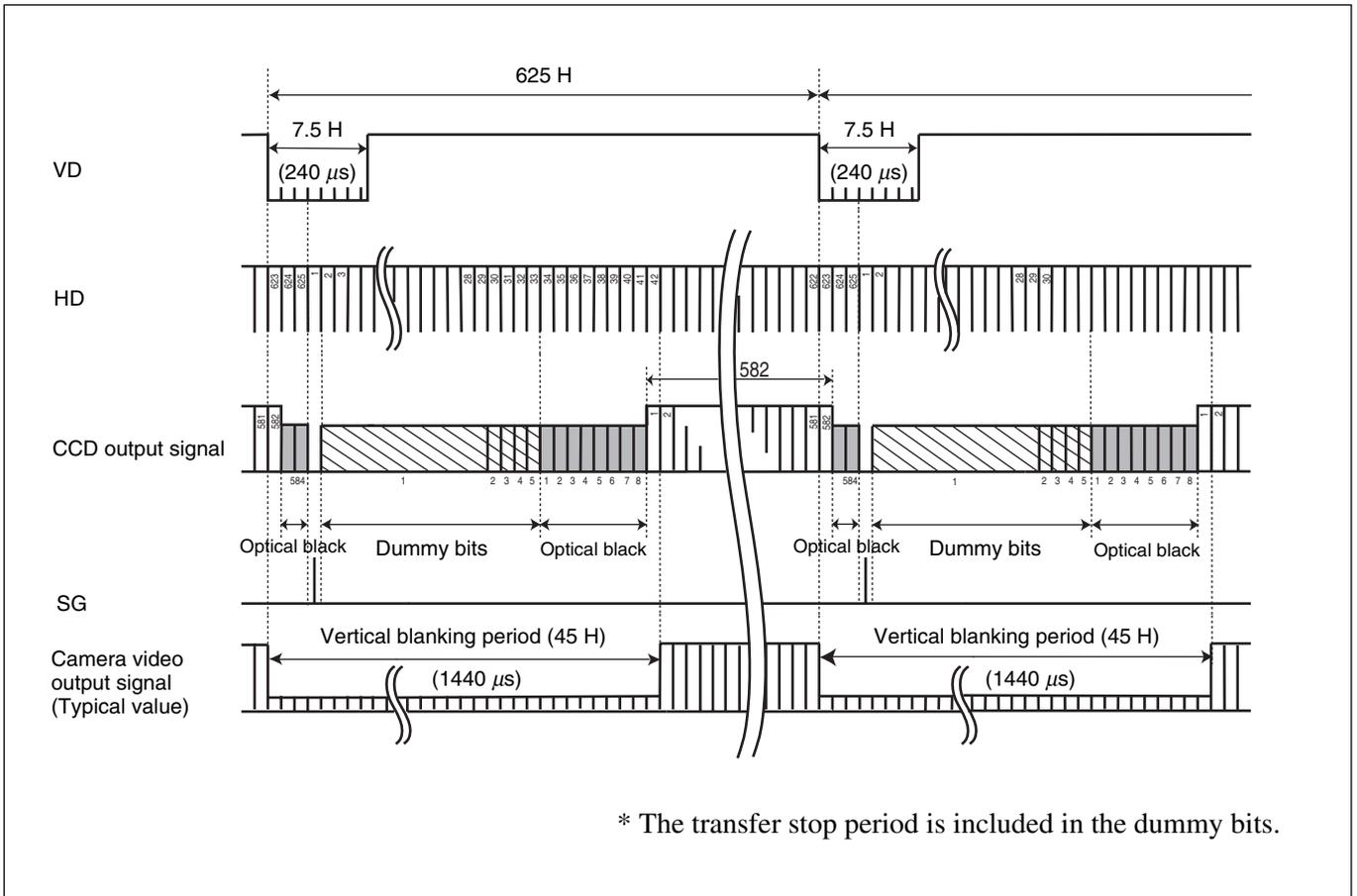


CCD Output Waveform Timing Chart

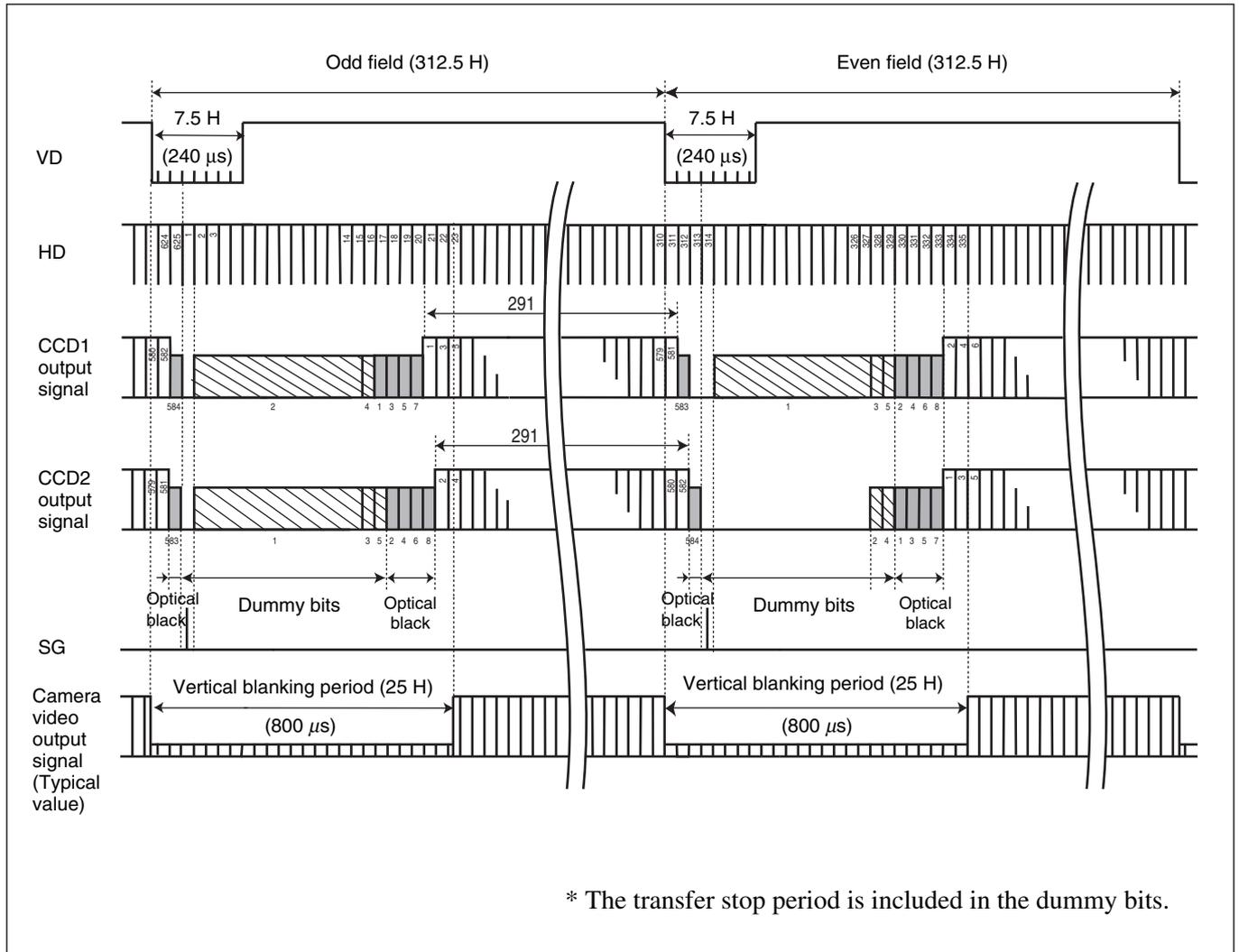
Horizontal Output Waveform Timing Chart



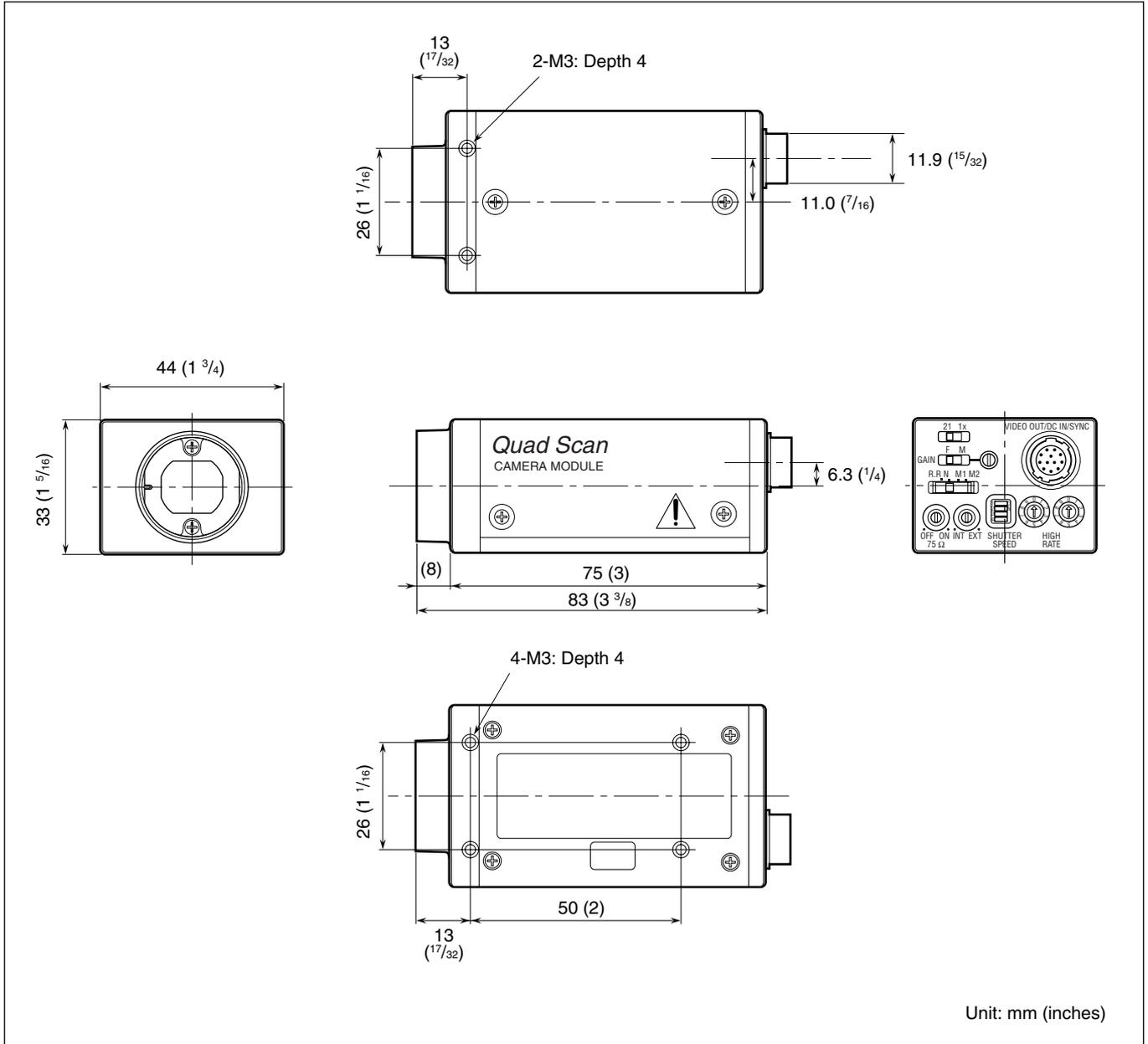
Vertical Output Waveform Timing Chart (1N)



Vertical Output Waveform Timing Chart (2I)



Dimensions



Appendix

Various Lens Selection

The following shows the specifications of the available accessory lenses.

List of C-Mount Lens

Model name		VLC-08YM	VLC-12YM	VLC-16Y-M	VLC-25Y-M	VLC-50Y-M
Focal distance (mm) (inches)		8 (¹¹ / ₃₂)	12 (¹ / ₂)	16 (²¹ / ₃₂)	25 (1)	50 (2)
Maximum aperture ratio		1:1.4	1:1.8	1:1.4	1:1.6	1:2.8
Operation	Iris	Manual				
	Focus	Manual				
Field angle (Horizontal × Vertical)	1/2 type CCD	42.6° × 32.6°	29.6° × 22.4°	22.6° × 17.0°	14.6° × 11.0°	7.3° × 5.5°
MOD* (mm) (inches)		207 (8 ¹ / ₄)	208 (8 ¹ / ₄)	289 (11 ¹ / ₂)	204 (8 ¹ / ₈)	438 (17 ¹ / ₄)
Image pickup range during maximum proximity (Horizontal × Vertical) (mm) (inches)		182.9 × 137.2 (7 ¹ / ₄ × 5 ¹ / ₂)	127 × 95 (5 × 3 ³ / ₄)	121 × 91 (4 ⁷ / ₈ × 3 ⁵ / ₈)	52.7 × 39.8 (2 ¹ / ₈ × 1 ⁵ / ₈)	49.8 × 37.3 (2 × 1 ¹ / ₂)
Back focus		11.54 mm (¹⁵ / ₃₂ inches)	10.99 mm (⁷ / ₁₆ inches)	12.50 mm (¹ / ₂ inches)	11.60 mm (¹⁵ / ₃₂ inches)	22.10 mm (⁷ / ₈ inches)
Flange back		17.526 mm (²³ / ₃₂ inches)	17.526 mm (²³ / ₃₂ inches)	17.526 mm (²³ / ₃₂ inches)	17.526 mm (²³ / ₃₂ inches)	17.526 mm (²³ / ₃₂ inches)
Weight		40 g (1 oz)	40 g (1 oz)	50 g (2 oz)	42 g (1 oz)	50 g (2 oz)

* MOD: Minimum Object Distance between the tip of the lens body and the object.

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