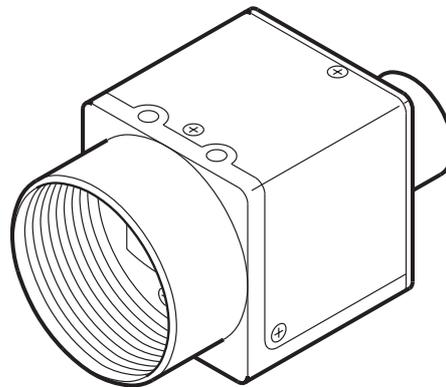


## CCD CAMERA

# IK-53N/IK-52N



### **FCC Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### **INFORMATION**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**USER-INSTALLER CAUTION:** Your authority to operate this FCC verified equipment could be voided if you make changes or modifications not expressly approved by the party responsible for compliance to Part 15 of the FCC rules.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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# 1. GENERAL

The IK-53N/IK-52N is a monochrome video camera using a solid image sensor CCD (Charged Coupled Device).

## High Picture Quality

The 410,000 pixels CCD provides a fine picture.

## Various Modes Setting

The following modes can be set by the switches on the rear panel.

- Gain: Fixed/manual adjustment (0 to +18 dB)
- Field accumulation/Frame accumulation
- Synchronized input/output (HD/VD)
- 75Ω terminal (at external synchronous input)
- Shutter function: Normal/external trigger shutter
- Shutter speed

## External Synchronization

External HD/VD signals are analyzed and the synchronization mode is automatically selected to match the input signals.

## Internal Synchronizing Signal Output

HD and VD signals can be outputted from the 12-pin connector by changing the switch position on the rear panel.

## Electric Shutter Speed

A variety of shutter speeds (1/100 to 1/100,000 sec) is provided to permit choice suitable for shooting conditions.

## External Trigger Function

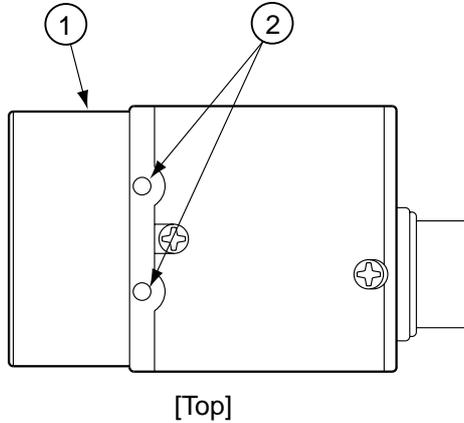
A trigger input provides one still image. This function exactly captures a subject moving at a high speed.

## Cabinet Fixing

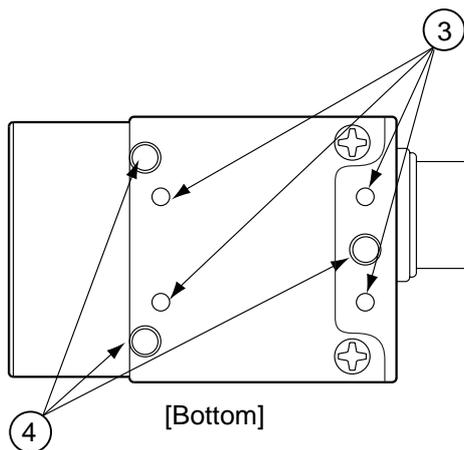
The cabinet fixing screw hole is provided below the front panel which includes the CCD datum level. Fix the camera using this screw hole to minimize shifts in the optical axis.

## 2. CAMERA PARTS AND FUNCTIONS

### Top/Bottom/Front Side



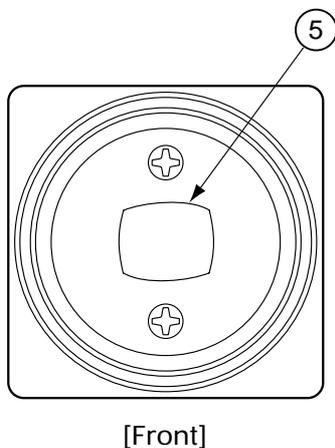
- ① Lens mount (C mount)  
This is used to mount a C-mount type lens or optical equipment.
- ② Camera fixing reference hole (top side)



- ③ Camera fixing reference hole/Tripod fixing metal screw hole (bottom side)
- ④ Camera fixing reference hole/Tripod fixing metal screw hole (bottom side)

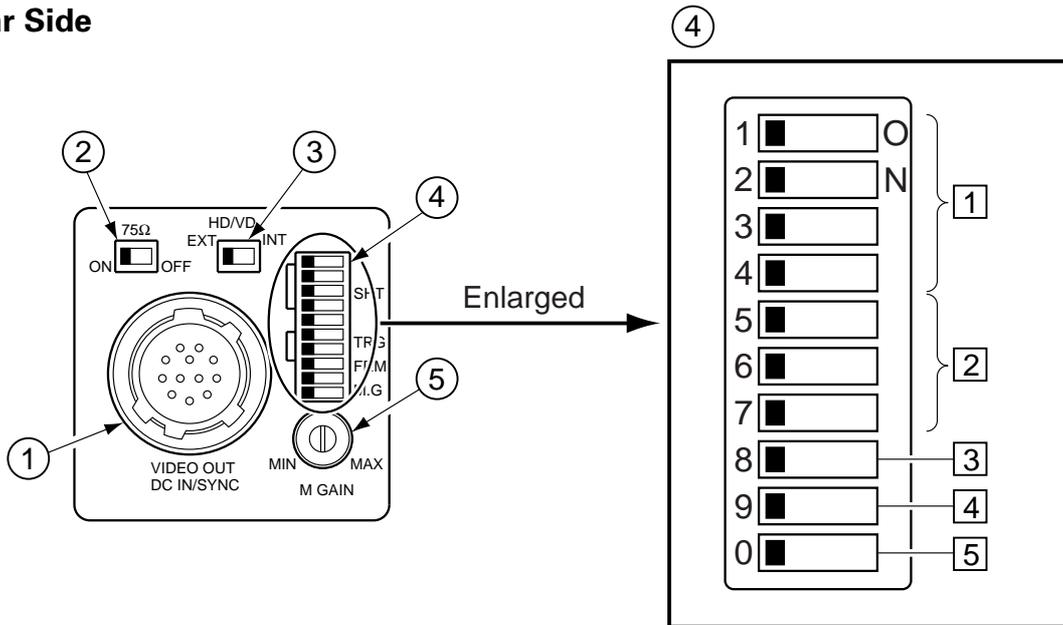
#### NOTE

When the mass of lens exceeds 300g, fix the camera at the side of the lens.



- ⑤ Imaging area  
The protection cap is attached on the lens mount portion. After removing the cap, mount the lens. Be careful not to scratch or touch the optical area.

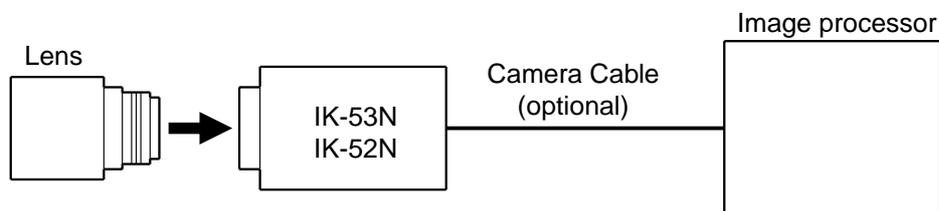
## Rear Side



- ① VIDEO OUT DC IN/SYNC plug (12-pin connector)  
This receives +12 VDC, and sends a video signal from the camera. When a synchronizing signal generator is connected to this plug and an external synchronizing signal (HD/VD signal) is applied, the camera can be operated synchronously with the external signal.
- ② 75Ω terminal switch (Terminal of external synchronizing HD/VD input signal)  
Set this switch to OFF when not terminated. The factory setting is ON.
- ③ HD/VD signal input/output selector switch  
Set to INT to output the HD/VD signals from the camera, and EXT to input external HD/VD signals. The factory setting is EXT.
- ④ MODE SELECT switch
  - ① Shutter speed setting (MODE SELECT switch bit 1 to 4)  
Set to the shutter speed suitable for the shooting conditions. For each setting position, refer to P. 7. The factory setting position is shutter OFF.
  - ② Reset restart/External trigger mode setting (MODE SELECT switch bit 5 to 7)  
For each setting position, refer to P. 8 to 13. The factory setting position is NORMAL.
  - ③ Trigger polarity setting (MODE SELECT switch bit 8)  
Selects the polarity of an externally inputted trigger.  
OFF: Positive ON: Negative  
The factory setting position is OFF.
  - ④ Field accumulation/Frame accumulation setting (MODE SELECT switch bit 9)  
For the mode setting, refer to P. 6. The factory setting position is Field accumulation.
  - ⑤ Gain selector switch setting (MODE SELECT switch bit 0)  
This switch selects the modes OFF (fixed) or ON (manual). The factory setting is OFF (fixed).
- ⑤ Manual gain (M GAIN) control knob  
This adjusts the gain of a video signal when the gain mode is set to ON by the MODE SELECT switch bit 0 on step ⑤. The factory setting is the fully counterclockwise position.

# 3. CONNECTIONS

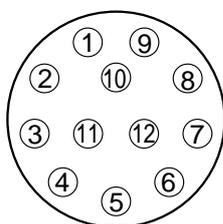
## Standard Connection



## Cautions on Connection

- When connecting the camera cables, be sure to turn off the camera and the other equipment connected.
- When using another lens, the best camera performance of this camera may not be obtained. (For example, low resolution may occur, and flare, ghost or shading may occur)
- Use the DC power source described below.
- Power supply voltage: +10.5V to +15V
- Current rating: More than 830 mA
- Ripple voltage: Less than 50 mV(p-p)

## Connector Pin Assignments



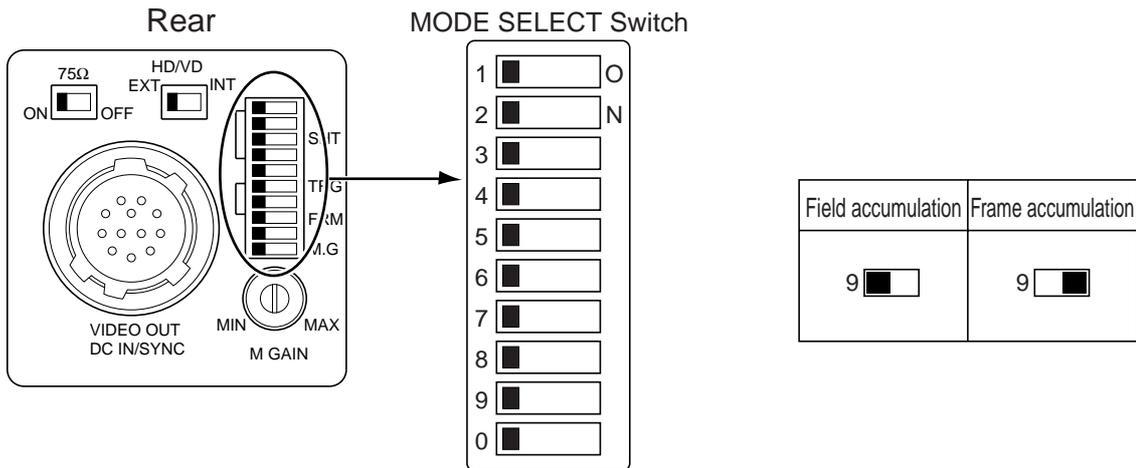
Connector:  
HR10A-10R-12PB by HIROSE electronics Co. Ltd

| Pin No. | External synchronization mode (HD/VD) | Reset restart               | External trigger mode        | Internal synchronization output signal |
|---------|---------------------------------------|-----------------------------|------------------------------|--|
| 1       | GND                                   | GND                         | GND                          | GND                                    |
| 2       | DC+12V                                | DC+12V                      | DC+12V                       | DC+12V                                 |
| 3       | Video output (GND)                    | Video output (GND)          | Video output (GND)           | Video output (GND)                     |
| 4       | Video output (signal)                 | Video output (signal)       | Video output (signal)        | Video output (signal)                  |
| 5       | HD input (GND)                        | HD input (GND)              | HD input (GND)               | HD output (GND)                        |
| 6       | HD input (signal)                     | HD input (signal)           | HD input (signal)            | HD output (signal)                     |
| 7       | VD input (signal)                     | Reset (signal)              | VD input (signal)            | VD output (signal)                     |
| 8       | GND                                   | GND                         | GND                          | GND                                    |
| 9       | -                                     | -                           | -                            | -                                      |
| 10      | -                                     | VIDEO INDEX output (signal) | VIDEO INDEX output (signal)  | -                                      |
| 11      | -                                     | -                           | Trigger pulse input (signal) | -                                      |
| 12      | VD input (GND)                        | Reset (GND)                 | VD input (GND)               | VD output (GND)                        |

# 4. SETTING

## 4-1. Field accumulation/Frame accumulation

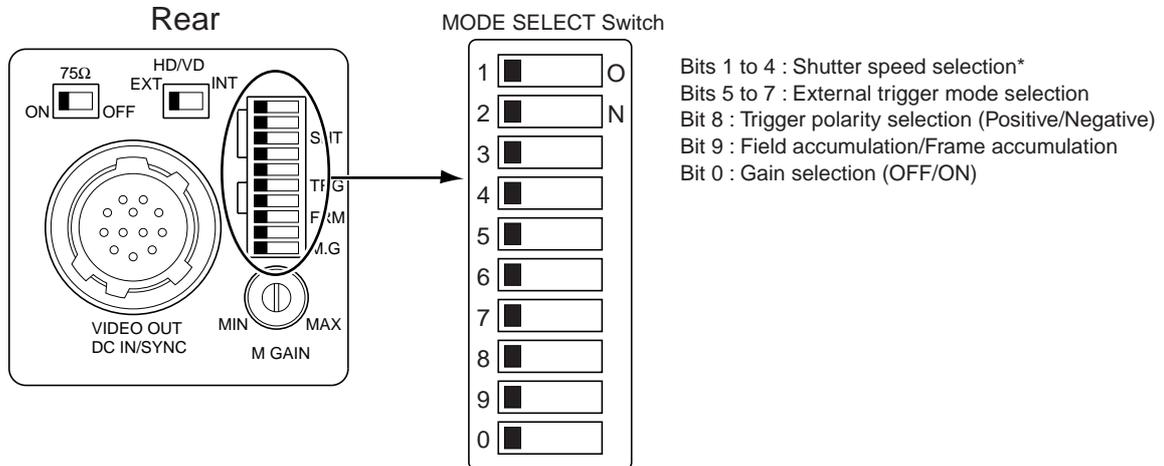
This switch selects the potential accumulation mode of the CCD output signal. The mode can be set with the MODE SELECT switch bit 9 on the rear panel.



## 4-2. Electronic Shutter

This can be set with the MODE SELECT switch located on the rear panel.

### Description of the MODE SELECT Switch



\*The electronic shutter cannot be used in the reset-restart operation.

### Normal Shutter

This mode permits a high-speed moving subject to be captured clearly with a shutter function incorporating a continuously available video signal. Set bit 5 of the MODE SELECT switch to OFF (i.e., the left side) as illustrated in the table below.

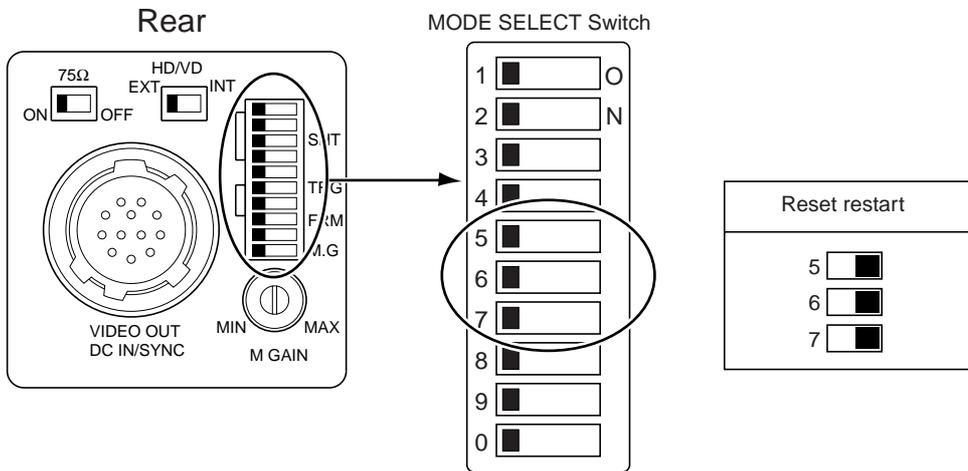
| Normal shutter                        | Reset restart or external trigger mode |
|---------------------------------------|--|
| 5 <input checked="" type="checkbox"/> | 5 <input type="checkbox"/>             |

(unit : second)

| OFF                                   | 1/100                                 | 1/250                                 | 1/500                                 | 1/1000                                | 1/2000                                |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 1 <input checked="" type="checkbox"/> |
| 2 <input checked="" type="checkbox"/> |
| 3 <input checked="" type="checkbox"/> |
| 4 <input checked="" type="checkbox"/> |
| 5 <input type="checkbox"/>            |
| 6 <input type="checkbox"/>            |
| 7 <input type="checkbox"/>            |
| 8 <input type="checkbox"/>            |
| 9 <input type="checkbox"/>            |
| 0 <input type="checkbox"/>            |
| 1/4000                                | 1/10000                               | 1/50000                               | 1/100000                              |                                       |                                       |
| 1 <input checked="" type="checkbox"/> |                                       |                                       |
| 2 <input checked="" type="checkbox"/> |                                       |                                       |
| 3 <input checked="" type="checkbox"/> |                                       |                                       |
| 4 <input checked="" type="checkbox"/> |                                       |                                       |
| 5 <input type="checkbox"/>            | 5 <input type="checkbox"/>            | 5 <input type="checkbox"/>            | 5 <input type="checkbox"/>            |                                       |                                       |
| 6 <input type="checkbox"/>            | 6 <input type="checkbox"/>            | 6 <input type="checkbox"/>            | 6 <input type="checkbox"/>            |                                       |                                       |
| 7 <input type="checkbox"/>            | 7 <input type="checkbox"/>            | 7 <input type="checkbox"/>            | 7 <input type="checkbox"/>            |                                       |                                       |
| 8 <input type="checkbox"/>            | 8 <input type="checkbox"/>            | 8 <input type="checkbox"/>            | 8 <input type="checkbox"/>            |                                       |                                       |
| 9 <input type="checkbox"/>            | 9 <input type="checkbox"/>            | 9 <input type="checkbox"/>            | 9 <input type="checkbox"/>            |                                       |                                       |
| 0 <input type="checkbox"/>            | 0 <input type="checkbox"/>            | 0 <input type="checkbox"/>            | 0 <input type="checkbox"/>            |                                       |                                       |

### 4-3. Reset Restart

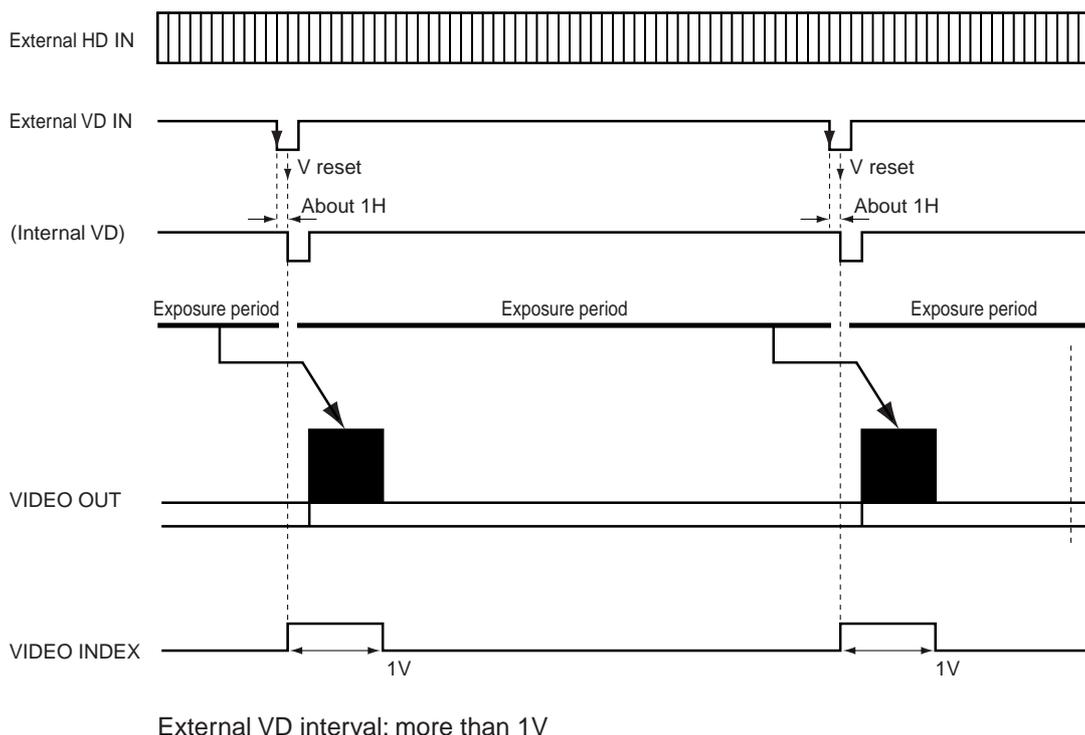
Input of an external reset-restart signal (VD) permits one screen of information to be output at an arbitrary timing. To set this mode, set the external trigger mode selection switch (i.e., MODE SELECT switch bits 5, 6, and 7) as illustrated in the diagram below.



### Long Term Exposure

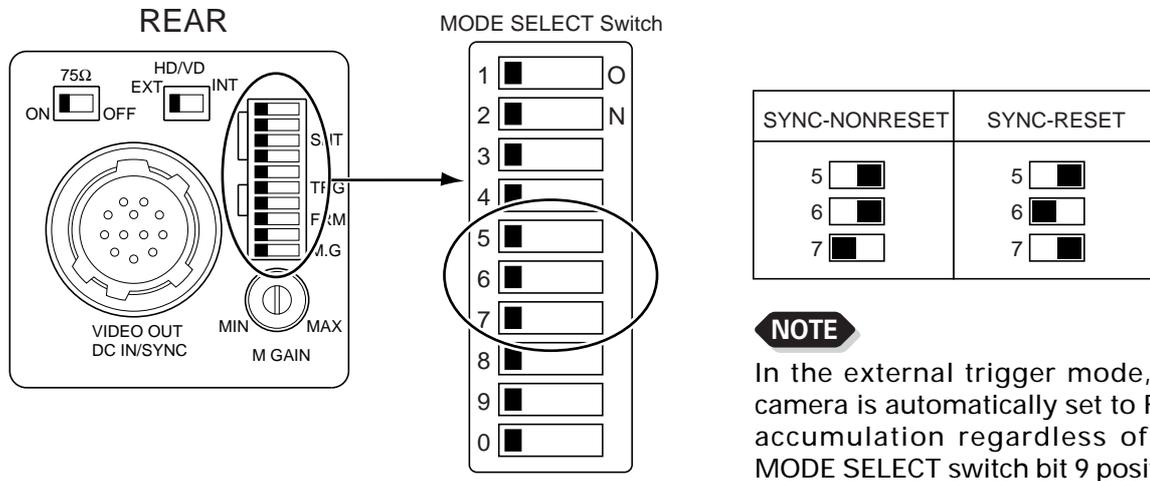
When the camera is used and sufficient sensitivity cannot be obtained for the reset-restart function under normal operating conditions, or when observation of the trail of a moving subject is desired, the exposure time can be extended to allow high-sensitivity images to be obtained. To achieve this, please input from an external source a VD signal that has an expanded VD pulse and VD pulse interval.

### Input Timing Chart Example



## 4-4. External Trigger Mode

Input of an external trigger permits a high-speed moving object to be captured at the proper position. Set the rear panel external trigger mode selection switch (i.e., MODE SELECT switch bits 5, 6, and 7) as illustrated in the diagram below.



The following two modes are available for video timing.

- SYNC-NON RESET Mode

In this mode, the video is synchronized to VD after the trigger input.

When external HD\*/VD is input: Sync is to external VD

When external HD\*/VD is not input: Sync is to internal VD

\*There is automatic determination of external sync or internal sync by the presence or absence of external HD input.

- SYNC-RESET Mode

In this mode, reset is applied to the internal VD and the video is output after a fixed period following the trigger pulse.

### External Trigger Shutter Speed Setting

The following two methods are available for shutter speed setting.

- **1 pulse trigger mode (Setting by the MODE SELECT switch of the rear panel)**

For shutter speed, refer to the table below.

(unit : second)

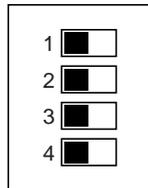
| 1/100                                 | 1/250                                 | 1/500                                 | 1/1000                                | 1/2000                                |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 1 <input checked="" type="checkbox"/> |
| 2 <input checked="" type="checkbox"/> |
| 3 <input checked="" type="checkbox"/> |
| 4 <input checked="" type="checkbox"/> |
| 5 <input type="checkbox"/>            |
| 6 <input type="checkbox"/>            |
| 7 <input type="checkbox"/>            |
| 8 <input type="checkbox"/>            |
| 9 <input type="checkbox"/>            |
| 0 <input type="checkbox"/>            |
| 1/4000                                | 1/10000                               | 1/50000                               | 1/100000                              |                                       |
| 1 <input checked="" type="checkbox"/> |                                       |
| 2 <input checked="" type="checkbox"/> |                                       |
| 3 <input checked="" type="checkbox"/> |                                       |
| 4 <input checked="" type="checkbox"/> |                                       |
| 5 <input type="checkbox"/>            | 5 <input type="checkbox"/>            | 5 <input type="checkbox"/>            | 5 <input type="checkbox"/>            |                                       |
| 6 <input type="checkbox"/>            | 6 <input type="checkbox"/>            | 6 <input type="checkbox"/>            | 6 <input type="checkbox"/>            |                                       |
| 7 <input type="checkbox"/>            | 7 <input type="checkbox"/>            | 7 <input type="checkbox"/>            | 7 <input type="checkbox"/>            |                                       |
| 8 <input type="checkbox"/>            | 8 <input type="checkbox"/>            | 8 <input type="checkbox"/>            | 8 <input type="checkbox"/>            |                                       |
| 9 <input type="checkbox"/>            | 9 <input type="checkbox"/>            | 9 <input type="checkbox"/>            | 9 <input type="checkbox"/>            |                                       |
| 0 <input type="checkbox"/>            | 0 <input type="checkbox"/>            | 0 <input type="checkbox"/>            | 0 <input type="checkbox"/>            |                                       |

● **Pulse Width Trigger Mode (Setting by Trigger Pulse Width)**

Set all dip switches (1 to 4) of the rear panel to "OFF".

An arbitrary shutter speed is obtained by setting the width of the trigger pulse to 2 μs or greater.

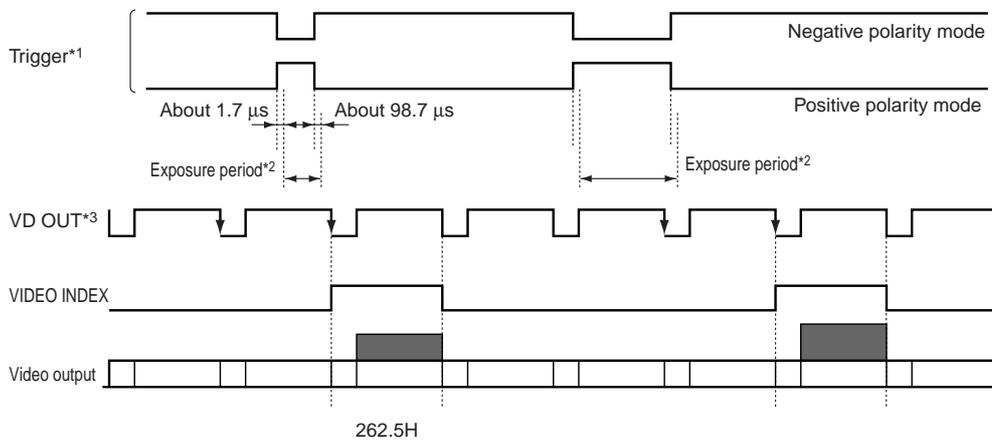
Shutter speed = Trigger pulse width + 97 μ sec



**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

● **Pulse Width Trigger SYNC-NON RESET Picture Output Timing (at Time of Internal Sync)**



\*1: Externally input signal

\*2: Exposure time = Trigger pulse width + 97 μs

(Valid trigger pulse width is 2 μs or greater for external trigger shutter operation.)

\*3: As long as there is no external sync input, the internal VD will be output when the rear panel HD/VD signal input/output switch is set to the INT side.

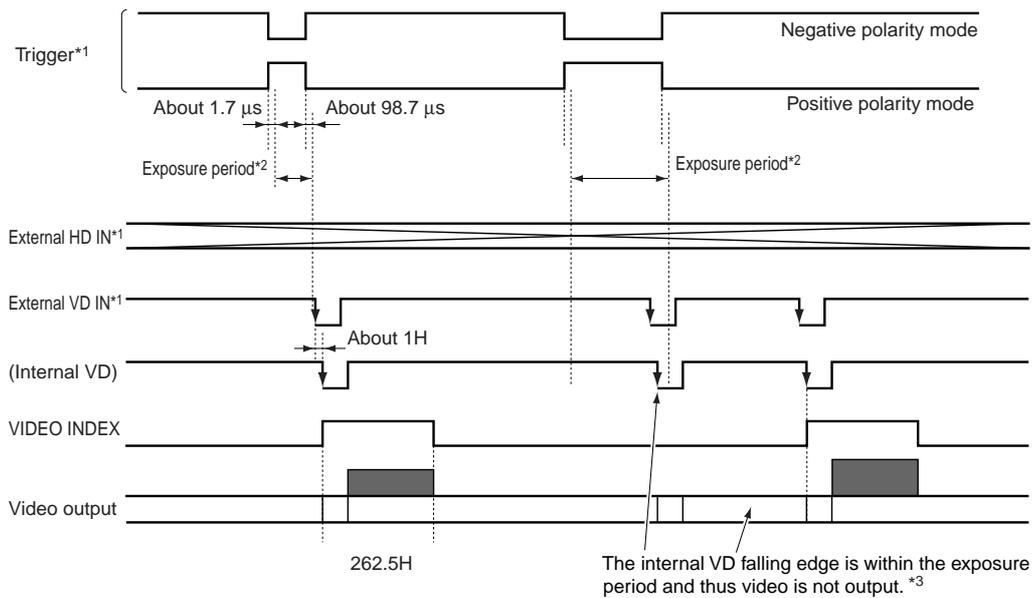
\*4: Video is output at the falling edge of the internal VD following completion of the exposure period.

The video and the VIDEO INDEX have a paired relationship.

**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

● **Pulse Width Trigger SYNC-NON RESET Picture Output Timing (At Time of One-shot or Continuous External VD/Continuous External HD Input)**

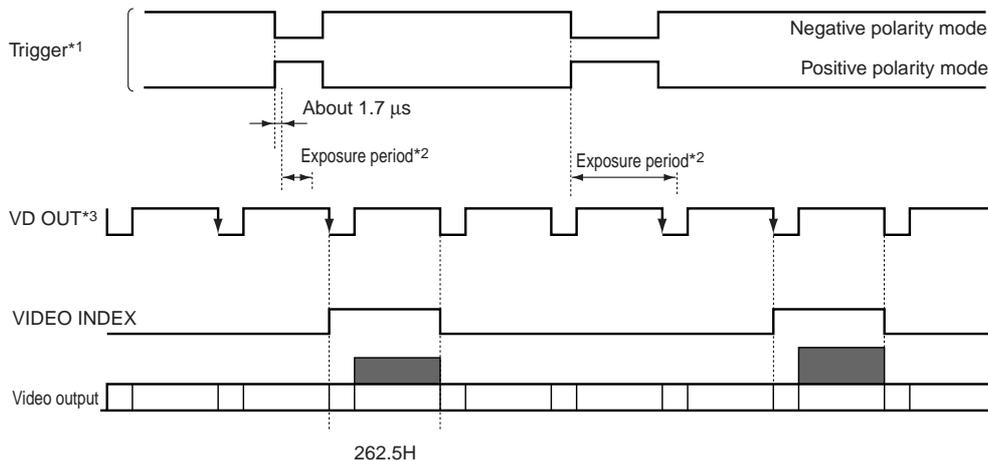


- \*1: Externally input signal
- \*2: Exposure time = Trigger pulse width + 97 μs  
(Valid trigger pulse width is 2 μs or greater for external trigger shutter operation.)
- \*3: Video is output at the falling edge of the internal VD following completion of the exposure period.  
The video and the VIDEO INDEX have a paired relationship.

**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

● **1 Pulse Trigger SYNC-NON RESET Picture Output Timing (at Time of Internal Sync)**

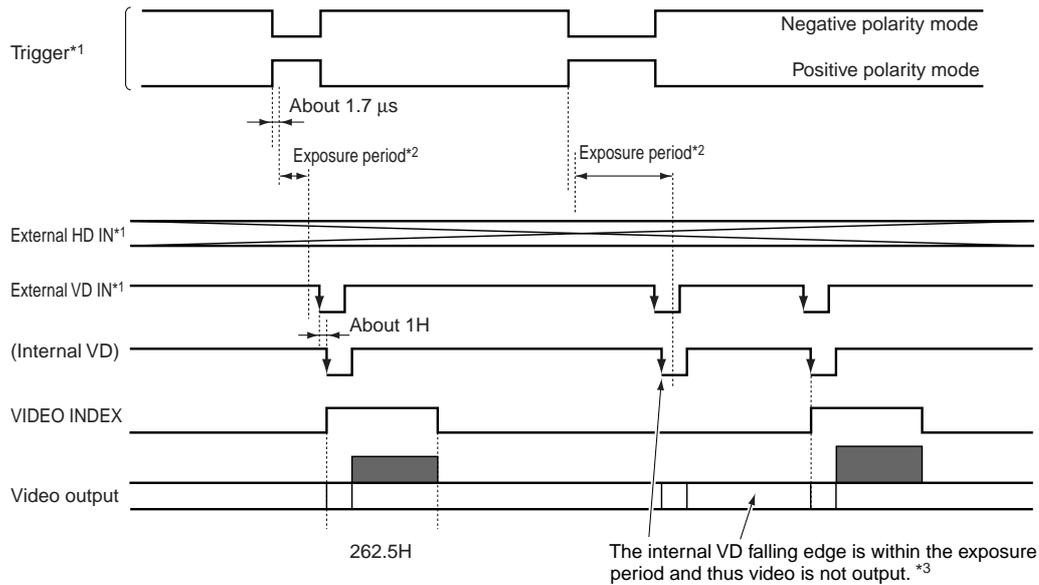


- \*1: Externally input signal
- \*2: Exposure time is determined by the setting of the MODE SELECT switch. Refer to page 9.  
As long as there is no external sync input, the internal VD will be output when the rear panel HD/VD signal input/output switch is set to the INT side.
- \*3: Video is output at the falling edge of the internal VD following completion of the exposure period.  
The video and the VIDEO INDEX have a paired relationship.

**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

● **1 Pulse Trigger SYNC-NON RESET Picture Output Timing**  
**(At Time of One-shot or Continuous External VD/Continuous External HD Input)**



\*1: Externally input signal

\*2: Exposure time is determined by the setting of the MODE SELECT switch. Refer to page 9.

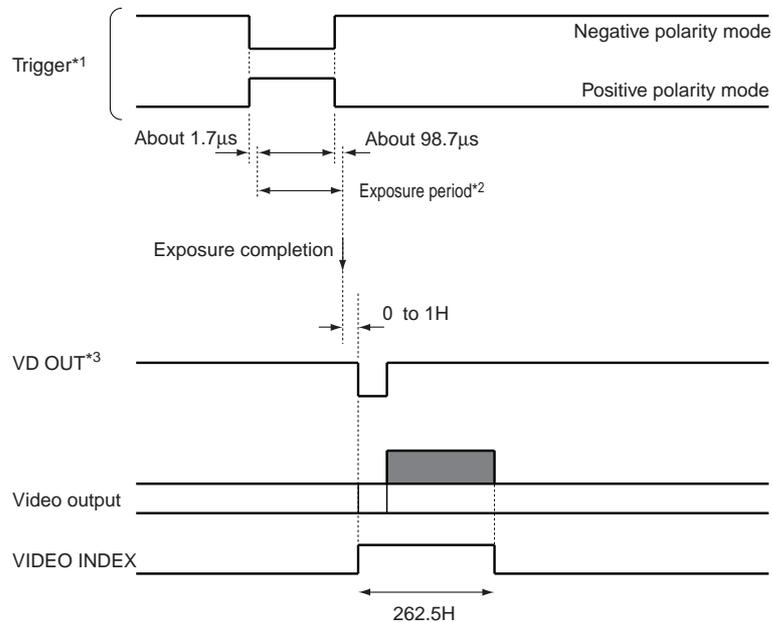
\*3: Video is output at the falling edge of the internal VD following completion of the exposure period.

The video and the VIDEO INDEX have a paired relationship.

**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

● **1 Pulse Width Trigger SYNC-RESET Picture Output Timing**



\*1: Externally input signal

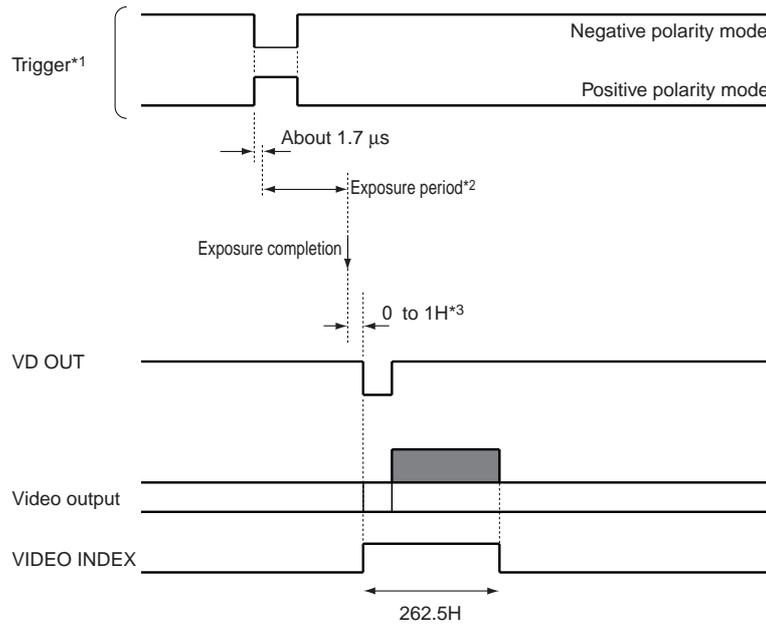
\*2: Exposure time = Trigger pulse width + 97 μs  
 (Valid trigger pulse width is 2 μs or greater for external trigger shutter operation.)

\*3: VD is generated after 0 to 1H following the completion of the exposure period and the video is synchronized to this and output.

**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

● 1 Pulse Trigger SYNC-RESET Picture Output Timing



\*1: Externally input signal

\*2: Exposure time is determined by the setting of the MODE SELECT switch. Refer to page 9.

\*3: VD is generated after 0 to 1H following the completion of the exposure period and the video is synchronized to this and output.

**NOTE**

When the next trigger is input before completion of the output of the video corresponding to the trigger, there will be an effect on the video.

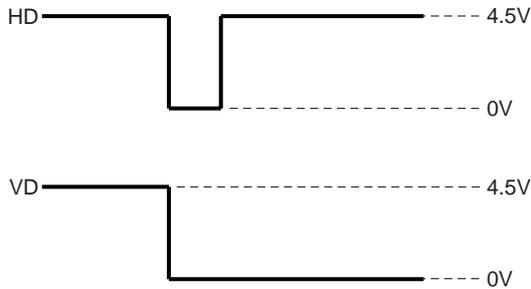
**External Sync Operation**

| Shutter mode                   | HD input | VD input | Note   |
|--------------------------------|----------|----------|--|
| At time of SYNC-NON RESET mode | N        | N        | Internal sync mode   |
|                                | Y        | Y        | External sync mode   |
|                                | N        | Y        | Only V reset is applied due to VD input. Normally not used.  |
|                                | Y        | N        | HD is synchronized to external, but video is not output because there is no VD input. Normally not used.                             |
| At time of SYNC-RESET mode     | N        | *        | Internal sync mode. The presence of VD is ignored, and after a specified time after a trigger input, V reset is applied.             |
|                                | Y        | *        | HD is synchronized to external. The presence of VD is ignored, and after a specified time after a trigger input, V reset is applied. |
| At time of reset restart       | Y        | Y        | HD is synchronized to external. Video is output due to VD input.   |
|                                | N        | Y        | HD is synchronized to the inside of the camera. Video is output due to VD input.   |
|                                | *        | N        | Video is not output because there is no VD input. Normally not used.   |
| At time of normal shutter      | N        | N        | Internal sync mode   |
|                                | Y        | Y        | External sync mode   |
|                                | Y        | N        | HD is synchronized to external. Normally not used.   |
|                                | N        | Y        | Disabled   |

\* Either Y or N is permitted.

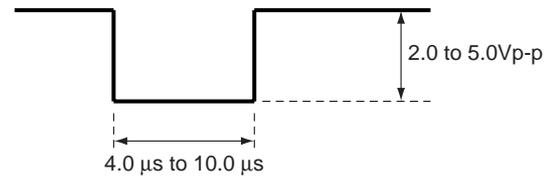
# 5. Input Output Signal Specifications

## HD/VD Output Amplitude Specifications



The amplitude level is the representative value when terminated with 10kΩ. Output is enabled when the rear panel HD/VD signal input/output switch is set to the INT side.

## HD Input Specifications



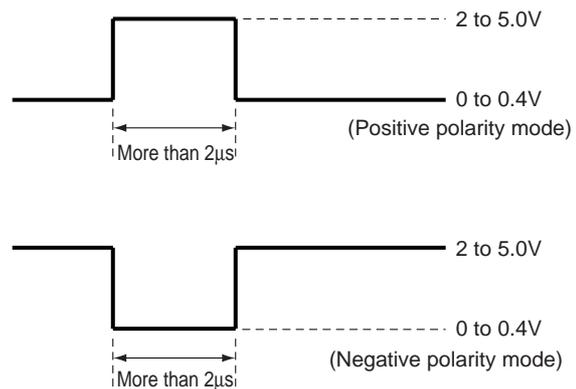
- \* Input impedance: 75Ω or 10kΩ or greater
- \* Input amplitude 2.0 to 5.0 Vp-p (75Ω termination ON or OFF)
- \* Voltage and pulse width were measured at pin 6 of the 12-pin connector located on the rear panel.

## VIDEO INDEX Output Specifications



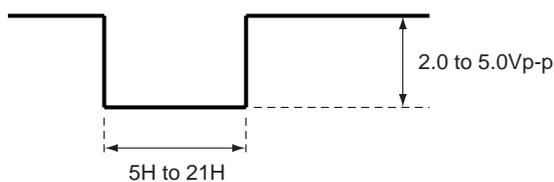
The amplitude level is the representative value when terminated with 10kΩ.

## Trigger Pulse Specifications



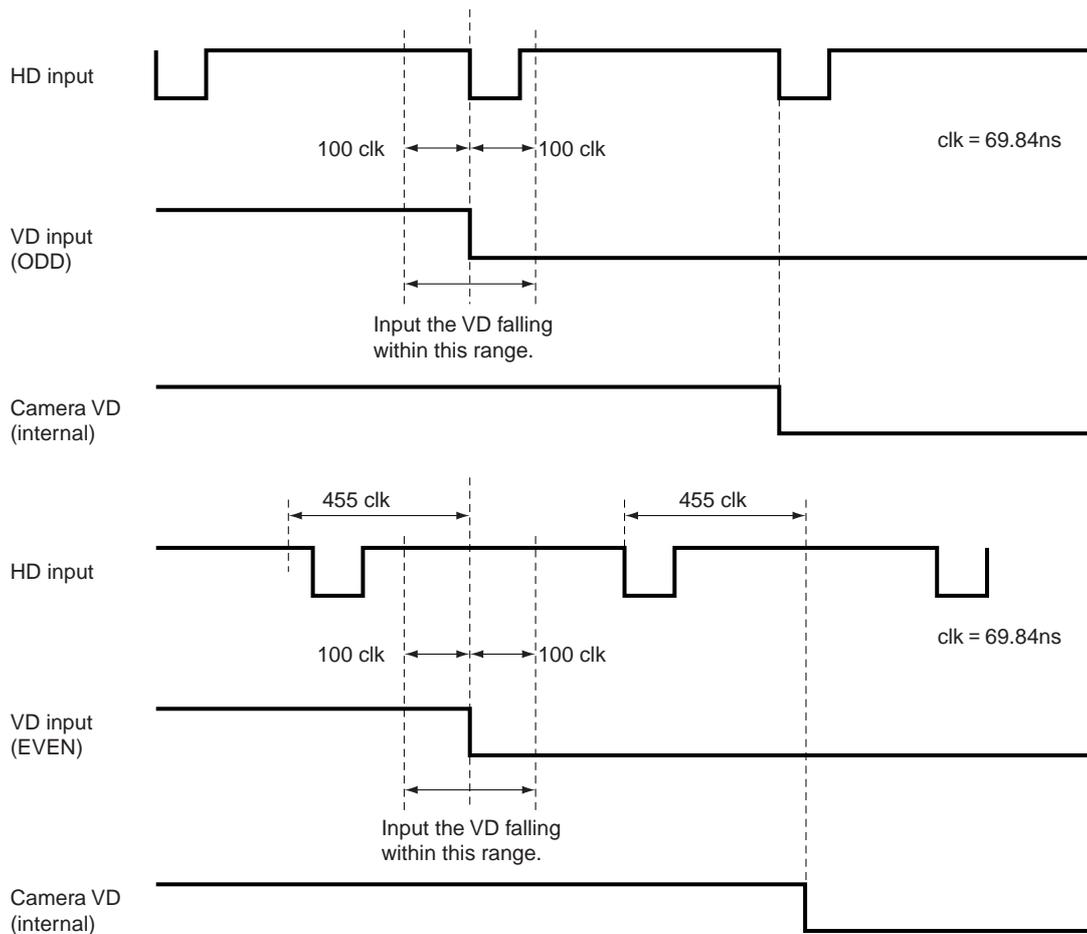
- \* Input impedance: 10kΩ or greater
- \* Voltage and pulse width were measured at pin 11 of the 12-pin connector located on the rear panel.

## VD Input Specifications



- \* Input impedance: 75Ω or 1kΩ or greater
- \* Input amplitude 2.0 to 5.0 Vp-p (75Ω termination ON or OFF)
- \* Voltage and pulse width were measured at pin 7 of the 12-pin connector located on the rear panel.

## External HD/VD Input Phase Specifications



The phase relationship of the external HD and VD should correspond to the center phase (i.e., the external HD falling edge) as illustrated in the above diagram.

Allowable frequency deviation of external sync:  $15.734\text{ kHz} \pm 1\%$   
 $(\pm 1\%$  of horizontal sync frequency)

### External VD falling edge:

Please input within about 100 clock cycles of the standard center phase.

Note that V sync of the video is output with a delay of about 1H from the external VD at the time of reset-restart and the external trigger mode.

### In the normal mode:

Continuously with the HD period of  $63.56\ \mu\text{s}$  and VD period of  $16.68\ \text{ms}$ .

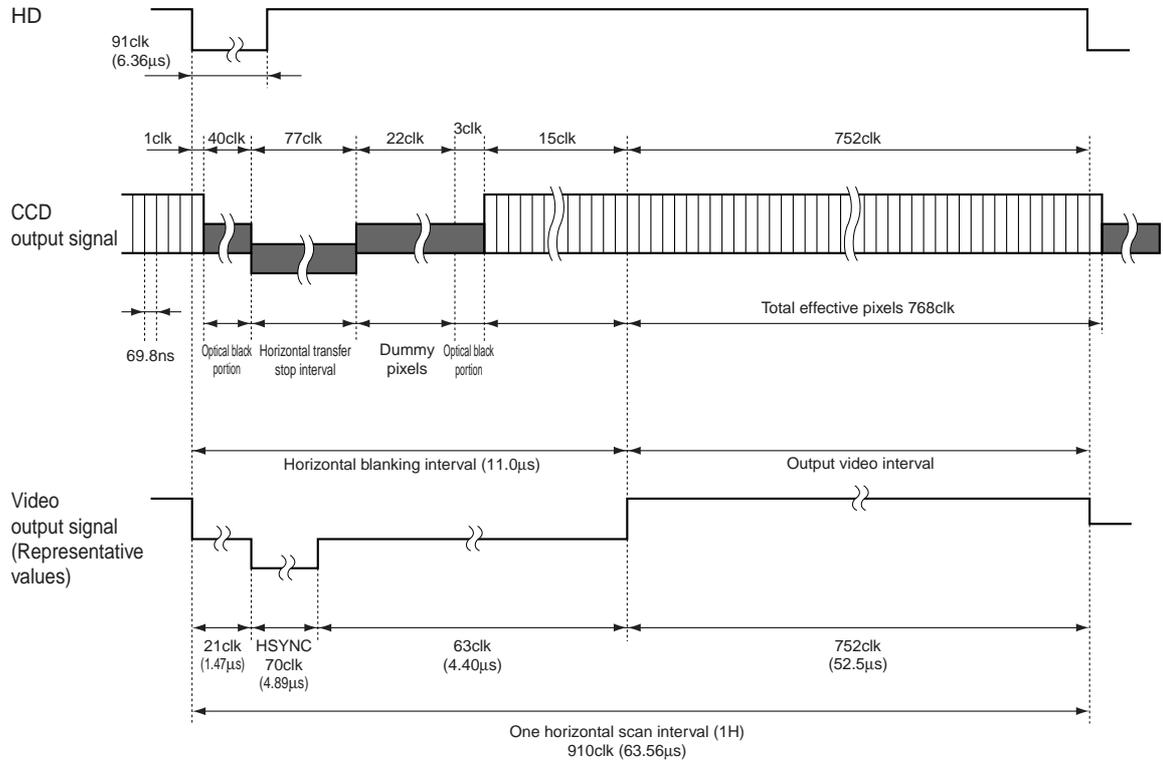
Phase timing is as illustrated in the above diagram (with only the falling edge applicable).

### In the reset-restart/external trigger mode:

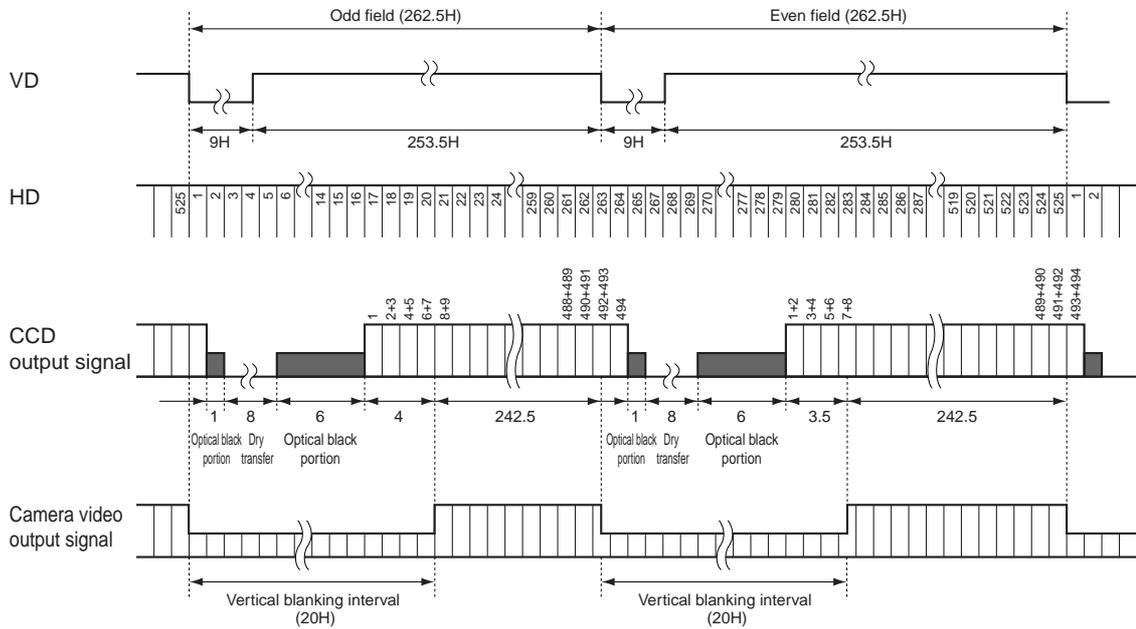
Continuously with the HD period of  $63.56\ \mu\text{s}$ . VD (reset) is at an arbitrary timing with the phase of HD being within the standard of the above diagram.

# 6. CCD Output Waveform Timing Chart

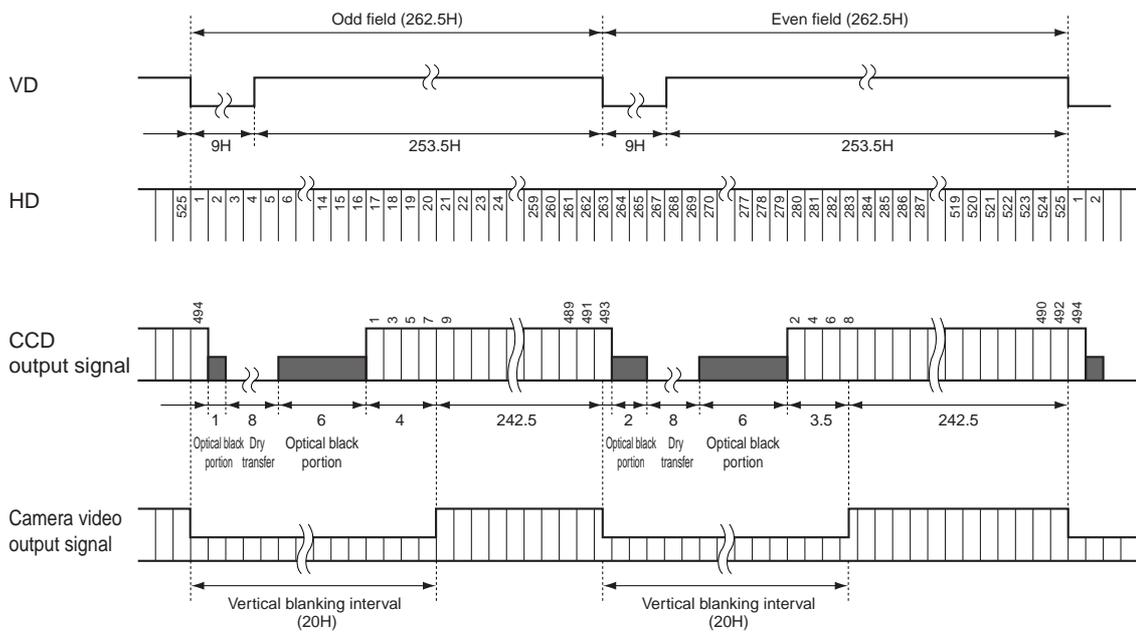
## Horizontal Output Waveform Timing Chart



## Vertical Output Waveform Timing Chart (2:1 Interlace Field Accumulation)

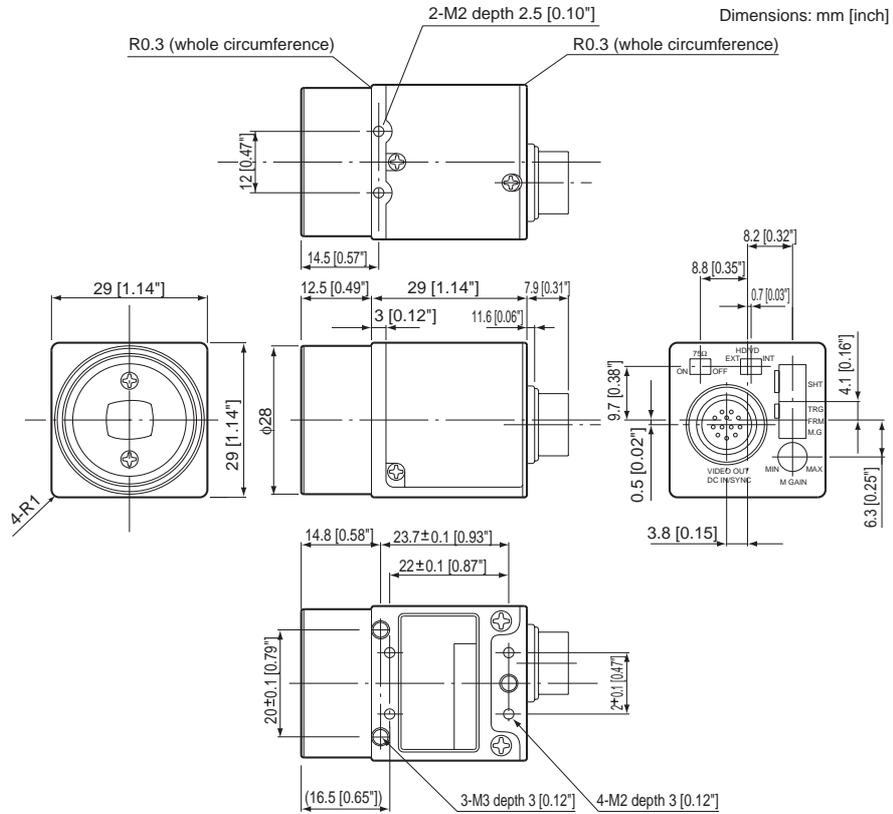


## Vertical Output Waveform Timing Chart (2:1 Interlace Frame Accumulation)

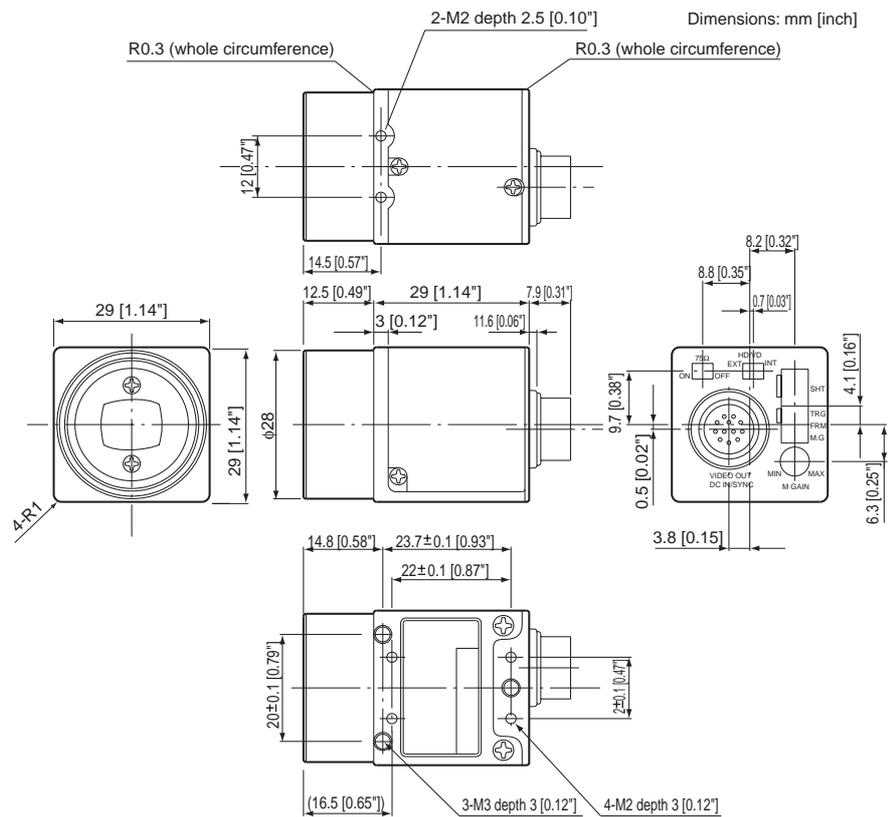


# 7. EXTERIOR VIEW

## IK-53N



## IK-52N



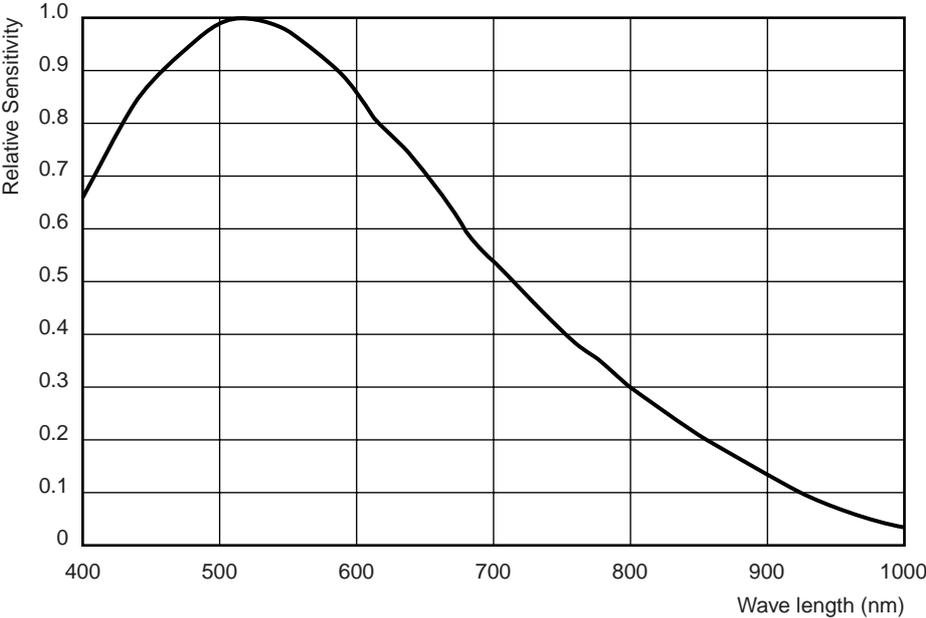
## 8. SPECIFICATIONS

|  |   |
|--|---|
| Power supply                                   | DC12V (Range +10.5 to +15V)   |
| Power consumption                              | IK-53N: 85mA (DC+12V), IK-52N: 90mA (DC+12V)  |
| Image sensor                                   | IK-53N: Interline transfer 1/3 inch CCD<br>IK-52N: Interline transfer 1/2 inch CCD  |
| Effective pixels                               | 768 x 494 (H/V)   |
| Effective shooting area                        | IK-53N: 4.88 x 3.66mm<br>IK-52N: 6.45 x 4.84mm  |
| Scan frequency                                 | H: 15.734 kHz, V: 59.94Hz   |
| Synchronizing system                           | Internal/external (HD/VD) (HD/VD input/output area selected by the switch on the rear panel.)   |
| Allowable frequency deviation of external sync | ±1% (For horizontal frequency)  |
| Mode   | Field accumulation<br>Frame accumulation<br>1 pulse trigger sync-reset<br>Pulse width trigger sync-reset<br>1 pulse trigger sync-nonreset<br>Pulse width trigger sync-nonreset<br>Reset restart |
| Electronic shutter                             | OFF , 1/100, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000, 1/50000, 1/100000   |
| Gain switch                                    | OFF (0dB) / ON (0 to +18dB)   |
| Horizontal resolution                          | 570TV lines   |
| Standard subject illuminance                   | IK-53N: 200 lx, IK-52N: 160 lx<br>F5.6 (Gain: OFF)  |
| Minimum subject illuminance                    | IK-53N: 0.5 lx, IK-52N: 0.4 lx<br>F1.4 (when the manual gain adjustment is at maximum)  |
| S/N ratio                                      | 60 dB   |
| Video output                                   | 1.0V(p-p)   |
| Output impedance                               | 75Ω unbalanced  |
| Infrared cut filter                            | No  |
| Dummy glass                                    | Yes   |
| Lens mount                                     | C mount   |
| Operation ensuring temperature/humidity        | 0°C to +40°C/ 90% or lower  |
| Vibration resistance/shock resistance          | Vibration resistance 70 m/S <sup>2</sup> (10 to 200 Hz),<br>Shock resistance 700 m/S <sup>2</sup>   |
| Weight   | 45g   |
| External dimension                             | 29 (W) x 29 (H) x 29 (D) mm (except for protruded portion)  |

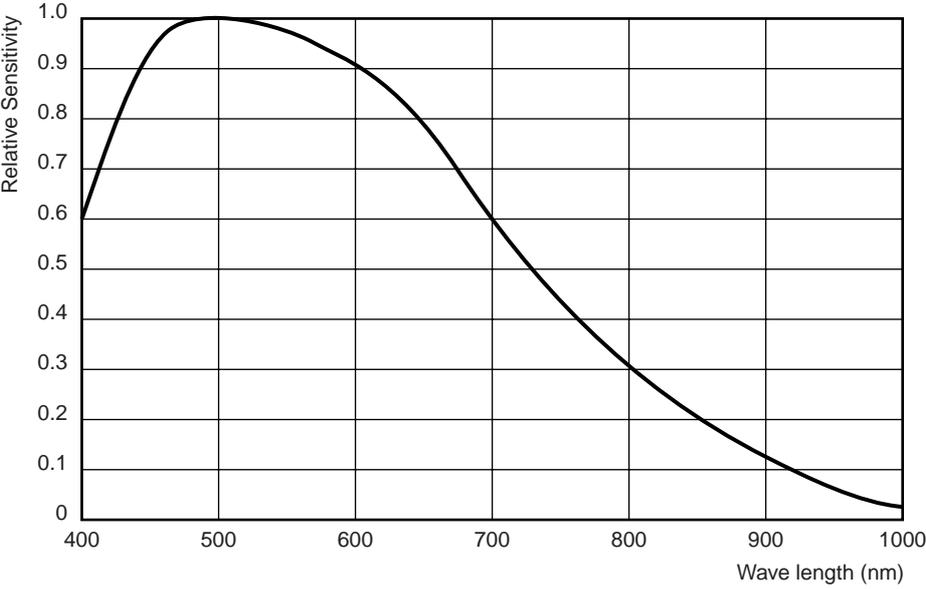
# Spectral Sensitivity Characteristics (Representative Values)

(Including lens characteristics, excluding light source characteristics)

## IK-53N



## IK-52N



**TOSHIBA**