

Progressive Scan Type Black and White Camera  
(Frame Shutter)

# KP-F1 Technical Operation Guide



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## 1. General

The Hitachi KP-FI is a full-frame shutter black and white camera using a 1/2" progressive scan CCD.

The KP-FI features high performance, high sensitivity, and high resolution. The KP-FI is provided with a variety of functions including a multiple step electronic shutter, integration mode switching, external HD/VD sync input, Field-on-Demand, and non-interlaced scanning functions.

A picture suitable for image processing systems is obtained, because a CCD with square lattice pixels is used.

### Major features

#### 1) Frame shutter function

The frame shutter is provided on this camera.

High resolution in the vertical direction is obtained for moving objects, compared with conventional cameras.

#### 2) Simultaneous odd/even outputs

The signals of two horizontal lines are separately output at 1/60 sec. (1/50 CCIR).

Two channel video signals can be simultaneously output from the multi-pin connector or the BNC connectors on the rear. (The video signals cannot be simultaneously output from the multi-pin connector and from the BNC connectors.)

#### 3) Frame output

All electric charges are read out from all pixels at 1/30 sec (1/25 CCIR).(Non-interlaced mode)

#### 4) High resolution

The latest high grade CCD with square lattice pixels is used. The number of pixels is 350,000 (490,000 CCIR), and the number of effective pixels is 659 (H) X 494 (V), 782 (H) X 582 (V) CCIR).

#### 5) Multiple step electronic shutter

A multi-step electronic shutter is provided.

Eight shutter speeds are selectable between 1/100 (1/120 CCIR) and 1/10,000 sec.

#### 6) Selectable internal/external synchronization (interlaced and non-interlaced)

The sync mode and the scanning mode are automatically switched according to the kind of the

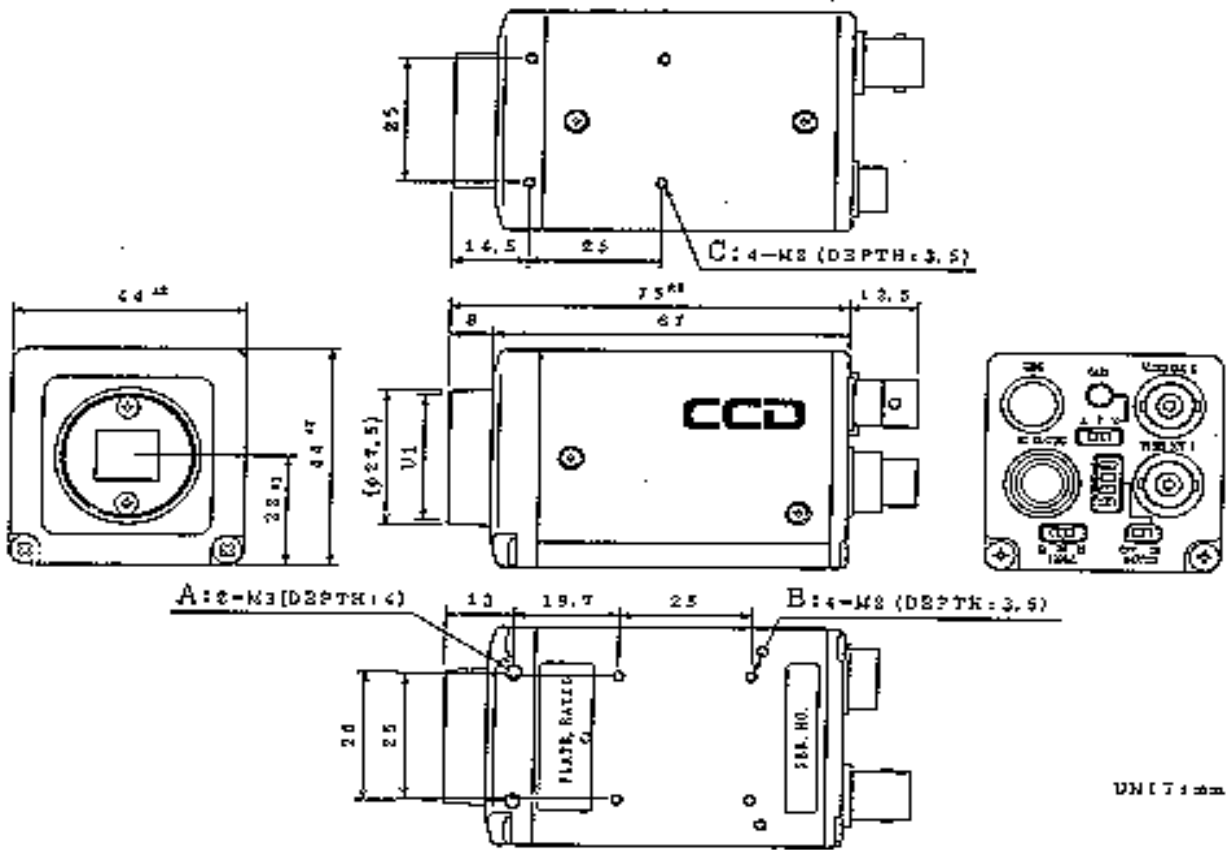
sync signal applied.

7) Field-on-Demand function

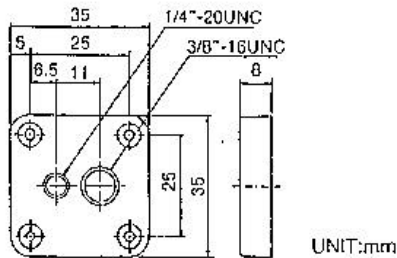
The images captured at an optional timing by an external trigger signal input can be instantly obtained as Images.

The timing can be adjusted by an external trigger signal and the shutter.

2. External View



Tripod adaptor TA-M1 (option)



Secure the adapter to the camera mounting holes B or C, using the four screws supplied (M2 x 5).

**NOTE:**

If the screws are too long, they will cause damage to the internal circuit boards in the camera. Be sure to check the length before installing.

### 3. Specifications

Imaging device	Interline CCD
No. of total pixels	EIA: 692 (H) x 504 (V) CCIR: 823 (H) x 592 (V)
Pixel Pitch	EIA: 9.9 (H) x 9.9 (V) $\mu\text{m}$ CCIR: 8.3 (H) x 8.3 (V) $\mu\text{m}$
No. of effective pixels	EIA: 659 (H) x 494 (V) CCIR: 782 (H) x 582 (V)
Sensing area (1/2 inch size)	EIA: 6.52 (H) x 4.89 (V) mm CCIR: 6.49 (H) x 4.83 (V) mm
Signal Format	Conforming to EIA / CCIR (Normal Mode)
Lens Format	C-Mount
Flange focal distance	17.526 mm (not adjustable)
Hor. Scanning frequency	EIA: 15.734 KHz CCIR: 15.625 KHz
Vert. Scanning frequency	EIA: 59.94 Hz CCIR: 50 Hz
Sync System	Internal / external (automatically switchable)
Internal sync operation	2 : 1 interlaced / non-interlaced
External sync input	HD / VD 2 to 6 Volts p-p negative Input impedance: 1k ohm Frequency deviation: $\pm 1\%$
Video Output	1.0 Volt p-p, 75 ohm unbalanced Video: 0.7 Volt p-p Sync: 0.3 Volt p-p, negative
Resolution	EIA: 500 TVL (H) x 485 TVL (V) CCIR: 580 TVL (H) x 575 TVL (V)
Sensitivity	400 lux f4.0, 3200 K
Minimum illumination	3 lux f1.4, AGC = on, Gamma = on, no IR cut filter
Signal-to-noise ratio	60db
Electronic shutter	1/10,000, 1/4000, 1/2000, 1/1000, 1/500, 1/250, 1/125, 1/100 (1/120 CCIR) External switch selectable. OFF mode: Normal exposure (factory setting)

Gamma correction	1 (factory setting) or selectable by internal switch Separately settable to two video channels
AGC	Fixed or AGC: Available to only VIDEO OUT 1 External switch selectable. Fixed = factory setting.
Gain selection	VIDEO 1 : Fixed or set by knob VIDEO 2 : Fixed The external switch is selectable. Finely adjustable to 2 channels by knob. (Fixed gain at factory setting)
Field-on Demand function	ON/OFF: Internal switchable ONE trigger, TWO trigger, and FIXED SHUTTER mode selectable by internal switch. (Factory setting: OFF)
Power supply	12 Volts DC $\pm$ 1Volt
Power consumption	250mA or less
Ambient conditions	Operating: -10 to 50 degrees C 90% RH or less. Storage: -20 to 60 degrees C 70% RH or less
<b>Caution:</b> For continued stable operation, the camera should be used under 40 degrees C or less when it is used continuously for an extended period of time.	
Anti-vibration	7G (10 to 60 Hz, amplitude: 0.98 constant, 60 to 200 Hz, amplitude: variable, acceleration: constant. 10 to 200 Hz. Sweep: 1min., XYZ, 30 min.
Dimensions	44 (W) x 44 (H) x 67 (D) mm
Mass	150 grams approximately

### 3.1 Composition

- 1) Camera body (with IR cut filter)
- 2) Operation manual

### 3.2 Optional accessories

- 1) Tripod adapter, TA-MI (23855AX\*)
- 2) 12-pin plug, HRIOA-IOP-12S(01) (23810AX\*)
- 3) 6-pin plug, HR-IOA-7R-6P(OI) (JMH0092\*)

- 4) AC adapter, AP-130 (23805AX\*)
- 5) Junction box, JU-FIA (23832AX\*)
- 6) Dummy grass (AR coated) (XMD0009\*)
- 7) Camera cables

	Assembly Type	Molded Type
2m	C-201KS (23856AX*)	C-201KSM
5m	C-501KS (23857AX*)	C-501KSM
10m	C-102KS (23858AX*)	C-102KSM

Molded type: Produced upon request.

- 8) Trigger cables

	Assembly Type
2m	C-201RK (23864AX*)
5m	C-501RK (23865AX*)

\*Product part code

### Caution

The specifications of this equipment are subject to change without notice for improvement. Prior to placing your order, be sure to confirm that these specifications are the latest ones. Hitachi Denshi guarantees that the equipment shipped from our factory conforms to Hitachi Denshi's standard warranty conditions and will perform quality control within the range necessary to meet the warranty.

### Warranty and After-sales Service

- 1) The guarantee period is one year after the date of purchase. However, defects due to erroneous use or intentional acts are excluded.
- 2) For defects after expiration of the guarantee period, Hitachi Denshi will repair the equipment if the intended function is restored by the repair work, and the cost is charged to a customer.
- 3) Hitachi Denshi is not liable for the losses caused when the equipment is used in a system used for business trades, production process, medical fields, crime prevention applications, etc.
- 4) The parts used in the equipment have their respective lives. The lives of such parts will be shortened under the environments of high temperature or high humidity. When stable operation is required for a long time, it is recommended to perform periodical maintenance and inspection every year or every two years, depending on operating conditions.

### 4. Operating precautions

#### 4-1 Power supply

Connect  $12V \pm IV$  DC from an external power supply.

Use a stable power supply without ripple and noise.

#### 4-2 To protect CCD(sensor)

1) Do not touch the glass surface of the sensor to avoid dirt and scratches.

2) If the glass surface of the sensor should become dusty or dirty, wipe off dust or dirt carefully with a cotton-tipped applicator. Never use dry cloth or paper. The surface may be scratched and further the sensor may be damaged by static electricity.

3) Be sure to mount a lens or the supplied mount cap on the camera to protect the sensor from dust.

#### 4-3 To protect camera

1) Do not use or store the camera under direct sunlight, in environments exposed to rain, or snow, or at a place exposed to flammable or corrosive gas.

2) The camera operates in the temperature range between  $-10$  and  $50^{\circ}C$ .

If the camera is used or left at a high temperature( $40^{\circ}C$  or more)for hours, the life of the camera may be shortened.

When using the camera continuously for hours, avoid using the camera in areas of high temperature or high humidity.

3) Do not drop the camera. Do not apply strong shock or vibration to the camera.

4) Before connecting or disconnecting a connector, turn off the camera. Be sure to hold the connector body to connect or disconnect the connector.

#### 4-4 Arrangement of camera

When several cameras are installed very close with each other, the cameras may interfere with each other to cause noise. Install the cameras as far as possible from each other or operate the cameras by an external sync signal.

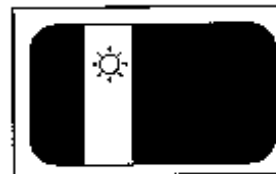
#### 4-5 Phenomena inherent to CCD imaging device

Following are phenomena inherent to a CCD imaging device, and are not defects.

1) Smear and blooming

When strong light (lamp, fluorescent lamp, reflected light, etc.)is shot, pale bands are displayed vertically above and below the light.

In this case, change the angle of the camera so that such strong light does not enter the camera through the lens.



2) Fixed pattern noise

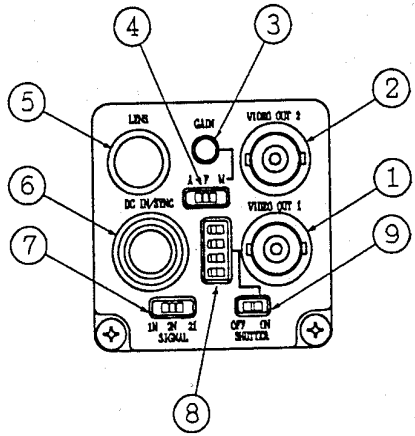
When the camera is operated in a high temperature, fixed pattern noise may appear on the entire screen. The higher the sensitivity of camera, the more this fixed pattern

noise appears.

3) Moire

When fine patterns are shot, moire may be displayed.

### 5. Name and function of each section.



- 1 Video Out 1 (BNC)  
Composite video signal (VS) output (VIDEO OUT 1)
- 2 Video Out 2 (BNC)  
Composite video signal (VS) output (VIDEO OUT 2)
- 3 Manual gain control  
Adjustable when switch 4 is set to M (effective only for Video Out 1)

- 4 Gain select switch  
Selects gain adjustment (effective only for VIDEO OUT 1)  
A: Automatic (AGC)  
F: Fixed  
M: Manual
- 5 LENS (Trigger) connector  
Use for iris lens, FLD signal output and trigger signal input C.
- 6 DC In/Sync connector  
Connector for DC 12 V supply, composite video signal (VS) output and external sync input.
- 7 Video output mode select switch  
The following modes can be selected.
  - 2I: Continuous interlaced odd and even field signals are respectively output from Video Out I and Video Out 2 at 1/60 s (CCIR: 1/50 s).
  - 2N: Continuous odd and even field signals are respectively output from Video Out I and Video Out 2 at 1/60 s (CCIR: 1/50 s).
  - IN: Non-interlaced output at 1/30 s (CCIR: 1/25 s) is obtained only from Video Out 1.
- 8 Shutter speed select switches  
Sets the desired shutter speed.
- 9 Shutter on/off switch  
Shutter mode is controlled by the position.

## 6. Signal connection to connector

1) Signal connections to DC IN / SYNC connector (12 pins)

Pin No.	Internal Sync Mode	External Sync Mode				
		Field-on-Demand Mode				
		HD/VD	One Trigger	Two Trigger	Fixed Shutter	Sync N.R.
1	Ground					
2	+ 12 volt input					
3	Video 1 output Ground					
4	Video 1 output Signal					
5		HD in		Trigger B In		
		Ground		Ground		
6		HD in		Trigger B In		
		Signal		Signal		
7		VD in	Trigger A In	Trigger A In	Trigger A In	Trigger A In
		Signal	Signal	Signal	Signal	Signal
8	Video 2 Output Ground					
9	Video 2 Output Signal					
10	Ground					
11	+12 Volt Input					
12		VD In Ground	Trigger A In Ground	Trigger A In Ground	Trigger A In Ground	

### Note:

The video signal cannot be fed simultaneously from both the VIDEO OUT connector and the DC IN/SYNC connector. If both outputs are connected simultaneously, a proper picture cannot be obtained.

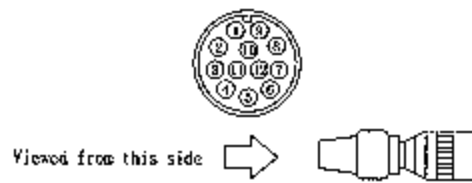
The supply voltage should be 12 volts DC with a tolerance of  $\pm 1$  volt DC.

### Plug :

DC IN/SYNC

Type: Hirose HR10-10P-12S(01)

Part Code: 23810AX



2) Signal connection to LENS (trigger) connector (6 pins)

Pin No.	Signal
1	FLD pulse output
2	WEN pulse output
3	GND
4	Trigger C input (SYNC N.R. only)
5	Auto iris video output
6	+12 volts DC

**Note:**

- The FLD pulse is not output in the field-on-demand function.
- The auto iris video output function cannot be used when using the field-on demand function.
- FLD and WEN pulse output is CMOS level.
- Strobe is inhibited in the Low period of the WEN pulse.

**Plug:**

LENS (trigger)

Type: Hirose HR10A-7P-6P(01)

Part Code: JMH0092

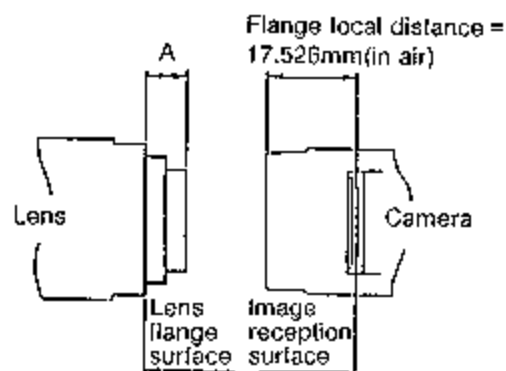


**7. Optical System**

- Image size: 1/4 inch
- The flange focal distance is 17.526mm (in air).
- Flange focal distance is not adjustable.

**Note:**

When selecting a lens, the length (A) from the flange surface to the end of the screw mount must be 8mm or less. If the length exceeds 8mm damage can occur to the lens or optical filter in the camera.

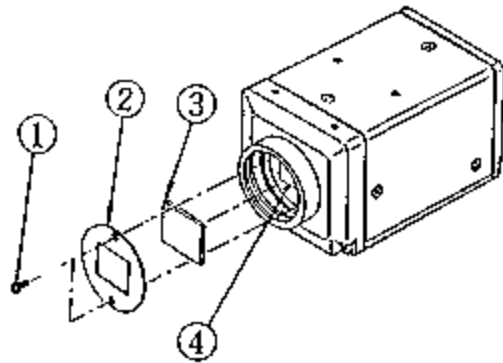


## 8. Optical Filter

The KP-F1 is provided with a IR cut filter, that can be removed if required for a specific application.

Removal of the IR cut filter.

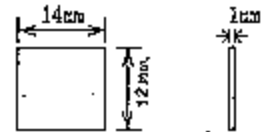
1. Remove two screws (1) shown, and filter holder (2) will come off.
2. Remove the IR cut filter (3) from the filter frame (4).
3. Then, reinstall and secure filter holder (2) with the two screws (1).



### Caution:

Prior to removal of the optical filter, be sure to turn off the power.

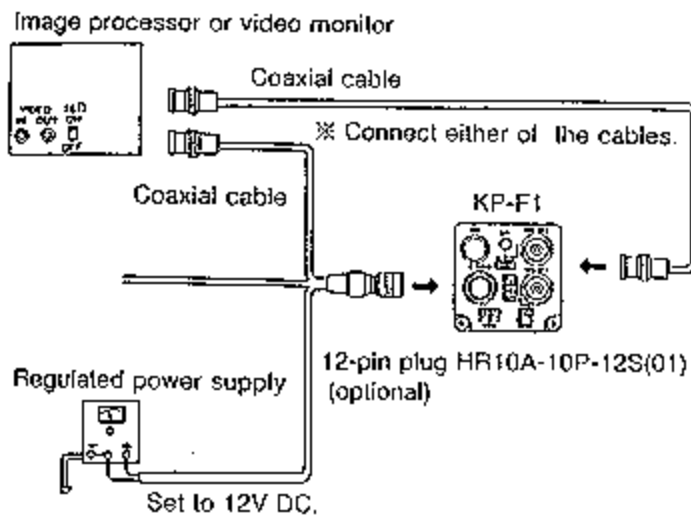
IR cut filter IRC650  
 Dimensions : 14×12×1.0t  
 Part code : XMD0006



External view

## 9. Cable connections

### Basic Connection



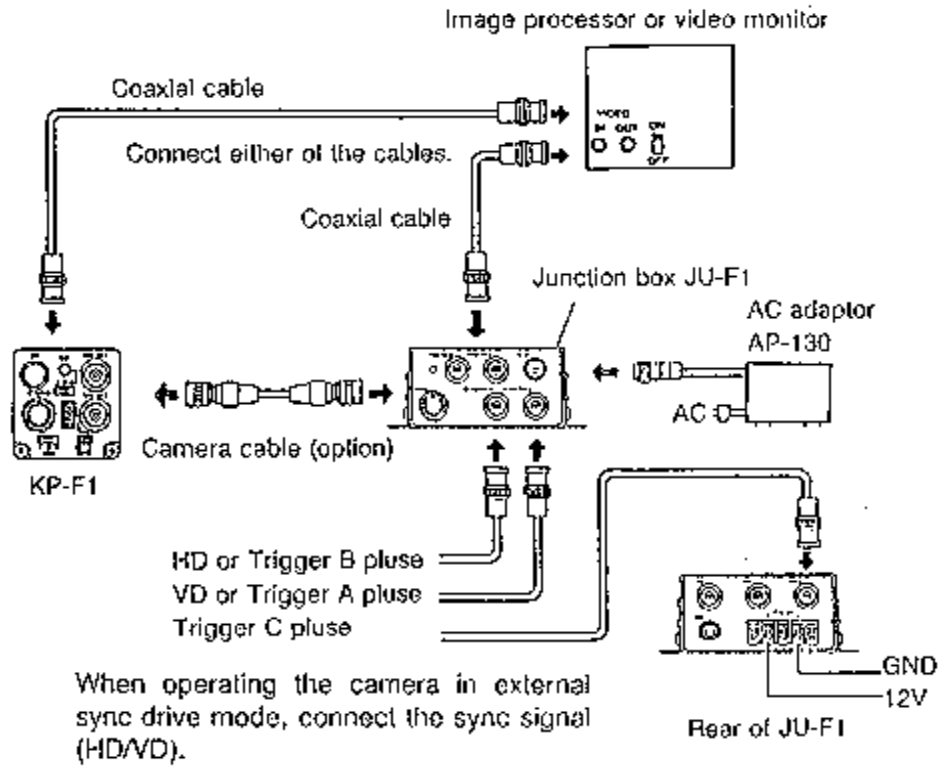
multiple monitors are connected

### Note:

The video signal cannot be fed simultaneously from both the VIDEO OUT connector and the DC IN/SYNC connector.

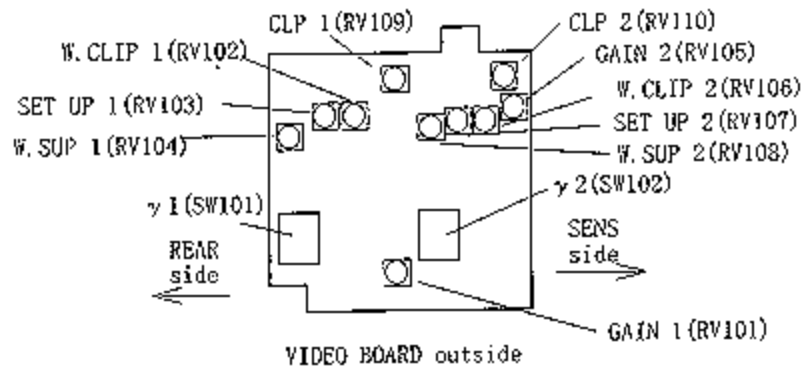
- Supply HD and VD pulses to the KP-F1 when using external sync drive.
- The power supply voltage should be between 11 and 13 volts DC and should be free of noise and ripple.
- Confirm proper voltage polarity before connecting a external power supply to the KP-F1.

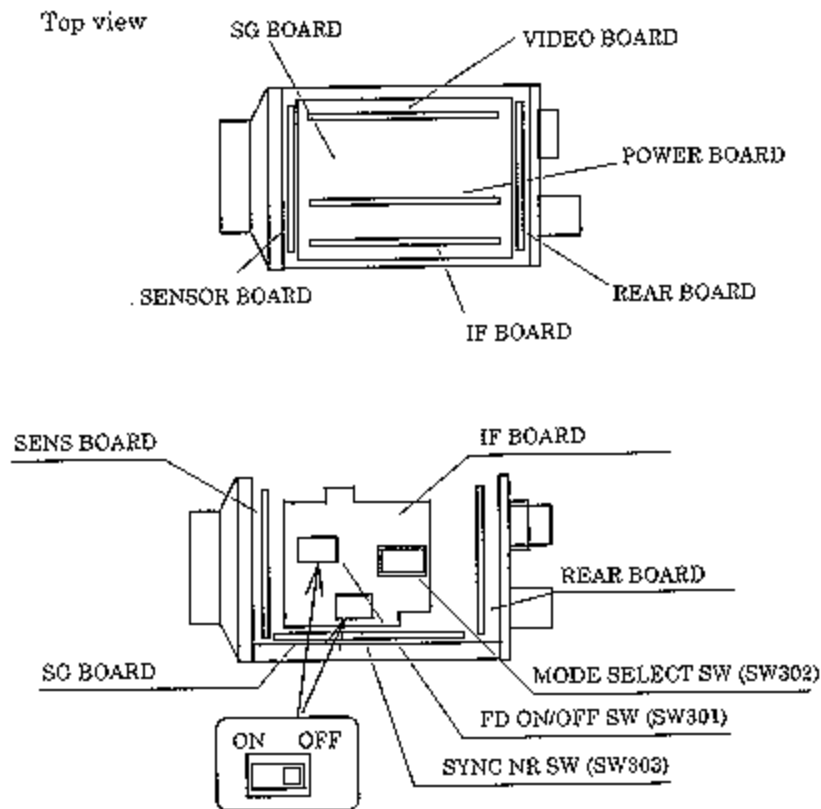
### Optional Connections



When not using the AP-130 power supply, connect 12 volts DC to the rear of the JU-F1.

## 10. Arrangement of Internal Controls



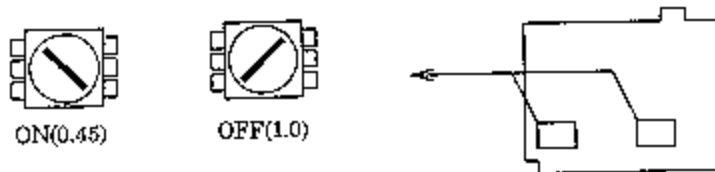


## 11. Camera Settings

### Gamma (γ) correction

Factory setting is OFF (1.0), but it is changeable if necessary.

VIDEO OUT 1 (SW101) and VIDEO OUT 2 (SW102) can be set separately.



### GAIN adjustment

Video output GAIN is adjustable. Adjusted to 0.70 V p-p (γ OFF) at F4, 400lux at factory setting. VIDEO OUT 1 (RV101) and VIDEO OUT 2 (RV105) can be set separately.

### Set-up adjustment

Set-up level is adjustable. Adjusted to 50 mV pep (DOFF) at factory setting. VIDEO OUT 1 (RV103) and VIDEO OUT 2 (RV107) can be set separately.

### White clip adjustment

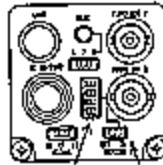
White clip is adjustable. Adjusted to 1.0 Vp-p at factory setting. VIDEO OUT 1 (RV102) and VIDEO OUT 2(RV106) are used for adjusting white clip

### White suppress (knee) adjustment available upon request.

Video signal level is prevented from white saturation and dynamic range is extended. It is adjusted so that the video level exceeding 120% can be suppressed. VIDEO OUT 1 (RV104) and VIDEO OUT 2 (RV108) can be set separately.

### Electric shutter setting.

The electric shutter speed is set by turning the ON/OFF switch to the ON position and using the shutter speed selection switch. The shutter always operates in the field storage mode.



Shutter speed selection switch

Shutter ON/OFF switch

As the shutter speed is increased, the CCD exposure time is decreased, causing a loss of sensitivity in the camera. Since the sensitivity is lower, adjust the lens iris or increase the scene illumination. When the shutter is used, the flicker of an object may be emphasized. If possible, use a DC light source, which will not cause flicker.

Setting of shutter speed

Speed(second)	※ 1	※ 2	1/125	1/250	1/500	1/1000	1/2000	1/4000	1/10000
Setting position									

※ 1 1/60(EIA), 1/50(CCIR)  
 ※ 2 1/100(EIA), 1/120(CCIR)

### Long-time exposure (low speed shutter) available on order.

Long-time exposure can be provided by switching the chip resistors of REAR board to 2FLD, 4 FLD, 6 FLD, 8 FLD, 10 FLD, 14 FLD, or 16 FLD.

## Field-on-demand

The field-on-demand function is set as follows.

Mode	SW301	SW302								SW303
		1	2	3	4	5	6	7	8	
Initial setting							ON			
One trigger	ON	ON	ON	ON	ON					
Two trigger	ON	ON	ON		ON	ON				
Fixed shutter *	ON									
SYNC N.R.			ON					ON		ON

Note: Blanks mean OFF.

\* The switch on the rear is set in the fixed shutter mode.

Shutter ON/OFF switch: ON

shutter speed selection switch: shutter speed is set.

(Refer to setting of electronic shutter.)

## 12. Video Output Modes

The frame shutter function operates in either of the following modes.

### Simultaneous odd/even field output mode

The CCD odd and even line pixels are read simultaneously and are separately output simultaneously (video 2-channel output). The two output methods are interlaced and non-interlaced.

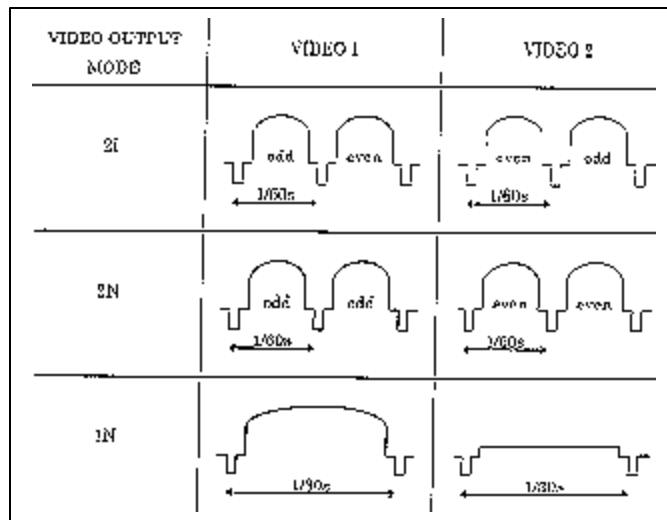
There are two kinds of output methods: interlaced (2 I) and non-interlaced (2 N).

Non-interlaced (2 N): EIA : 518 lines/frame

CCIR: 620 lines/frame

### Frame output mode

The non-interlaced (1N) video data of all exposed pixels are output (Video 1 only) at one frame intervals.

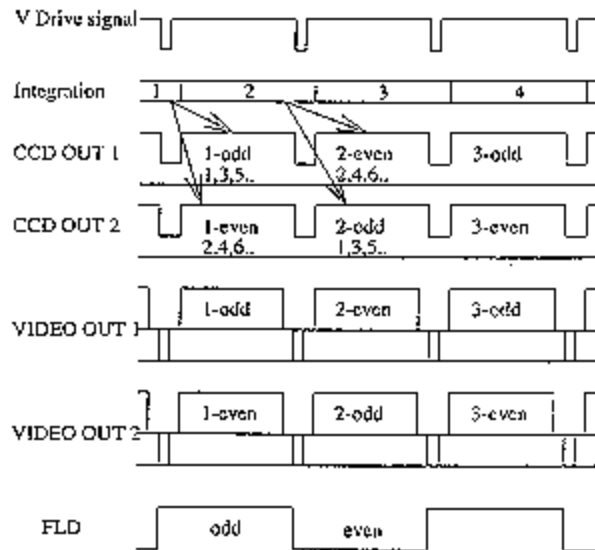


**KP-F1 Video Output Mode Table**

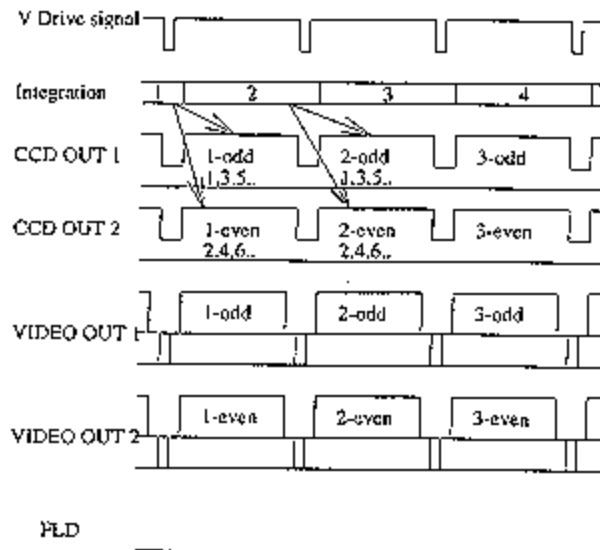
Video Output Mode	Output Connector	Output signal
2I	Video 1, Video 2	1/60 s 2:1 Interlace (standard)
2N	Video 1, Video 2	1/60 s 2:1 non-interlace (video 1; odd, video 2; even)
1N	Video 1	1/30 s 1:1 non-interlace (progressive)

**Video Output Mode signals:**

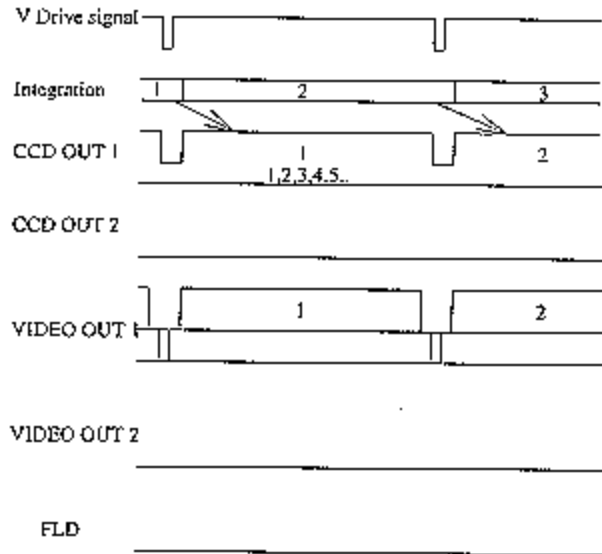
Interlaced (EIA: 1/60 s, CCIR: 1/50 s)



Non-interlaced (EIA: 1/60 s, CCIR: 1/50 s)



Progressive



Non-interlace (EIA: 1/30 s, CCIR: 1/25 s)

### 13. External synchronization (2:1 interlaced)

When operating the camera by external drive signals, connect sync drive signals (HD and VD) to the DC IN/SYNC connector. When sync signals are supplied, the mode is automatically switched from the internal sync mode to the external sync mode.

#### Input signals

HD and VD signals

HD EIA :  $f(H)=15.734\text{kHz} + 1\%$   
 CCIR:  $f(H)=15.625\text{kHz} + 1\%$

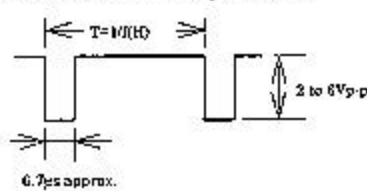
VD EIA :  $f(V)=59.94\text{Hz}[f(V)=f(H) \div 262.5]$   
 CCIR :  $f(V)=50\text{Hz}[f(V)=f(H) \div 312.5]$

#### Input level

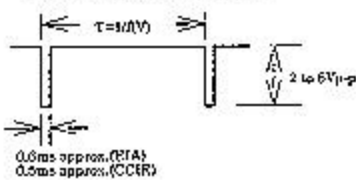
HD 2 to 6 Vp-p  
 Negative signal

VD 2 to 6Vp-p  
 Negative signal

Horizontal drive signal(HD)



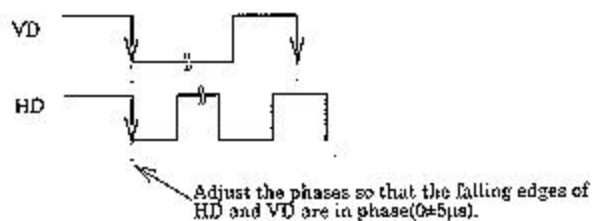
Vertical drive signal(VD)



#### Input impedance

1 k ohms

Phase relationship between horizontal drive signal (HD) and vertical drive signal (VD)



## 14. Field on demand function

Field on demand refers to a function for picking up rapidly moving objects by applying a trigger pulse input at a desired timing to provide a desired or a fixed exposure time. The function is effective since the object is always taken at the same position in the picture. The camera is provided with four modes. Simultaneous odd and even field output and frame output can be produced for each of these modes. However, one image output is obtained per trigger. This function is unavailable in the 2N mode.

**Field-on-Demand Function Table**

Trigger Mode	Camera Switch Setting	Signal Setting	Video 1 Output Signal	Video 2 Output Signal
One Trigger	SW1: ON	2I	OK: VS signal 1/60s	OK: VS signal 1/60s
	SW2: 11110000	2N	NG: No signal (*1) 1/60s	NG: No signal (*1) 1/60s
	SW3: OFF	1N	OK: VS signal 1/30s	NG: S signal 1/30s
Two Trigger	SW1: ON	2I	OK: VS signal 1/60s	OK: VS signal 1/60s
	SW2: 11011000	2N	NG: No signal (*1) 1/60s	NG: No signal (*1) 1/60s
	SW3: OFF	1N	OK: VS signal 1/30s	NG: S signal 1/30s
Fixed Shutter	SW1: ON	2I	OK: V signal 1/60s	OK: V signal 1/60s
	SW2: 00000000	2N	NG: VS signal (*2) 1/60s	NG: VS signal (*2) 1/60s
	SW3: OFF	1N	OK: V signal 1/30s	NG: No signal 1/30s
Sync Non-Reset	SW1: OFF	2I	OK: VS signal 1/60s	OK: VS signal 1/60s
	SW2: 01000010	2N	NG: VS signal (*3) 1/60s	NG: VS signal (*3) 1/60s
	SW3: ON	1N	OK: VS signal 1/30s	NG: S signal 1/30s

(\*1) Output Signal is 0 Volts DC

(\*2) Output Signal has composite sync and black pedestal

(\*3) Output Signal is not synchronized with external sync

Example of DIP switch, SW2 setting:

SW2: 01000010

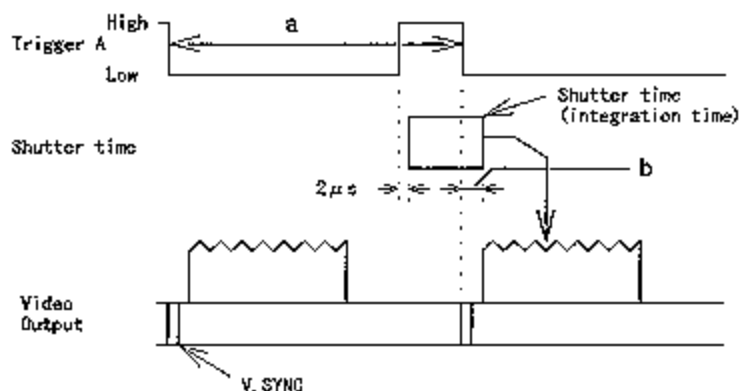


1:HIGH (ON)  
0:LOW (OFF)

### One trigger mode

At a single trigger pulse input (Trig-A), exposure starts at the pulse rising edge and ends at the pulse falling edge. The vertical sync is reset and the video output is obtained immediately.

The pulse width equals the exposure time.



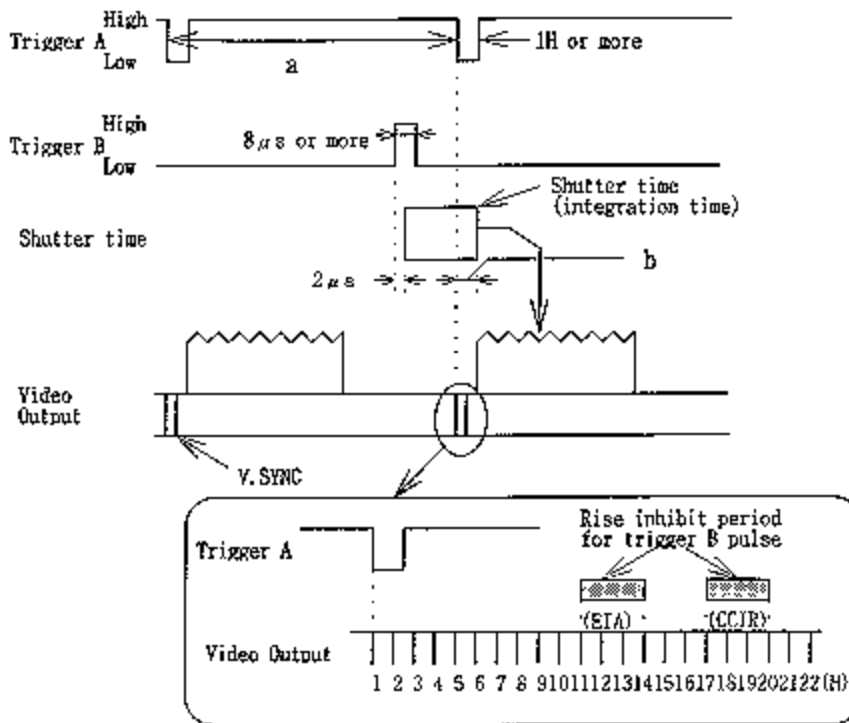
Trigger specifications: 5 Volts p-p +0.5/-1.0 Volts p-p

a: 2I:	1 field or more	EIA: 16.7 ms or more
		CCIR: 20 ms or more
1N:	1 frame or more	EIA: 33.4 ms or more
		CCIR: 40 ms or more
b: 2I:	741.6 $\mu$ s (EIA)	1131.3 $\mu$ s (CCIR)
1N:	1250.1 $\mu$ s (EIA)	2027.3 $\mu$ s (CCIR)

High period = 8  $\mu$ s or more

### Two Trigger Modes

Two trigger pulses are input. Exposure starts at the Trigger B rising edge and ends at the Trigger A falling edge. The vertical sync is reset and the video output is obtained immediately. The interval between the two trigger pulses equals the exposure time.



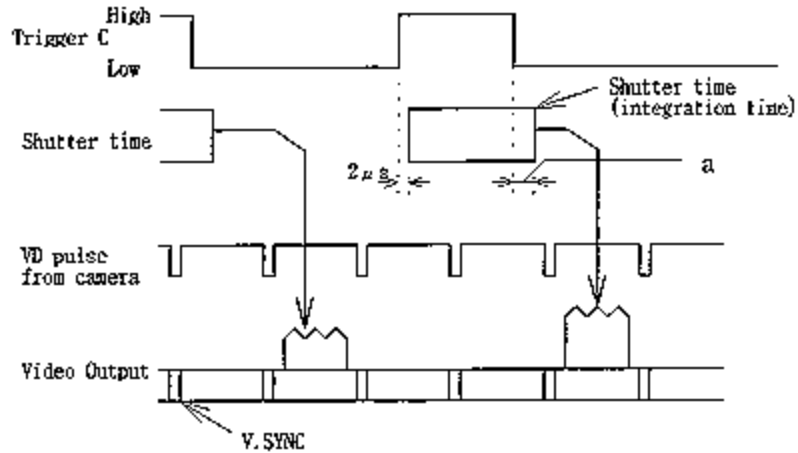
Trigger specifications: 5 Volts p-p +0.5 / 1.0 Volt p-p

Trig-A	Low Period: EIA	63.5 $\mu$ s or more	
		CCIR	64 $\mu$ s or more
a: 2I:	EIA	: 16.7 ms or more	b: 2I: 741.6 $\mu$ s (EIA)
		CCIR: 20 ms or more	1131.3 $\mu$ s (CCIR)
1N:	EIA	: 33.4 ms or more	1N: 1250.1 $\mu$ s (EIA)
		CCIR: 40 ms or more	2027.3 $\mu$ s (CCIR)
Trig-B	Low period :	Not specified	
	High period :	8 $\mu$ s or more	

**Note:** Use a sync signal that is free of noise.

**Sync non-reset mode.**

At a single trigger pulse input (Trigger C), exposure starts at the pulse rising edge and ends at the pulse falling edge. The video output is obtained at the next field after the end of the exposure. The pulse width equals the exposure time.



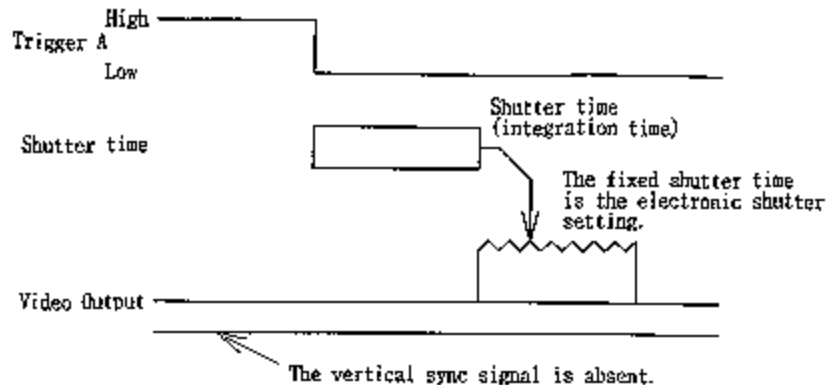
**Note:** The Trigger input cannot be applied to fields of the video output where a picture is produced ( a normal picture will not be obtained ). Use a sync signal that is free of noise.

Trigger specifications: 5 Volts p-p +0.5 / -1.0 Volt p-p  
 a: 2I: 741.6 μs (EIA)  
 1131.3 μs (CCIR)  
 1N: 1250.1 μs (EIA)  
 2027.3 μs (CCIR)  
 High period 8 μs or more

**Fixed shutter mode**

At a single trigger pulse input (Trigger A), exposure starts at the pulse rising edge. The exposure time is set by the cameras electronic shutter switch. The video output is obtained immediately after the end of the fixed exposure. In this mode, the vertical sync signal is absent from the video output.

**Note:** The trigger input cannot be applied to fields of the video output where a picture is



produced ( a normal picture will not be obtained ). Use a sync signal that is free of noise.

Trigger specifications: 5 Volts p-p +0.5 / 1.0 Volt p-p  
High period 8  $\mu$ s or more

## 15. Non-interlaced operation

When non-interlaced external sync drive signals (HD/VD) are connected from an external unit, the mode is automatically switched to non-interlaced scanning mode. When the following external sync drive signals are connected, the camera operates in the non-interlaced mode.

### Input signals

HD and VD signals

HD EIA :  $f(H)=15.734\text{kHz} \pm 1\%$

CCIR:  $f(H)=15.625\text{kHz} \pm$

1%

VD EIA :  $f(V)=f(H) \cdot (262\pm)(\text{Hz})$

CCIR:  $f(V)=f(H) \cdot (312\pm)(\text{Hz})$

### Input level

2 to 6Vp-p, negative

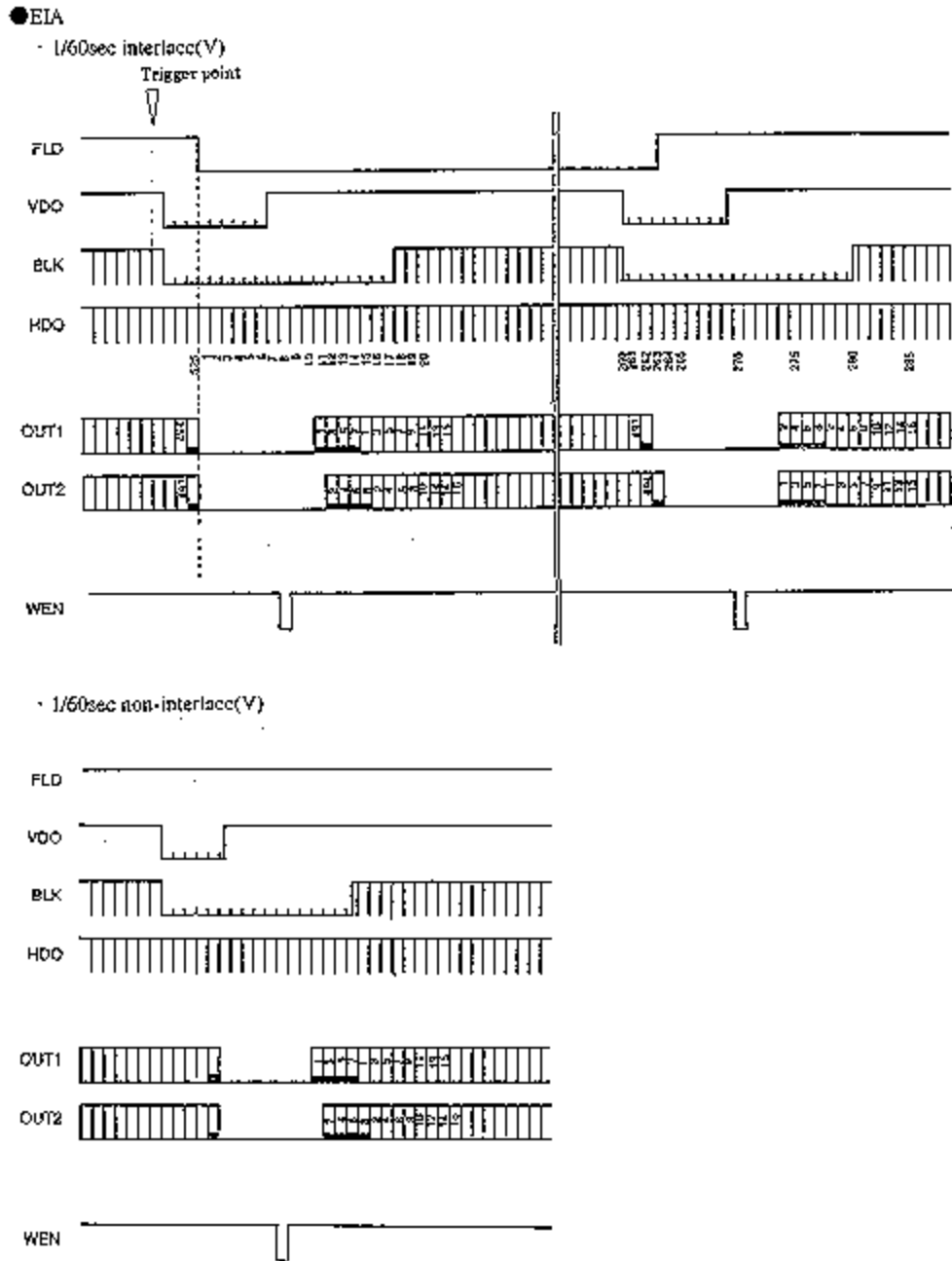
### Input impedance

1k ohms

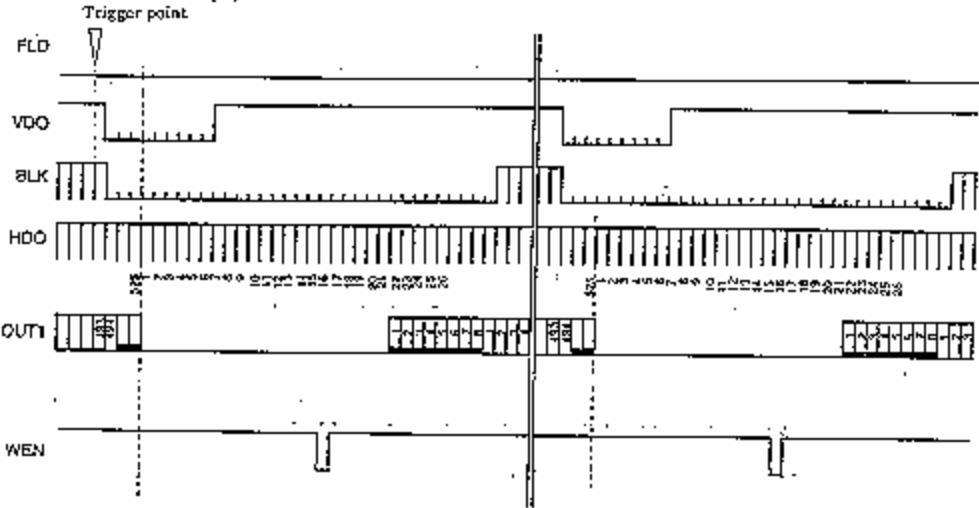
Waveforms of external drive signal (non-interlaced scanning).

The waveforms are the same as those of 2:1 interlaced external sync drive signals.

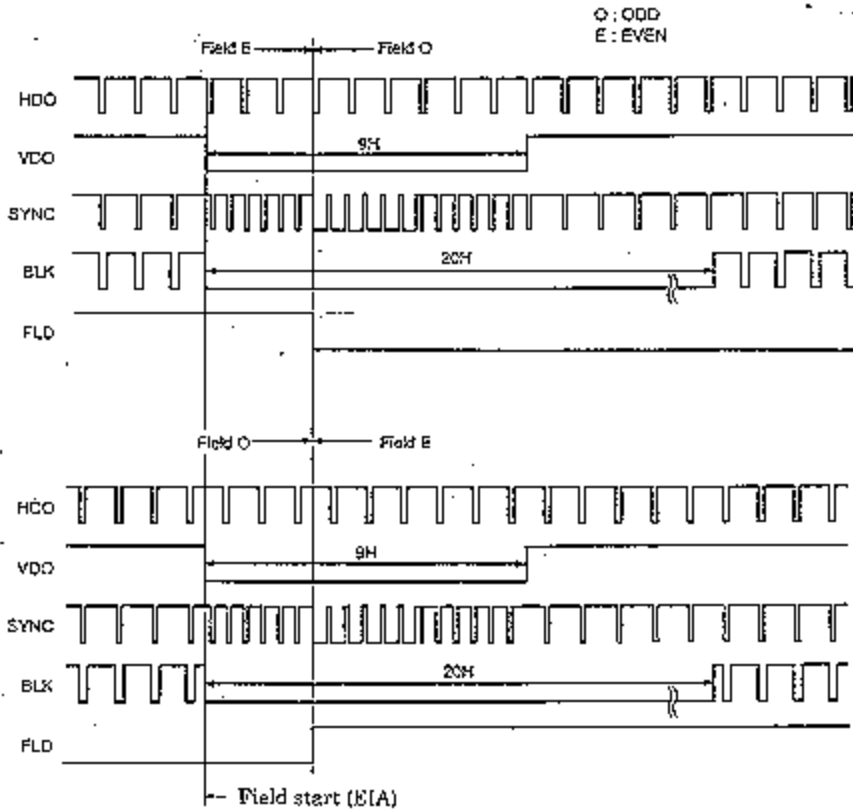
# 16. Timing Diagrams



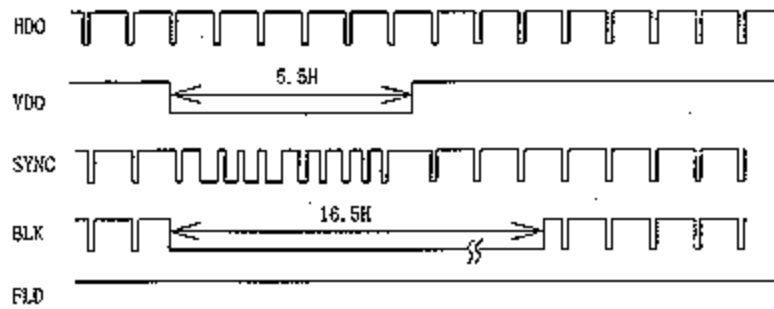
· 1/30sec non-interlacc(V)



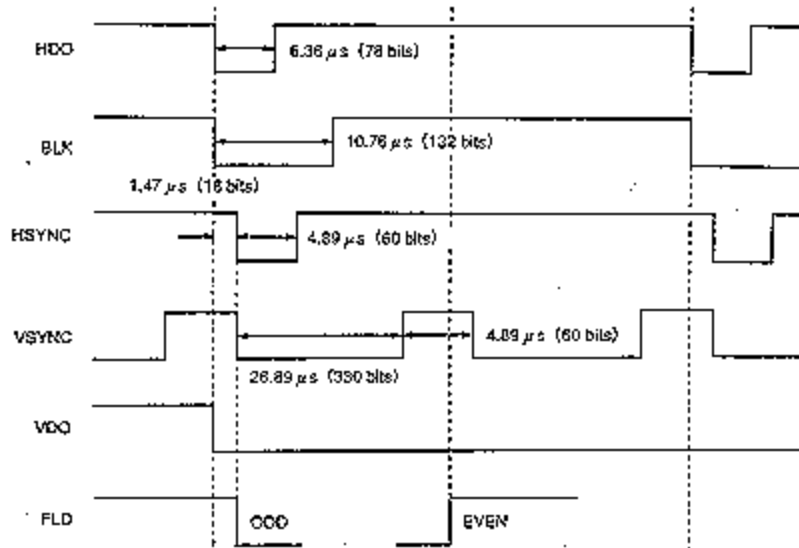
· SG vertical (1/60sec, 1/30sec)



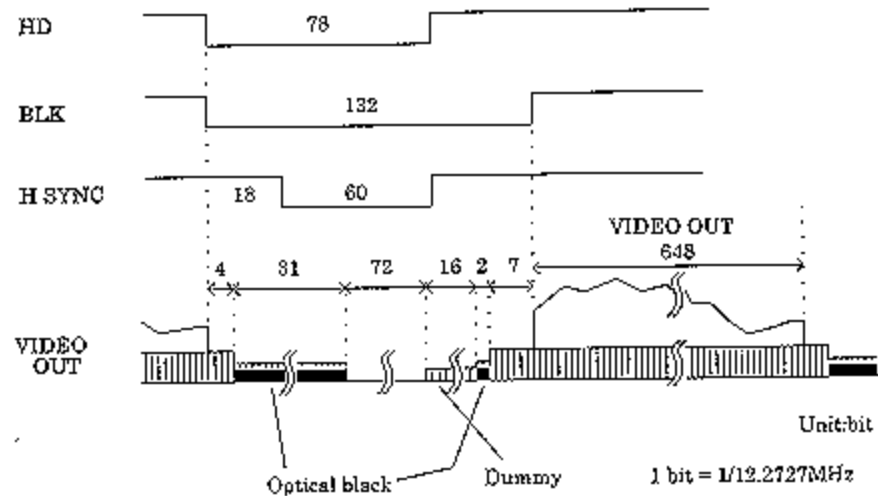
· SG vertical (1/60sec non-interlace)



· SG horizontal

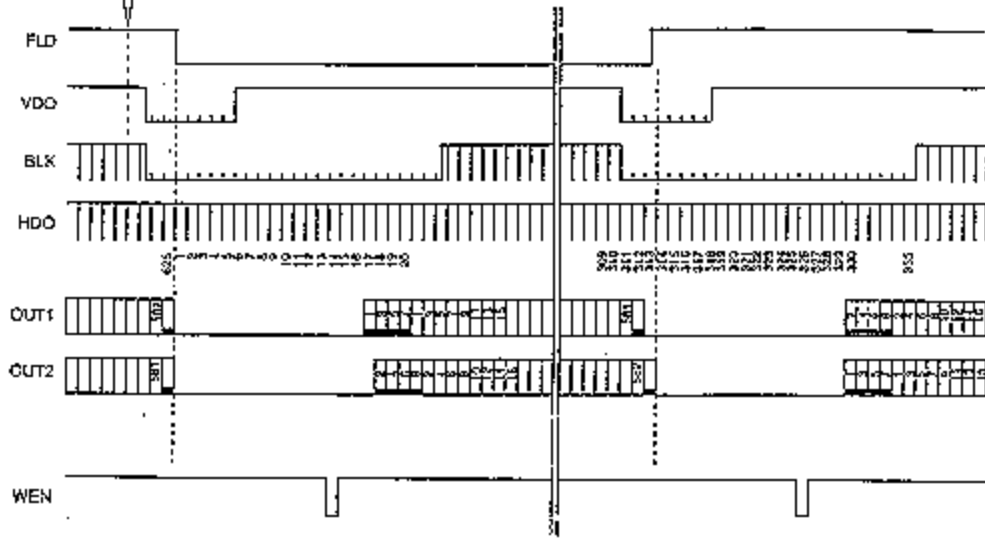


· Horizontal

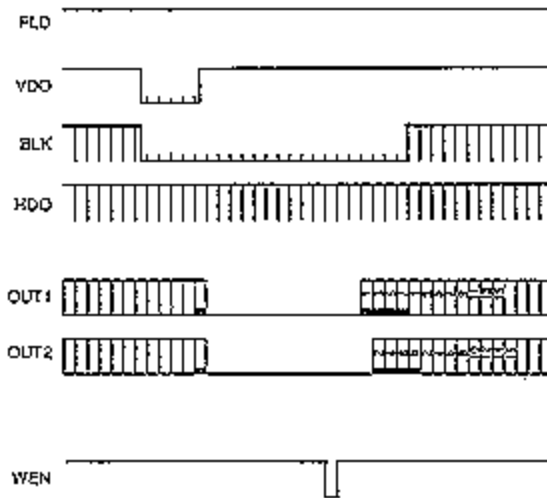


●CCIR

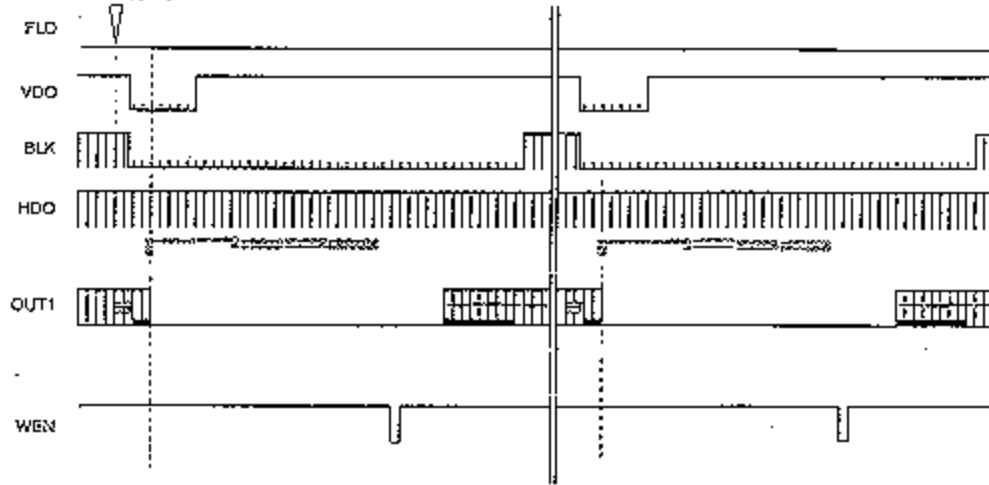
· 1/50sec interlace(V)  
Trigger point



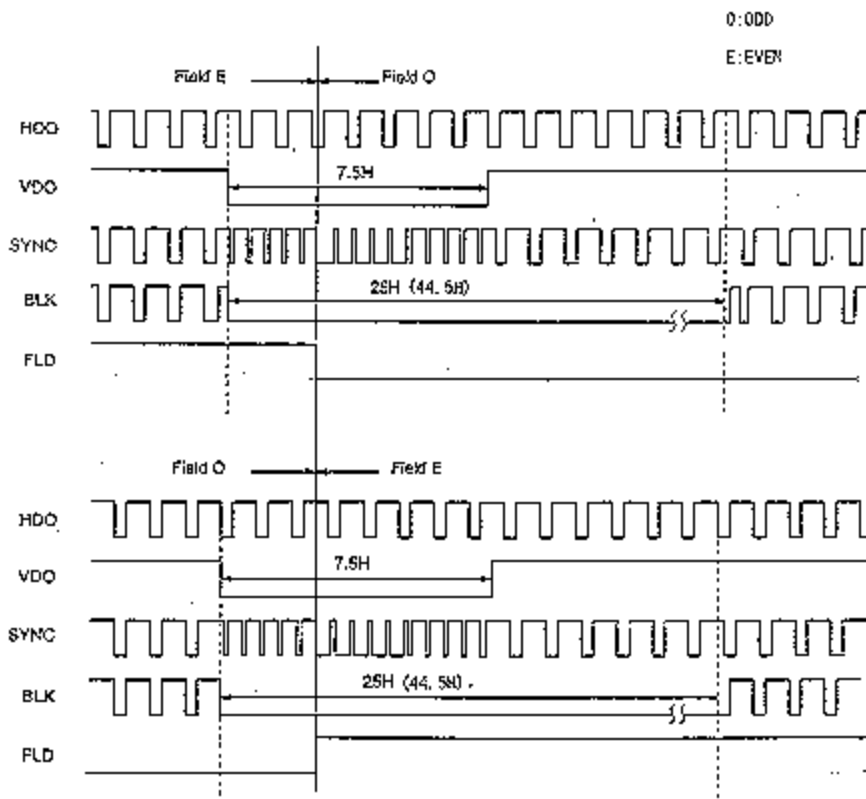
· 1/50sec non-interlace(V)



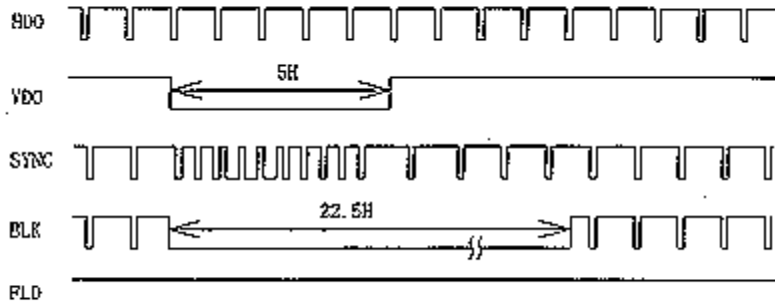
· 1/25sec non-interlace(V)  
Trigger point



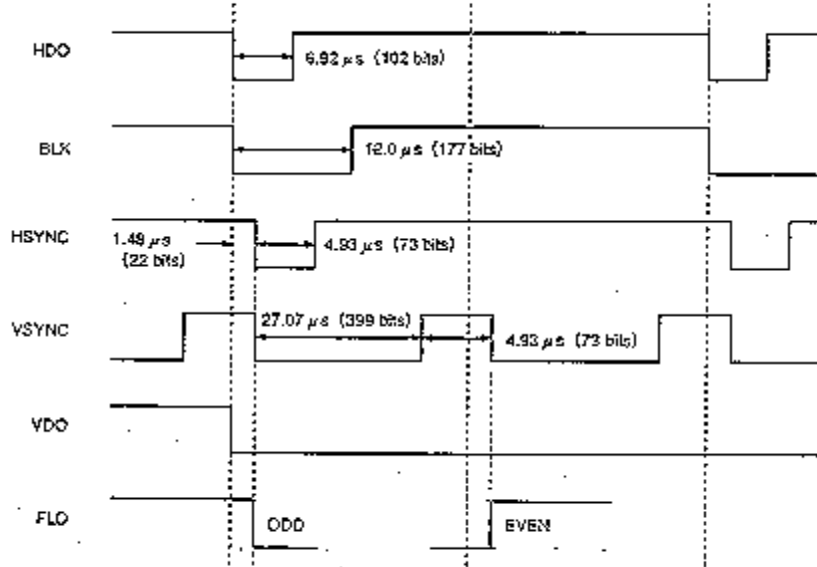
· SG vertical (1/50sec, 1/25sec)



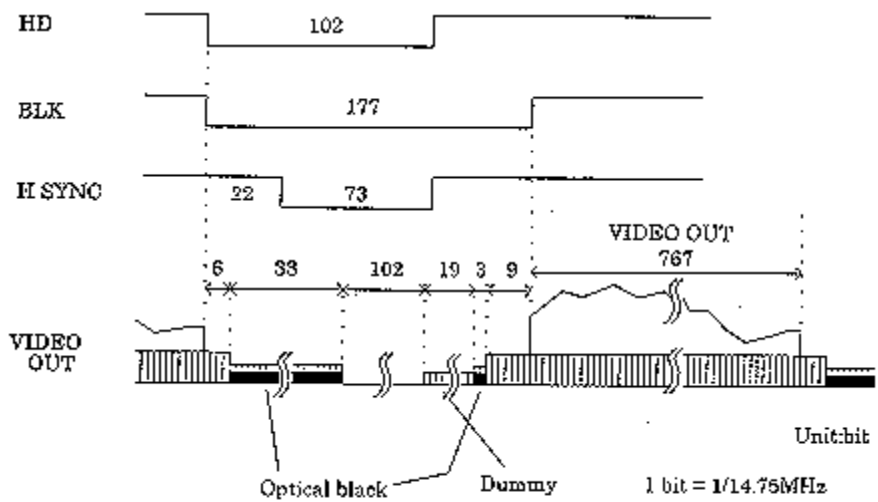
· SG vertical (1/50sec non-interface)



· SG horizontal



· Horizontal

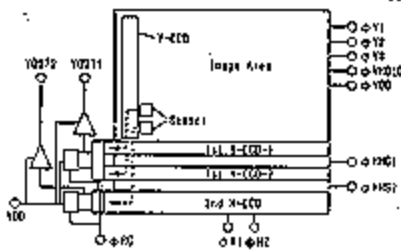
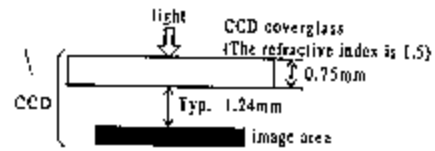


∞∞

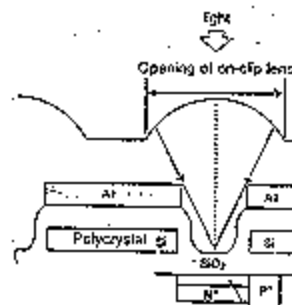
## 17. Image sensor

1/2 inch interline, all-pixel read out type CCD

Total pixel number:	EIA 692(H) X 504(V)	CCIR 823(H) X 592(V)
Effective pixel number:	EIA 6S9(H) X 494(V)	CCIR 782(H) X 582(V)
Imaging area:	EIA 6.52(H) X 4.89(V)mm	CCIR 6.49(H) X 4.83(V)mm
Pixel size:	EIA 9.9(H) X 9.9(V) $\mu$ m	CCIR 8.3(H) X 8.3(V) $\mu$ m
Equivalent aperture size per pixel:	EIA about 6(H) X 6(V) $\mu$ m    CIR about 5(H) X 5(V) $\mu$ m	

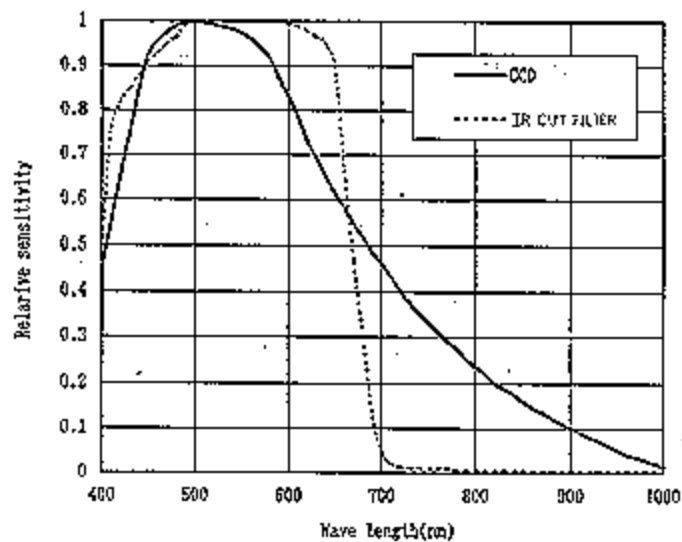


CCD block diagram



Face plate cross section

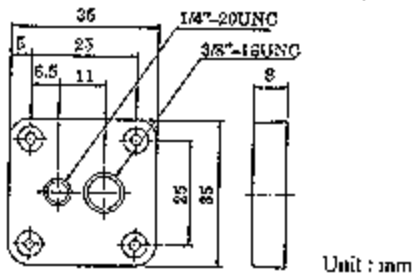
- Spectral response (lens response included, optical source response excluded)



## 18. Options

- Tripod adaptor TA-M1

Product code : 23855AX



Mount on tripod hole B or C of the camera.  
Use supplied M2×5 four screws.

Caution :

Excessive length screw may damage the camera.  
Make sure screw long thc before using.

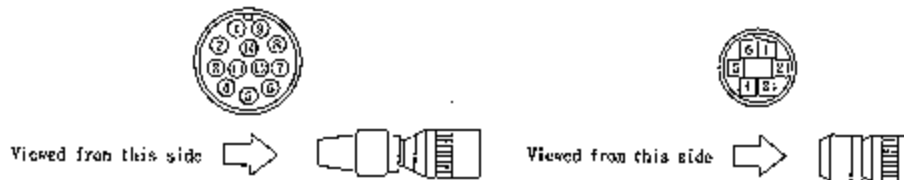
- Plug

HR10A-10P-12S(01)

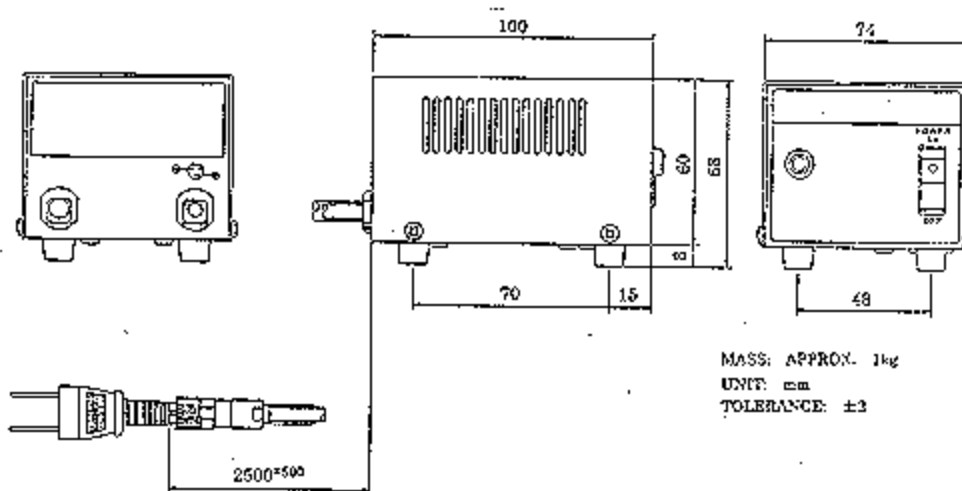
Product code : 23810AX

HR10A-7P-6P(01)

Part code : JMH0092



- AC adaptor AP-130 Product code : 23805JX



MASS: APPROX. 1kg  
UNIT: mm  
TOLERANCE: ±3

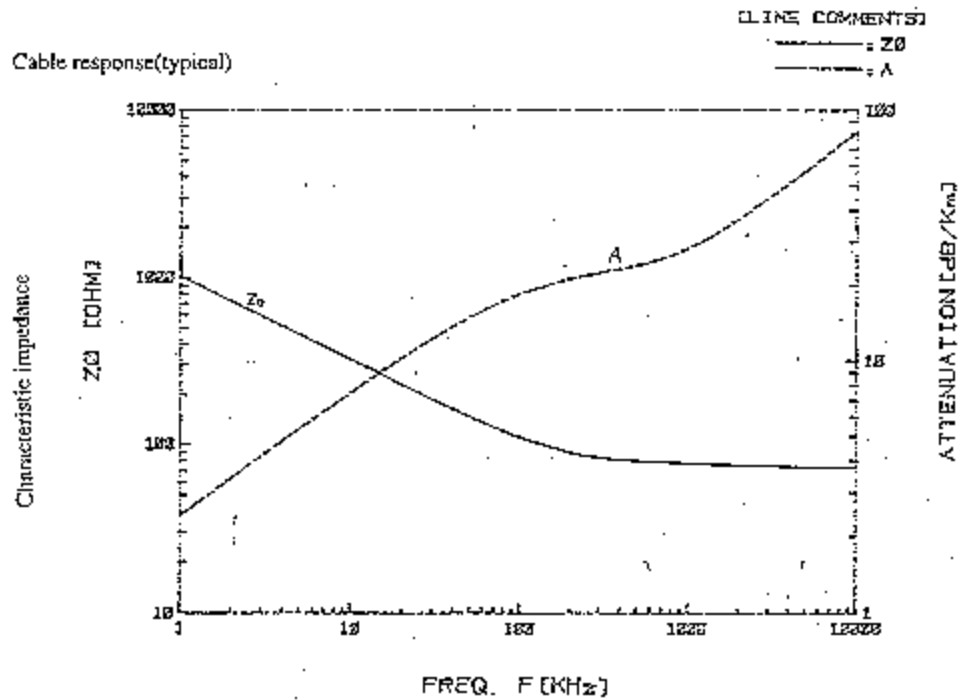


Attenuation of Video Signal due to cable length.

The attenuation due to optional cables C-501KS and C-201KS is shown in the chart below. Attenuation is proportionate to the cable length. The characteristic cable impedance remains constant as the cable length changes.

	Cable Length	Attenuation at 4 MHz 50 db/Km	Attenuation at 7 MHz 70 db/Km
Attenuation due To cable length In db.	1 m	0.05	0.07
	2 m	0.1	0.14
	5 m	0.25	0.35
	10 m	0.5	0.7

The video bandwidth of the KP-F1 is approximately 7 MHz.



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