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KP-M1A

B/W CCD Camera
Operation Guide



Aug 2001

Hitachi Kokusai Electric Inc.

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1. General

The KP-M1A is a black and white camera using the latest high grade CCD having a 2/3-inch image size.

The KP-M1A features high sensitivity, high resolution and high performance.

The KP-M1A is provided with various functions including the multiple step electronic shutter function, field-on-demand function, integration mode switching function, HD/VD pulse switching function and non-interlaced scanning function.

The KP-M1A is most suitable for use with a microscope or an image processing system.

The KP-M1A is compatible with the KP-M2/M3.

KP-M1AN: EIA, KP-M1AP: CCIR

2. Major features

(1)Small size and lightweight

Though the KP-M1A is small in size and light in weight, it offers high performance.

A video signal is obtained only by supplying 12V DC.

(2)High resolution

The latest high grade CCD is used. The horizontal resolution is 570TVL (560TVL CCIR), and the vertical resolution is 485TVL(575TVL CCIR).

(3)Multiple-step electronic shutter function

The multiple-step electronic shutter function is provided.

The eight-step shutter speeds can be selected from 1/100(1/120 for CCIR) to 1/10000.

(4)Internal or external synchronization, and interlaced or non-interlaced operation

The synchronization system and the scanning system are automatically switched by the kind of an external sync signal.

(5)Field-on-demand function

The image captured at an optional timing by an external trigger signal can be displayed instantly.

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

(6)Frame or field integration mode

As the integration mode can be switched, the image according to applications can be obtained by combining with the scanning system and the electronic shutter function.

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3. Specifications

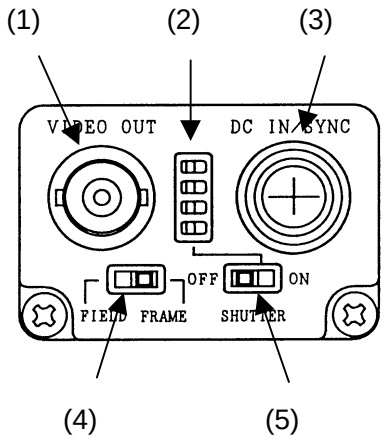
(1)Imaging device	interline CCD
No. of total pixels	EIA :811(H) ×508(V)
	CCIR:795(H)×596(V)
Pixel size	EIA :11.64(H)×13.5(V)μm
	CCIR:11.6(H)×11.2(V)μm
No. of effective pixels	EIA :768(H)×494(V)
	CCIR:752(H)×582(V)
(2)Sensing area	EIA :8.94 ×6.67mm(2/3 inch size)
	CCIR:8.72 ×6.52mm(2/3 inch size)
(3)TV format	EIA/CCIR
(4)Lens mount	C-mount
(5)Flange focal distance	17.526mm(Not adjustable)
(6)Hor. Scanning freq.	EIA:15.734kHz CCIR:15.625kHz
(7)Vert. Scanning freq.	EIA:59.94Hz CCIR:50Hz
(8)Sync system	Internal/external (automatic switching)
(9)Int. sync scanning system	2:1 interlaced
	No. of Hor. lines:525(625 CCIR)
	fv=2fH/525(625 CCIR)
(10)Ext. sync input	HD/VD : 2 to 6Vp-p,negative
	Input impedance : 1kΩ
	Frequency deviation : ±1%
(11)Video output	1.0Vp-p/75Ω, unbalanced
	Video: 0.7Vp-p
	Sync: 0.3Vp-p, negative
(12)Resolution	EIA : 570TVL(H)/485TVL(V)
	CCIR: 560TVL(H)/575TVL(V)
(13)Sensitivity	400Lx, f4, 3200K
(14)Min. illumination	0.3Lx, fl.4, AGC:ON, GAMMA:ON,
	W/O IR cut filter
(15)Signal-to-noise ratio	56dB
(16)Electronic shutter	1/10000, 1/4000, 1/2000, 1/1000, 1/500,
	1/250, 1/125, 1/120(CCIR), 1/100(EIA)sec
	OFF :Normal exposure
	Settable from external switch.
	Set to OFF at factory.

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(17)Integration mode	Field or frame (Settable by external switch.) Set to frame integration mode at factory.
(18)Gamma correction	Gamma = 1.0 or correction (Settable by internal switch.) Set to 1.0 at factory.
(19)AGC	Fixed or AGC (Settable by internal switch.) Set to fixed gain at factory.
(20)Field-on-demand	ON or OFF (Settable by internal switch.) Set to OFF at factory.
(21)Restart ・ Reset	ON or OFF (Option) (Settable by chip components) Set to OFF at factory.
(22)Supply voltage	12V DC ± 1V
(23)Power consumption	220mA approx.
(24)Ambient conditions	Operating:-10 to 50℃, 90%RH or less Storage :-20 to 60℃,70%RH or less
(25)Anti-vibration	98 m/s^2 (10 to 60Hz,amplitude:0.98mm constant 60 to 200Hz amplitude, variable) (10 to 200Hz, sweep:1 min, XYZ,duration:30mm.)
(26)Anti-vibration	686 m/s^2 (Once each, top/bottom/left side/right side)
(27)Dimensions	44(W)×29(H)×72(D)mm
(28)Mass	120g approx.

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4. Name of each section



(1) VIDEO OUT (BNC) connector

A composite video signal (VS) is fed from this connector. Connect a 75-ohm coaxial cable between the connector and a video monitor or other video equipment.

(2) Shutter speed select switch

Use this switch to set the shutter speed.

(3) DC IN/SYNC connector

This connector is for 12V DC input, a composite video signal (VS) output and an external sync signal input.

(4) FIELD/FRAME integration select switch

Use this switch to select an integration mode. This switch is set to FRAME at factory.

(5) SHUTTER ON/OFF switch

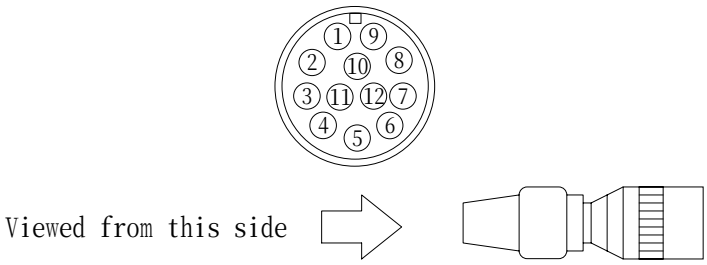
Set the SHUTTER ON/OFF switch to ON to establish the shutter mode.

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5. Signal connection to DC IN/SYNC connector.

PIN NO.	Internal sync mode	External sync mode				
		HD/VD	Frame/field on demand			
			ONE trigger	TWO trigger	Fixed shutter	EXT shutter
1	GND	GND	GND	GND	GND	GND
2	+12V	+12V	+12V	+12V	+12V	+12V
3	GND(Vout)	GND(Vout)	GND(Vout)	GND(Vout)	GND(Vout)	GND(Vout)
4	Vout	Vout	Vout	Vout	Vout	Vout
5	-	GND(HD)	-	-	-	GND(HD)
6	-	HD IN	-	-	-	HD IN
7	-	VD IN	Trigger A IN	Trigger A IN	Trigger A IN	VD IN
8	-	-	-	GND(Trig B)	-	GND(Trig B)
9	-	-	-	Trigger B IN	-	Trigger B IN
10	GND	GND	GND	GND	GND	GND
11	+12V	+12V	+12V	+12V	+12V	+12V
12	-	GND(VD)	GND(Trig A)	GND(Trig A)	GND(Trig A)	GND(VD)

12-pin plug HR10A-10P-12S(01) Product code: 23810AX



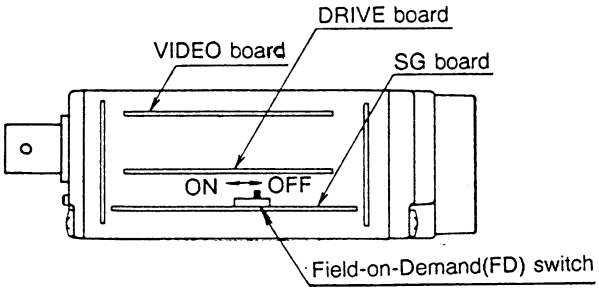
Note:

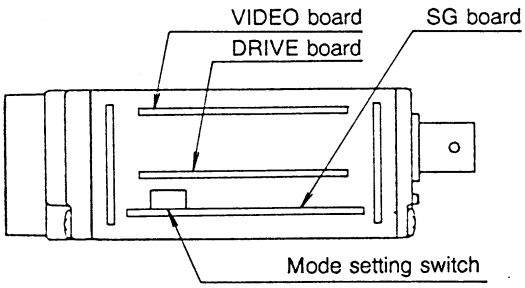
The video signal cannot be fed simultaneously from both the VIDEO OUT connector and the DC IN/SYNC connector. If both the outputs are connected simultaneously, a proper picture cannot be obtained.

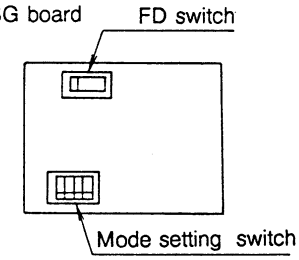
Supply 12V DC in range between 11 and 13V.

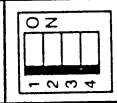
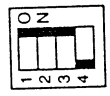
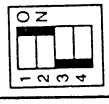
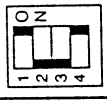
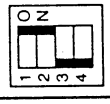
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6. Arrangement of internal switches

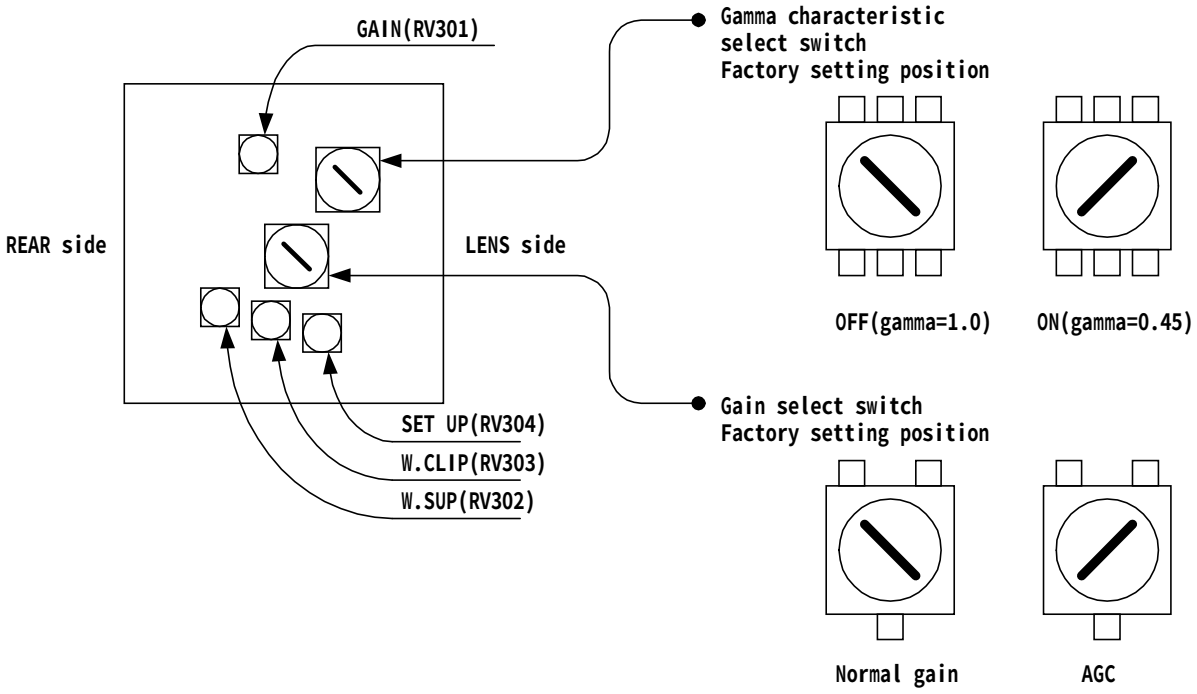






	Normal mode	ONE trigger mode	TWO-trigger mode	Fixed shutter mode	Ext. shutter control mode
Mode setting switch					
FD switch	OFF (Setting at factory)	ON	ON	ON	OFF

Internal controls



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Gain control	Adjusts a video level. Set to 0.7Vp-p at 400lx, f4. (Gamma: off, AGC: Normal)
SET UP control	Adjusts a setup level. Set to 75 mVp-p. (Gamma: OFF, AGC: Normal)
W.CLIP control	Clips a video level. Set to 1.0Vp-p. (Max: 1.2Vp-p)
W.SUP control	Prevents white compression of a video signal and extends a dynamic range. Effective when a video level is approximately 120% (Gamma: 1.0). (Approx. 110% for Gamma: ON)

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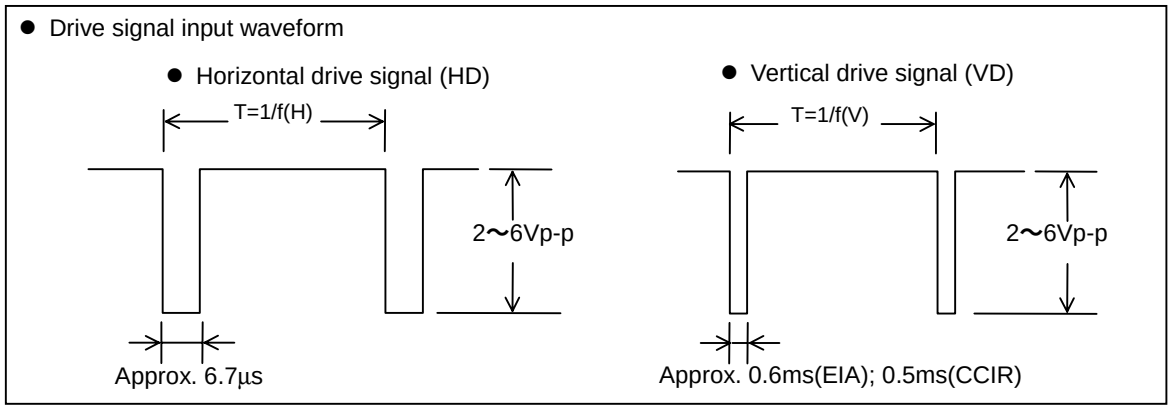
7. External synchronization (2:1 interlaced)

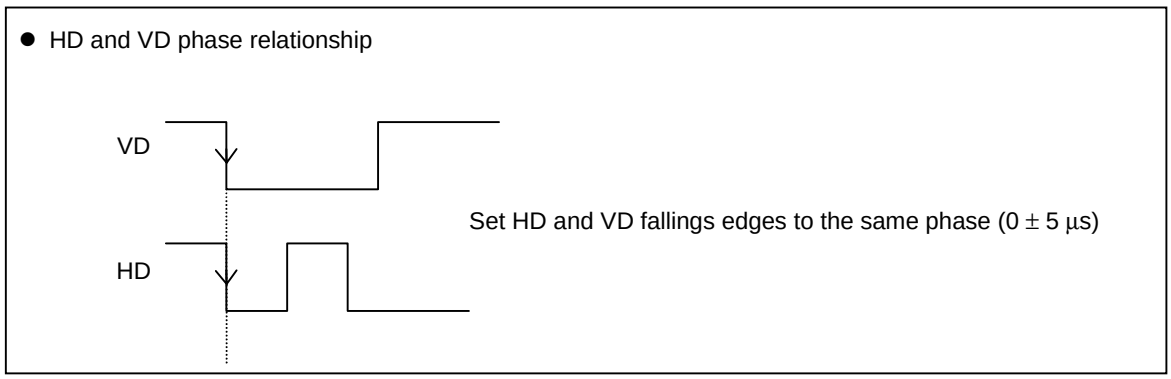
When operating the camera by external drives signals, connect sync drive signals (HD, VD) to the DC IN/SYNC connector, then the mode is automatically switched from the internal sync mode to the external sync mode.

- Horizontal and vertical drive signal inputs
  HD EIA: f(H) = 15.734 kHz ±1 %
  CCIR: f(H) = 15.625 kHz ±1 %
  VD EIA: f(V) = 59.94 Hz (f(V) = f(H) ÷ 262.5)
  CCIR: f(V) = 50 Hz (f(V) = f(H) ÷ 312.5)

- Input level
  HD 2 to 6 Vp-p negative
  VD 2 to 6 Vp-p negative

- Input impedance 1 kΩ





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8. Field on demand function

The KP-M1A is provided with the Field-on-Demand function to record a picture obtained at an optional timing by triggering to an image memory, etc. Four modes are switchable by the internal switch.

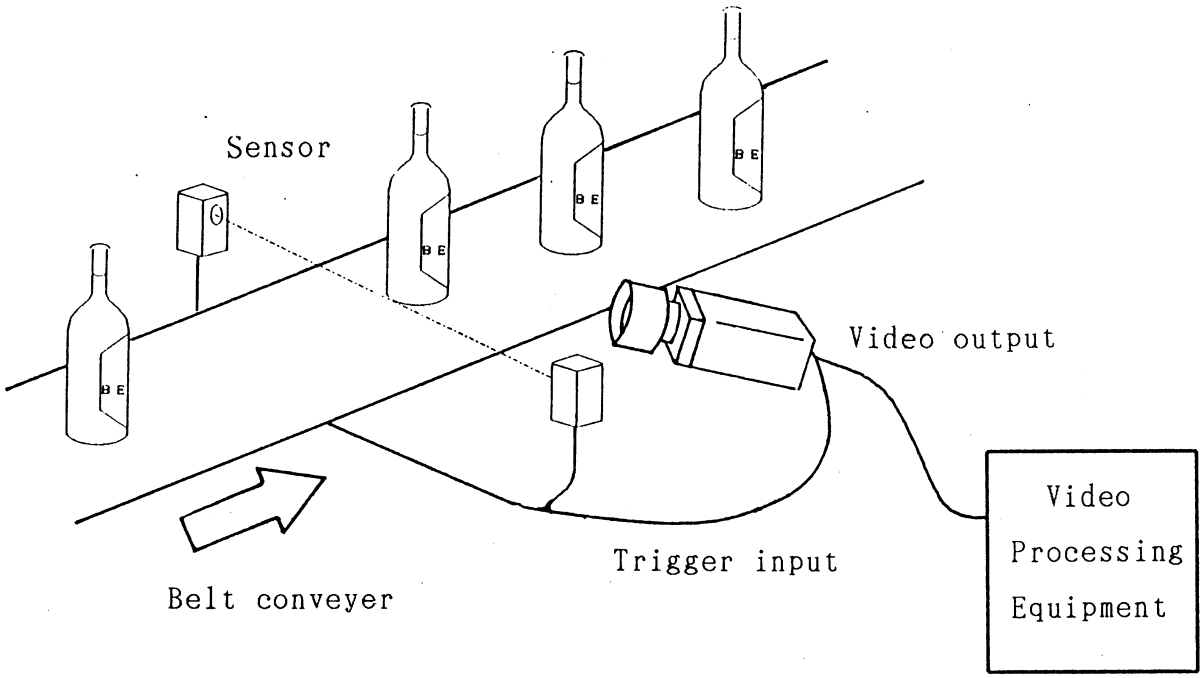
1) ONE trigger mode
2) TWO trigger mode
3) Fixed shutter mode: 1/1600s(EIA) / 1/1000s (CCIR)
4) External shutter control mode

Set the electronic shutter to OFF.

(1) Application

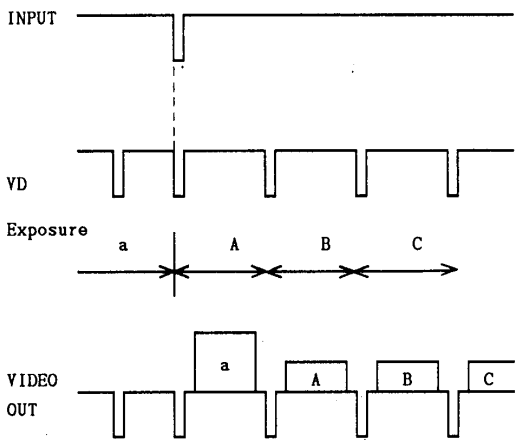
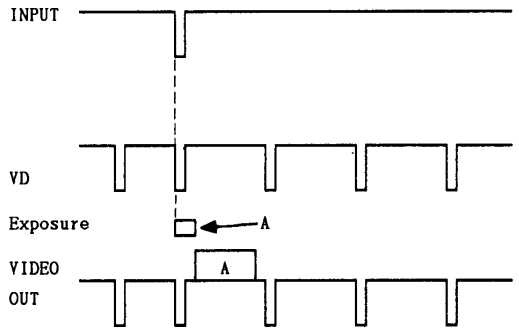
This function is effective to shoot moving objects for image processing.

Example: Defect detection of items on belt conveyer



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(2) Difference between the restart/reset (R/R) function and the Field-on-Demand (FD) function.

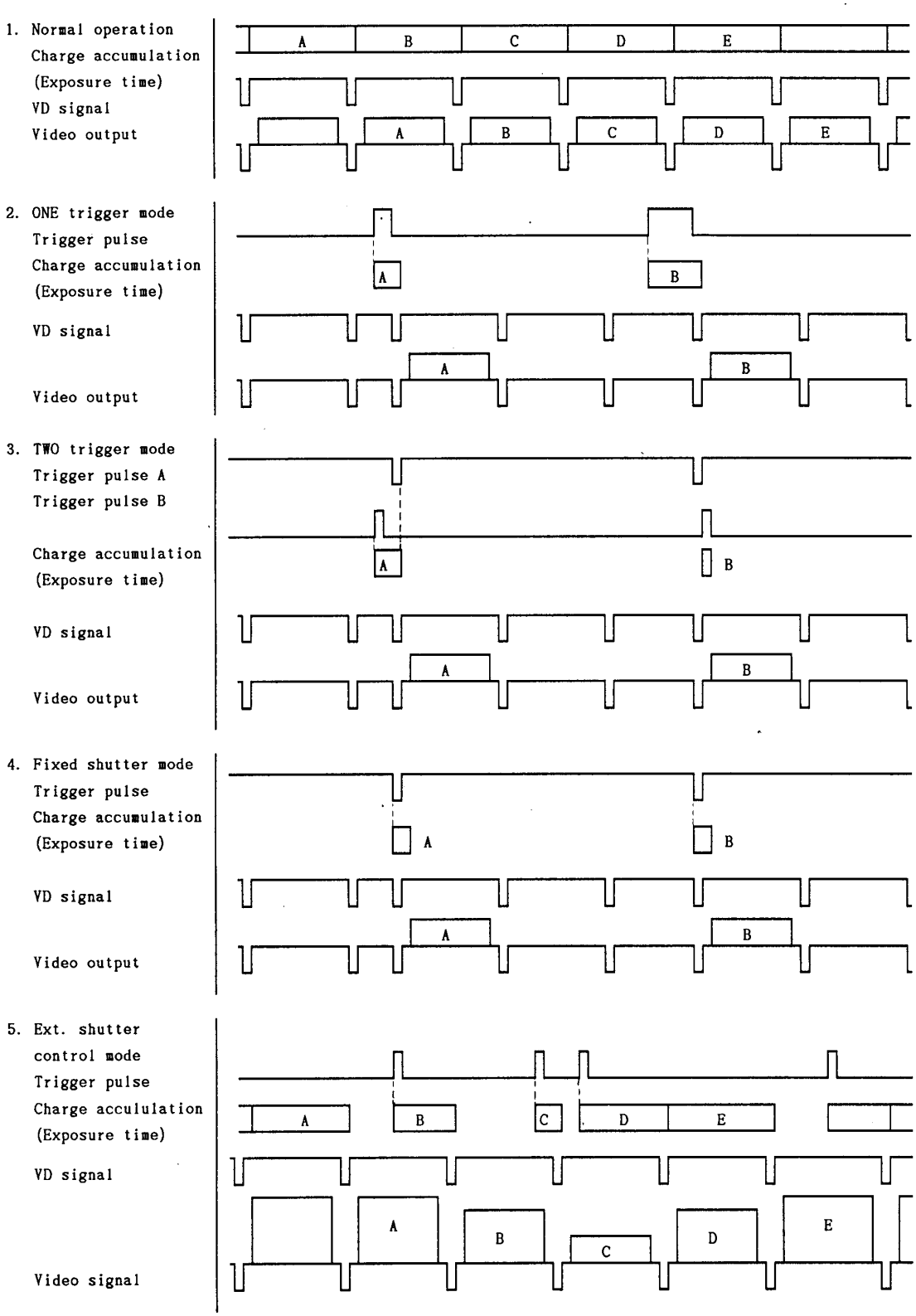
<table>
<tr><td>R.R.
Restart of sync signal only</td><td>
</td><td>A: Image required for the pulse</td></tr>
<tr><td>FD
(Fixed shutter)
Reset of sync signal and start of shutter</td><td>
</td><td>A: Image required for the pulse</td></tr>
</table>

R/R function: The desired image is after one field with respect to the input pulse.

FD function: The desired image is immediately after the input pulse.

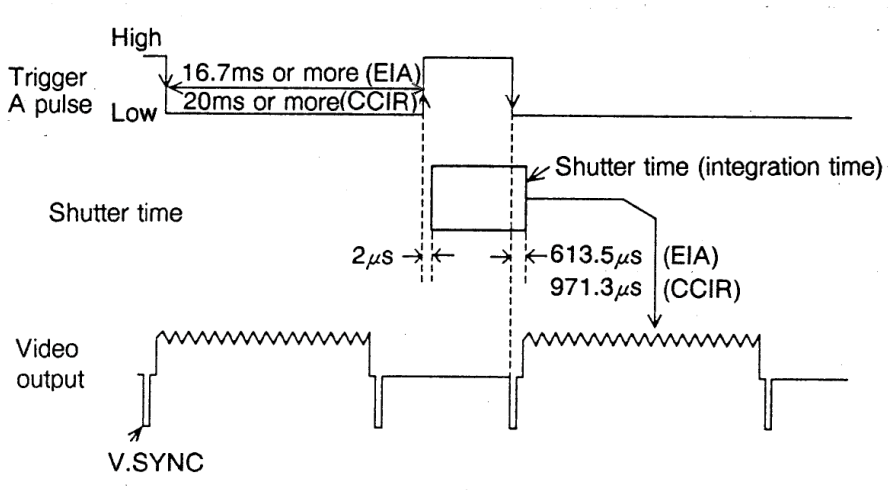
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(3) Timing diagram



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8-1 ONE trigger mode



The shutter is started by the rising edge of the trigger A pulse, and V.SYNC is reset by the falling edge of the trigger A pulse. (After reset, the first field is delivered)

A shutter time is controlled by the duration when the trigger pulse is high.

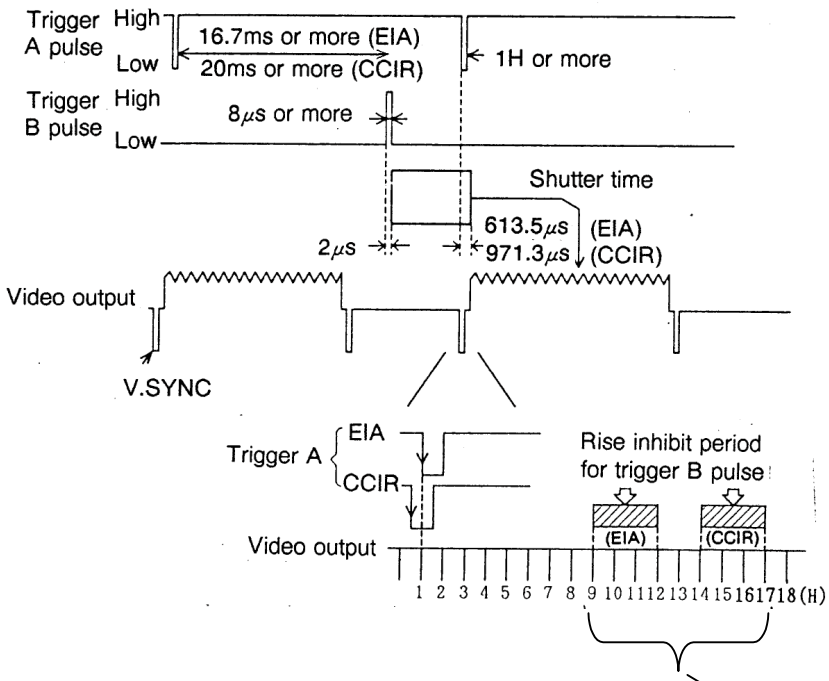
Only one field image is delivered by one trigger pulse, and a sync signal lasts till the next pulse.

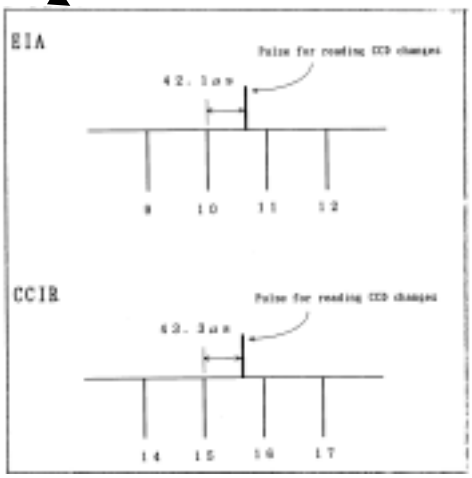
Trigger pulse

* 5Vp-p +0.5/-1.0Vp-p
* Low period: EIA: 16.7ms or more
  CCIR: 20ms or more
* High period: 8us or more

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8-2 TWO trigger mode





V.SYNC is reset by the falling edge of the trigger A pulse. (After reset, the first field is delivered.)

The shutter is started by the rising edge of the trigger B pulse.

The trigger B pulse is inhibited from the falling edge of the trigger A pulse to 9 to 12H(EIA) /14 to 17H(CCIR), and a correct picture is not obtained.

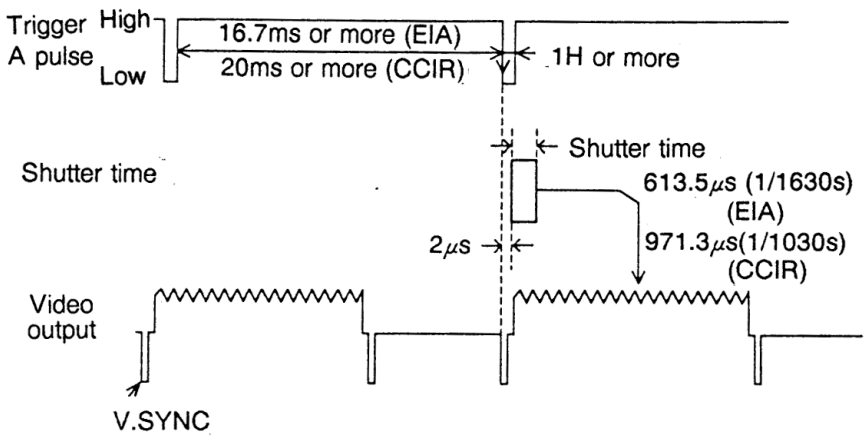
Trigger pulse

* 5Vp-p +0.5/-1.0Vp-p

* Trigger A:	Low period:	EIA: 63.5us or more
		CCIR: 64us or more
	High period:	EIA: 16.7ms or more
		CCIR: 20ms or more
* Trigger B:	Low period:	Not specified
	High period:	8us or more

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8-3 Fixed shutter mode: 1/1600s(EIA), 1/1000s(CCIR)



The shutter is started by the falling edge of the trigger A pulse, and at the same time V.SYNC is reset. (After reset, the first field is delivered.)

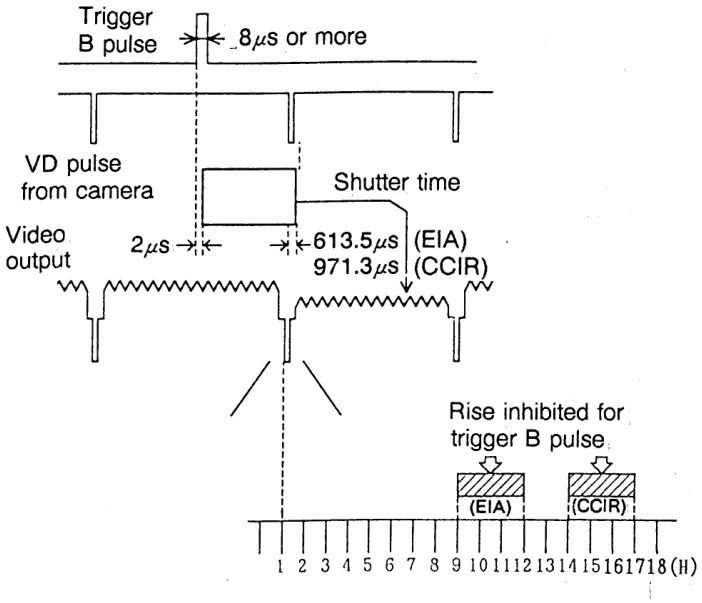
In this mode, the shutter speed is fixed to 1/1600s (EIA) / 1/1000s(CCIR). Only one field is delivered by one trigger pulse, and a sync signal lasts till the next pulse.

Trigger pulse

* 5Vp-p +0.5/-1.0Vp-p
* Low period: EIA: 63.5us or more
  CCIR: 64us or more
* High period: EIA: 16.7ms or more
  CCIR: 20ms or more

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8-4 External shutter control mode



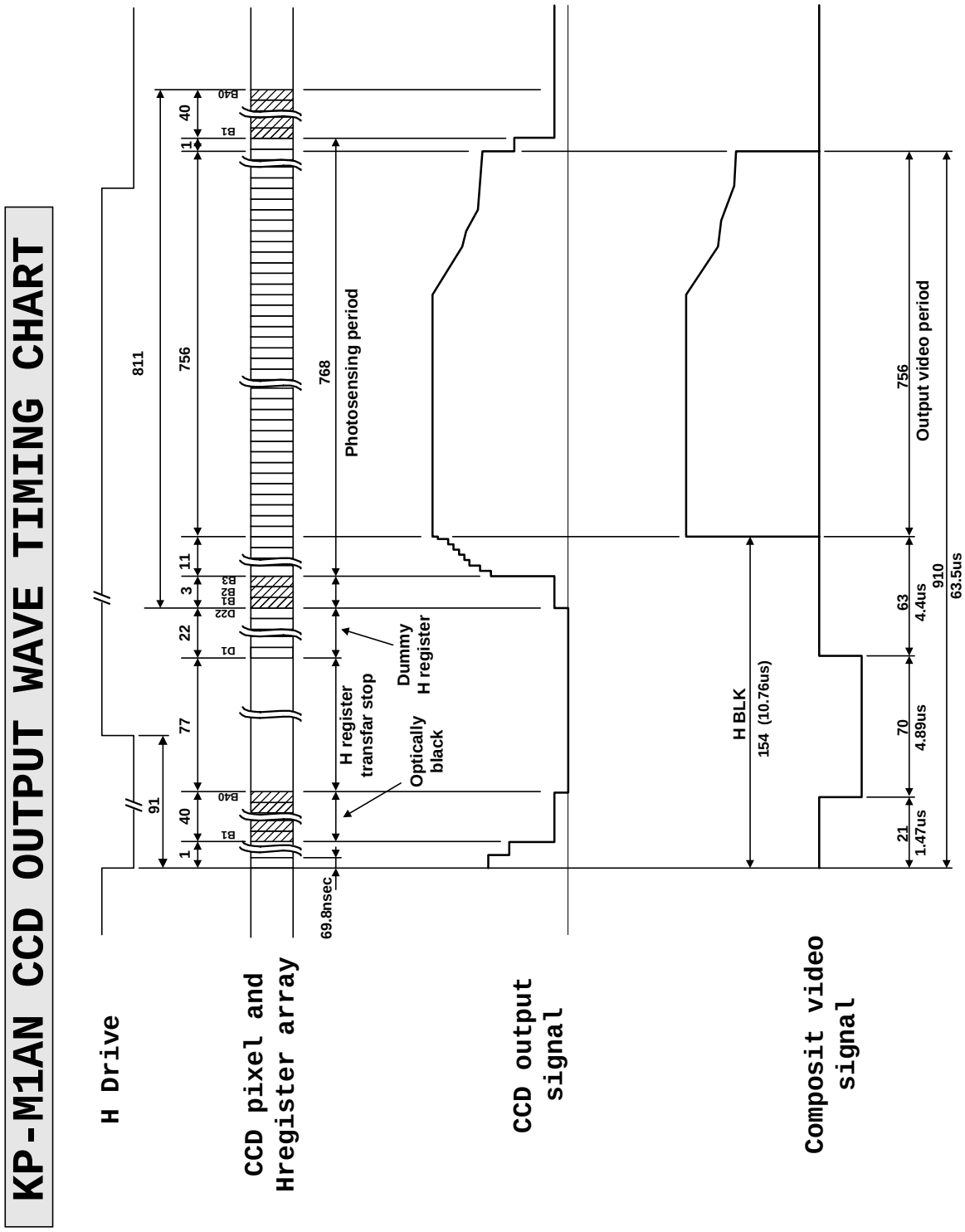
The shutter is started by the rising edge of the trigger B pulse. The shutter is effective only for the next field of the pulse input. When the trigger B pulse is not supplied the normal exposure results.
The V.SYNC pulse of the camera is not reset.

Trigger pulse

* 5Vp-p +0.5/-1.0Vp-p
* Low period: Not specified
* High period: 8us or more

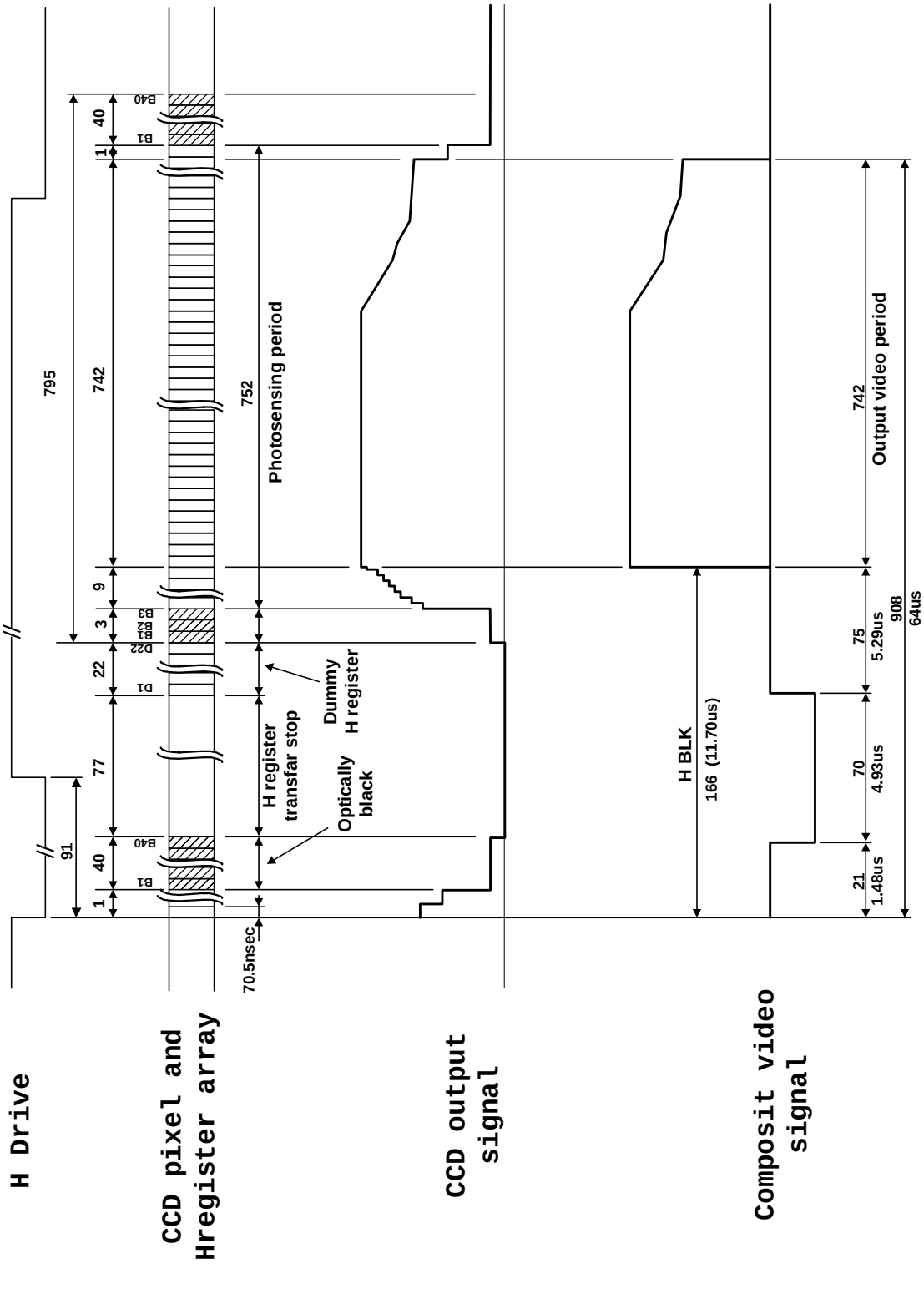
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9. Timing chart



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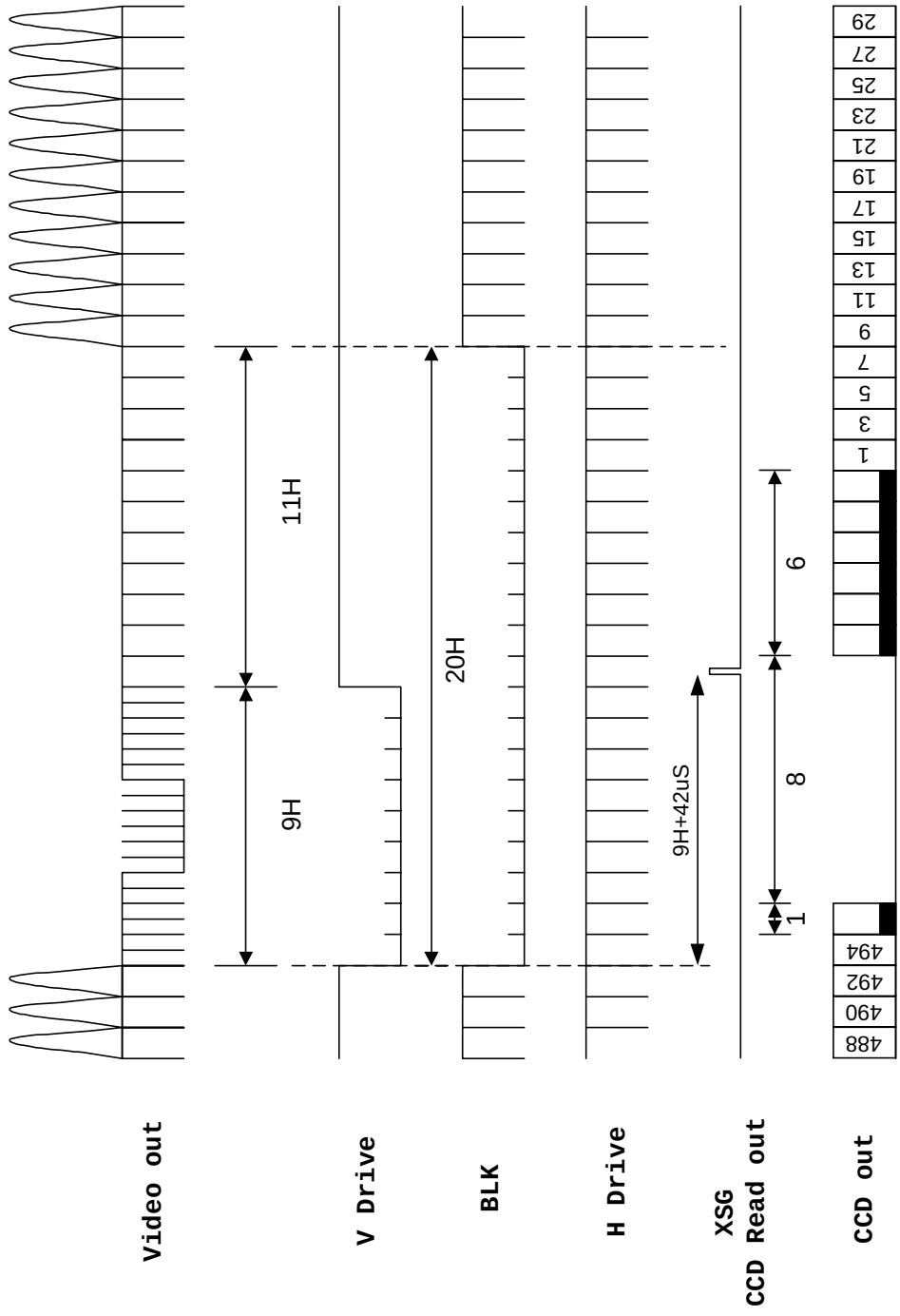
KP-M1AP CCD OUTPUT WAVE TIMING CHART



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KP-M1AN Timming chart

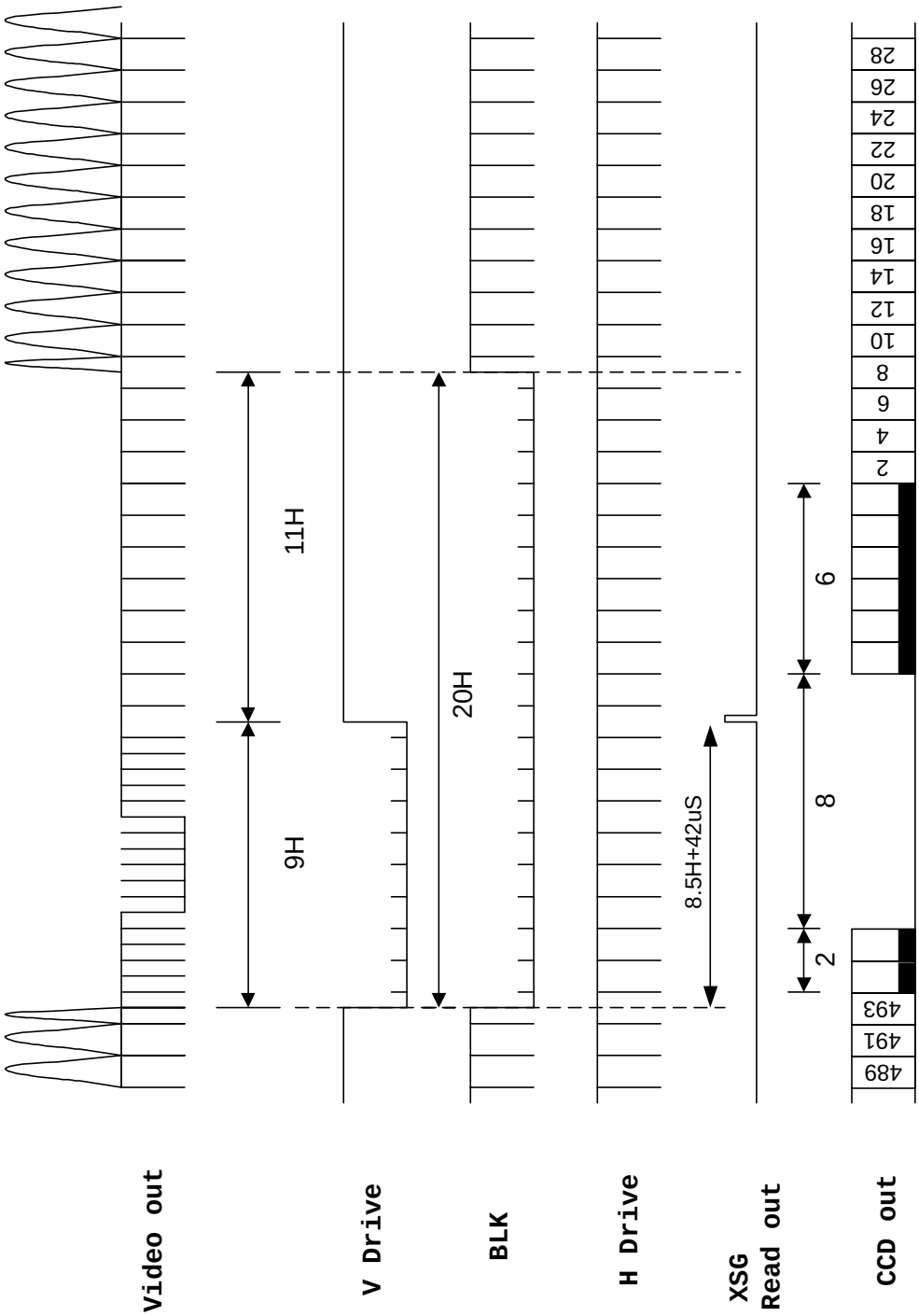
[ODD Field]



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KP-M1AN Timming chart

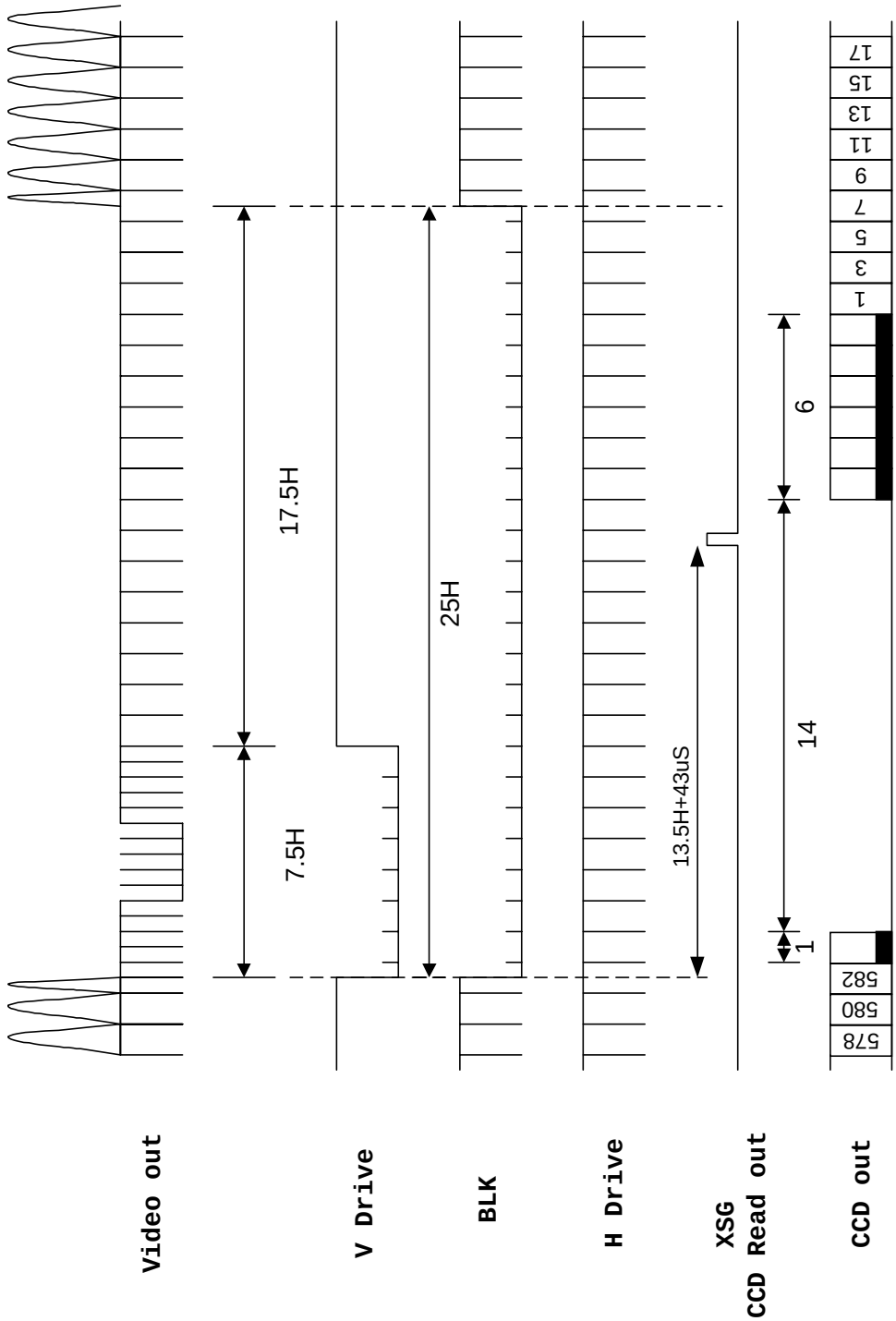
[EVEN Field]



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KP-M1AP Timming chart

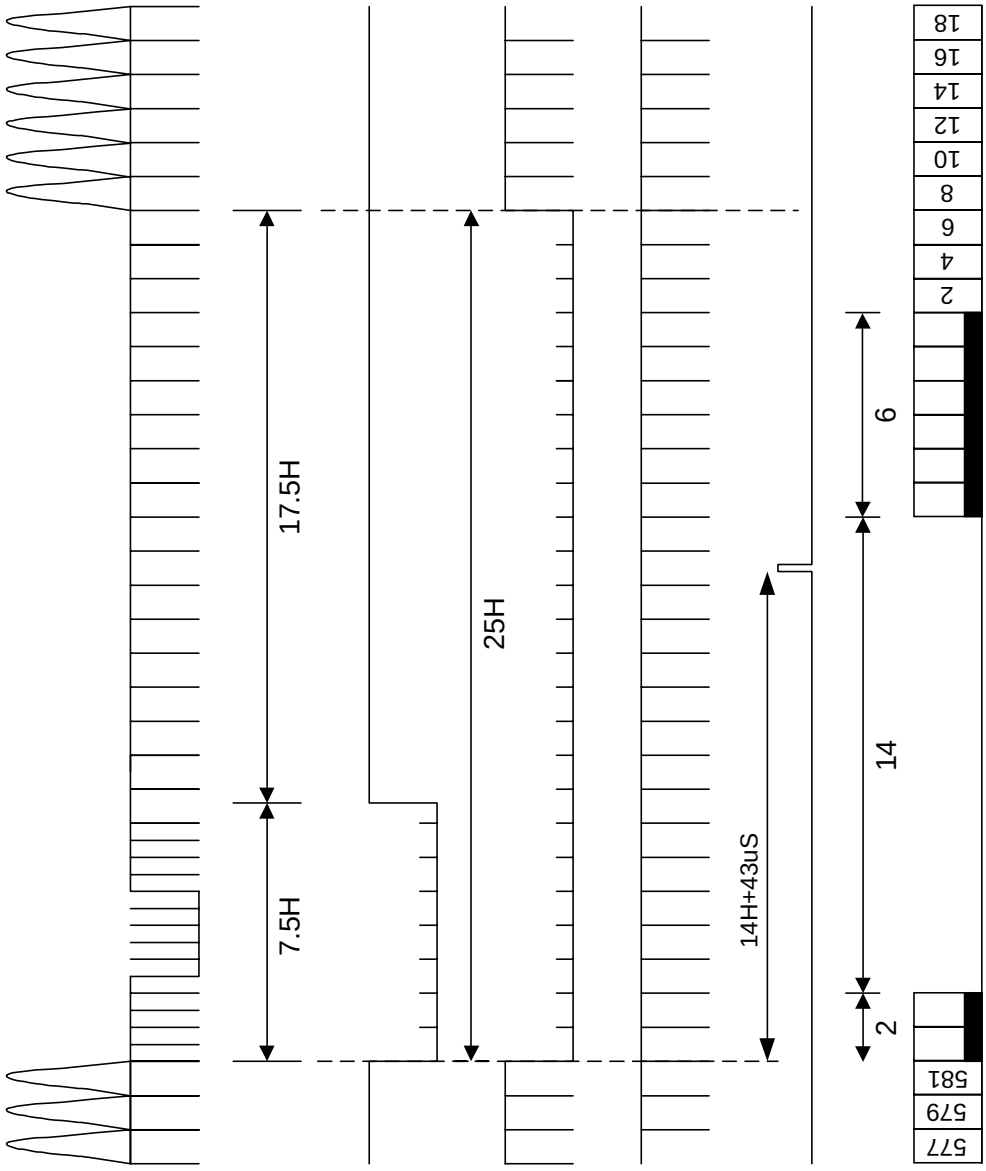
[ODD Field]



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KP-M1AP Timming chart

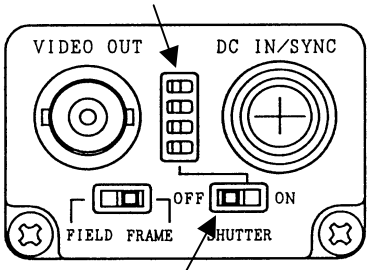
[EVEN Field]



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10. Electronic shutter

Shutter speed select switch



SHUTTER ON/OFF switch

Set the SHUTTER ON/OFF switch to ON, then set the speed with the shutter speed select switch.

Setting of shutter speed

Setting position	Speed (second)	Relative sensitivity	Setting position	Speed (second)	Relative sensitivity
(*1)	1/60(EIA) 1/50(CCIR)	1		1/500	1/8
				1/1000	1/16
	1/100(EIA) 1/120(CCIR)	1/1.5		1/2000	1/32
	1/125	1/2		1/4000	1/64
	1/250	1/4		1/10000	1/160

(*1) Or set the shutter ON/OFF switch to OFF.

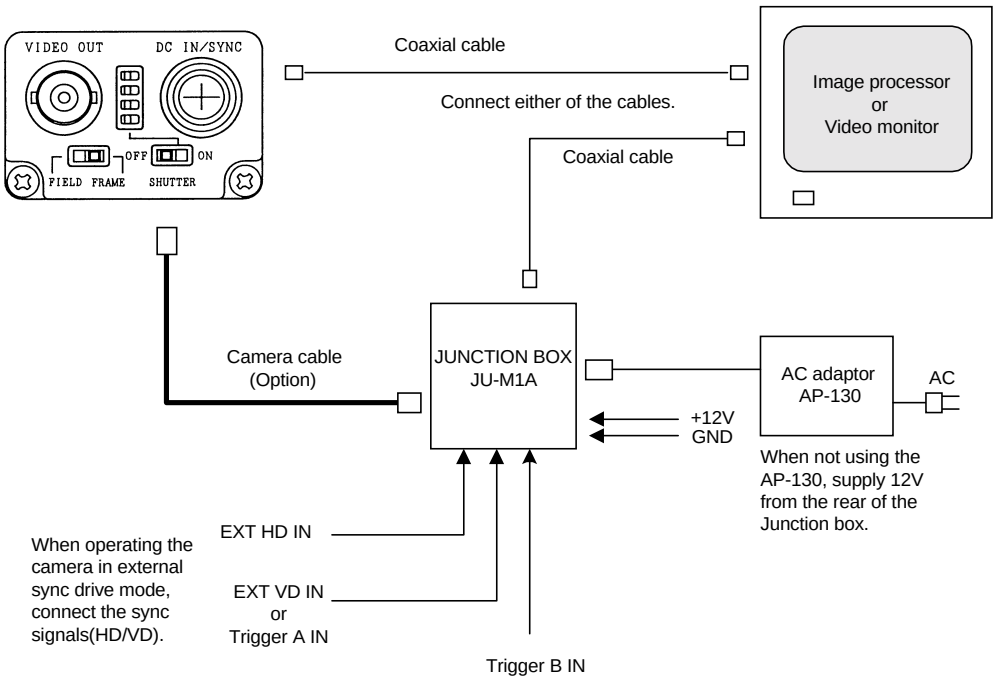
The higher the shutter speed, the greater the effect. However, since sensitivity lower, adjust the lens iris or increase illumination. And when the shutter is used, the flicker of an object may be emphasized. Use a light which causes no flicker, such as a DC lighting lamp.

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11. Connection

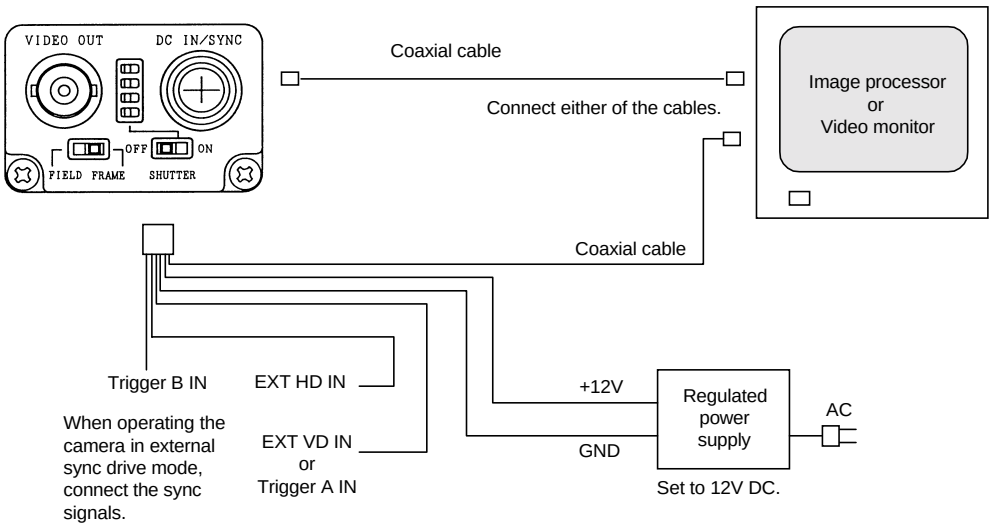
Connection of options

KP-M1A



Basic connection

KP-M1A



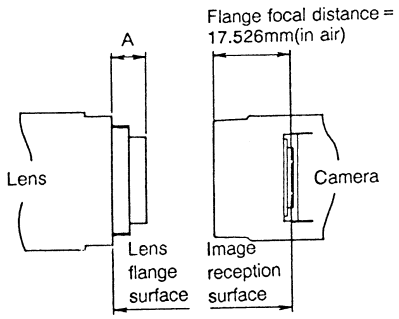
When Connecting more than one monitor, set the 75-ohm termination switch of the last unit only to ON.
When operating the camera in external sync drive mode, input the sync signal(HD/VD).
Available voltage rangeis 11 to 13V.
Before turning on an external power supply unit, be sure to check the polarities of the power supply.

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12. Optical system

12-1 Flange focal

- Image size: 2/3-inch
- The flange focal distance is 17.526mm(in air).
- Flange focal distance cannot be adjusted.

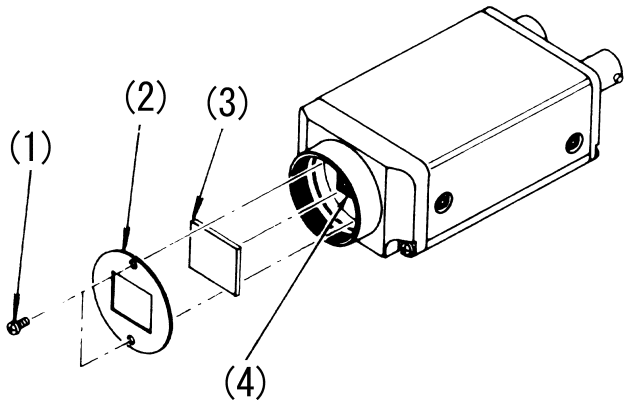


Note:

Select such a lens as the length (A) from the flange surface of the lens to the end of the screw side is 8mm or less.

12-2 Optical filler

This camera is provided with an IR cut filter.



IR cut filter removal

a) Remove two screws (1) shown in Fig., and filter holder (2) will come off.

b) Remove the IR cut filter (3) from filter frame (4).

c) Reinstall and secure filter holder (2) with two screws (1).

Caution

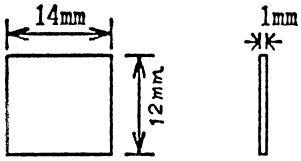
Prior to removing the optical filter, be sure to turn off the power.

IR cut filter IRC650

Dimensions: 14 x 12 x 1.0t

Part code: XMD0006

External view



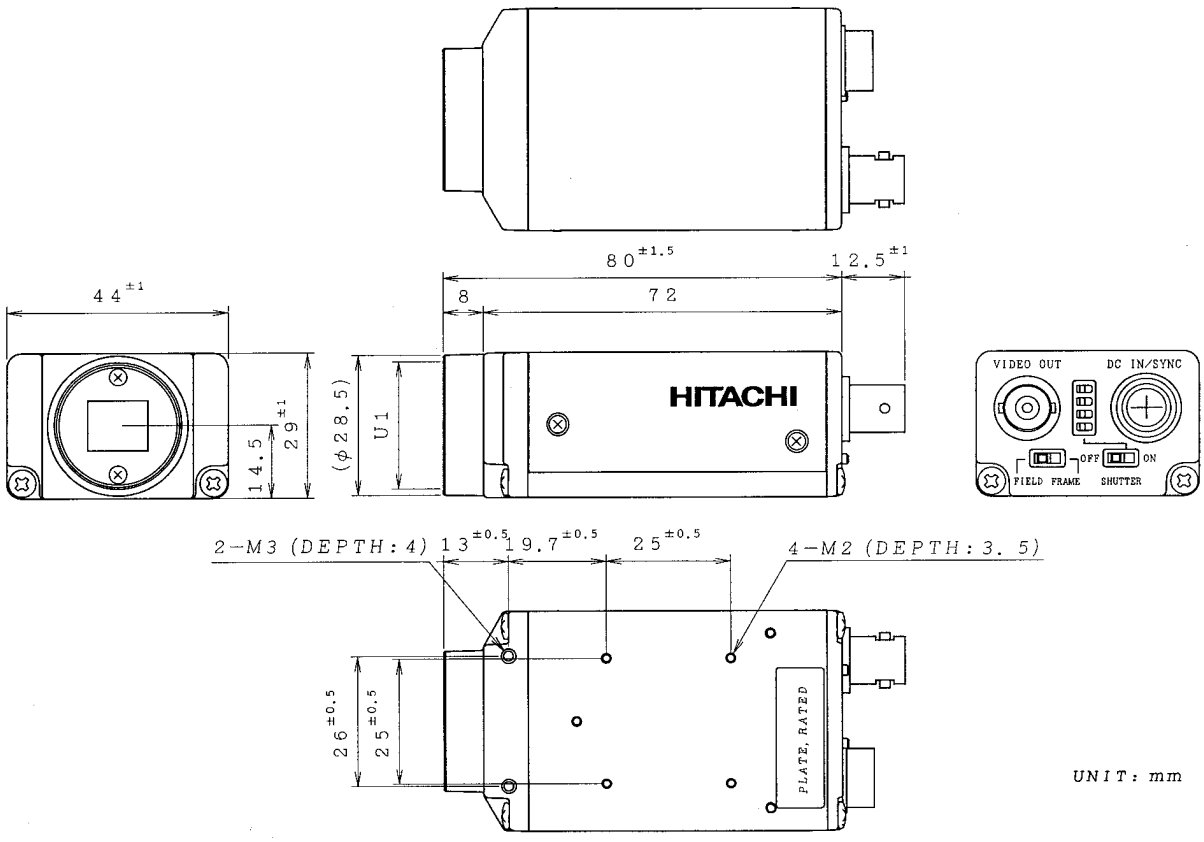
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13. Composition

1)Camera(With dummy glass, AR coated)

2)Operation manual

14. External view



15. Optional accessories

1)Tripod adapter, TA-M1

2)12-pin plug, HR10A-10P-12S(01)

3)Junction box, JU-M1A

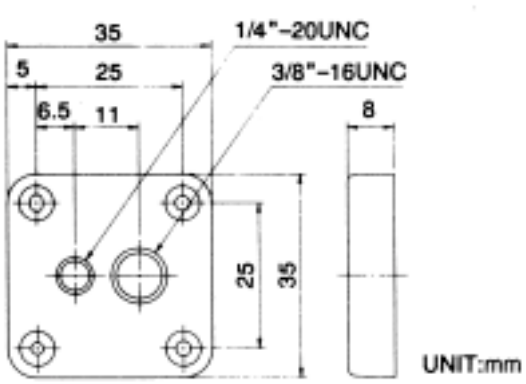
4)Dummy glass, ARC1214

5)Camera cables

	Mould Type	Assembly Type	Shield Type
2m	C-201KSM	C-201KS	C-201KSS
5m	C-501KSM	C-501KS	C-501KSS
10m	C-102KSM	C-102KS	C-102KSS

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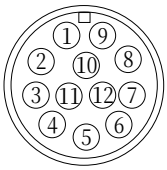
1) Tripod adaptor TA-M1



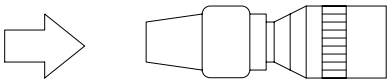
Secure the adaptor to camera mounting holes B, using four supplied screws(M2x5).

Note:
If the screws are too long, they will cause trouble to the camera.
Be sure to check the length before use.

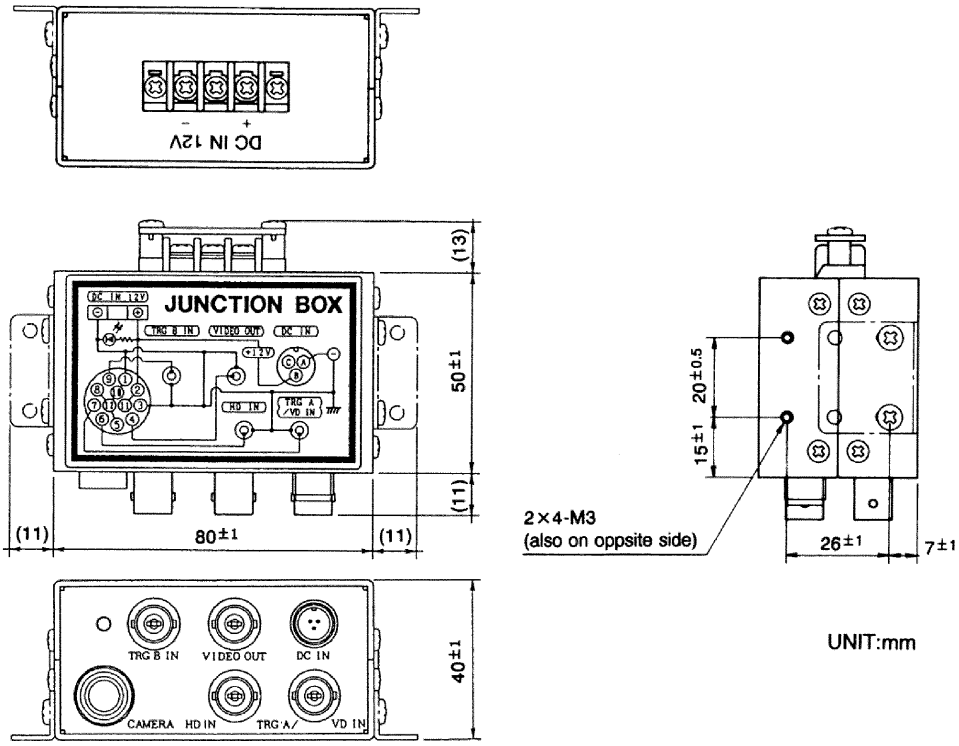
2) 12-pin plug HR10A-10P-12S(01) Product code: 23810AX



Viewed from this side



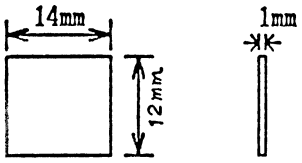
3) Junction box JU-M1A



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4) Dummy glass ARC1214 Parts code: XMD0009

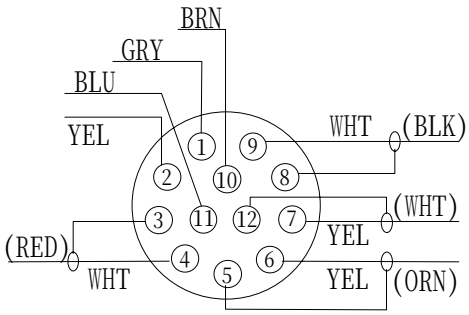
External view



5) Camera cables

Optional cables are available to connect the camera and the Junction Box JU-M1A.

Length	Type
2m	C-201KSM
5m	C-501KSM
10m	C-102KSM



- Voltage drop due to a cable is about 0.01V per meter.
- The H phase delays by about 5ns per meter.
- When using a cable only to supply power, use the C-201KSM(2m) cable.

Cables other than the above will be prepared upon request.

	Mould type	Assy type	Shielded type
2m	C-201KSM(23861AX)	C-201KS(23856AX)	C-201KSS(23872AX)
5m	C-501KSM(23862AX)	C-501KS(23857AX)	C-501KSS(23873AX)
10m	C-102KSM(23863AX)	C-102KS(23858AX)	C-102KSS(23874AX)

Specify assembly or shielded type at time of order.

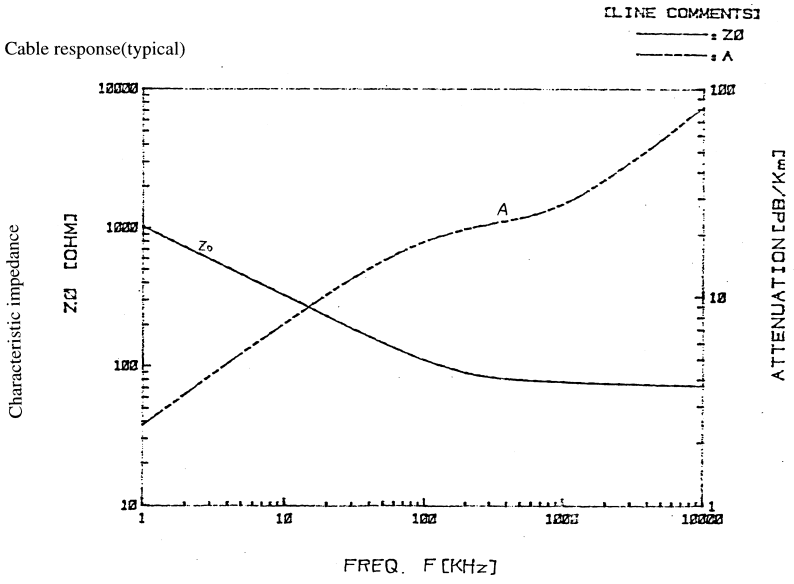
( ): Product code

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• Attenuation of video signal due to used cable
Attenuation due to optional cables C-501KSM and C-102KSM is shown below.
Attenuation is proportionate to the cable length.
Characteristic impedance is kept at constant even at cable length change.

	Cable length	Attenuation at 4MHz 50dB/Km	Attenuation at 7MHz 70dB/Km
Attenuation due to cable length(dB)	1m	0.05	0.07
	2m	0.1	0.14
	5m	0.25	0.35
	10m	0.5	0.7

The video bandwidth obtained by the KP-M1A is up to approximately 7MHz.



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16. Notes to users

◆ Power supply

- Connect a 12V DC voltage (11 to 13V) from an external regulated DC power supply.
- Use a stable power supply without ripple and noise.
- Prior to turning on the power switch , check that the polarities of the power cable are correct , referring to the connection diagram

◆ To protect CCD (sensor)

- Do not touch the glass surface of the CCD sensor to avoid deterioration in picture quality due to dirt and scratches.
- If the glass surface of the sensor should become dusty or dirty , remove dust or dirt carefully with a cotton-tipped applicator. Do not wipe the surface with dry cloth or paper tissue to avoid possible damage to the glass surface by static electricity.

◆ Protection of camera

- Do not use or store the camera under direct sunlight , at a place exposed to rain or snow , or at a place where flammable or corrosive gas is present.
- When housing the camera in a camera case , use the utmost care regarding rise of internal temperature.
- When casing the camera , the temperature normally rises by 10 to 20℃ , compared with the outside air temperature. The camera operates in the temperature range from -5 to 45℃. If the camera is used or left in high temperature environment for hours , the life of the camera may be shortened.
- Do not drop the camera. Do not apply strong shock or vibration to the camera.
- Before connecting or disconnecting a connector , turn off the camera and be sure to hold connector body to connect or disconnect the connector.

◆ Camera arrangement

- Mutual interference noise can occur if multiple cameras are arranged in close proximity. Separate the cameras to the extent possible.
- When camera units are installed directly into other equipment , external noise can prevent a normal picture. In such cases , shield the camera units.
- The camera can be damaged by static electricity. Use ample care when installing and arranging.

◆ Auto electric shutter

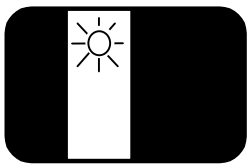
- In regions using 50 Hz power line frequency , flicker can appear on the monitor screen from light sources such as fluorescent or mercury. In such cases , release the auto electronic shutter.

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◆ Phenomena inherent to CCD imaging device

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

- 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.



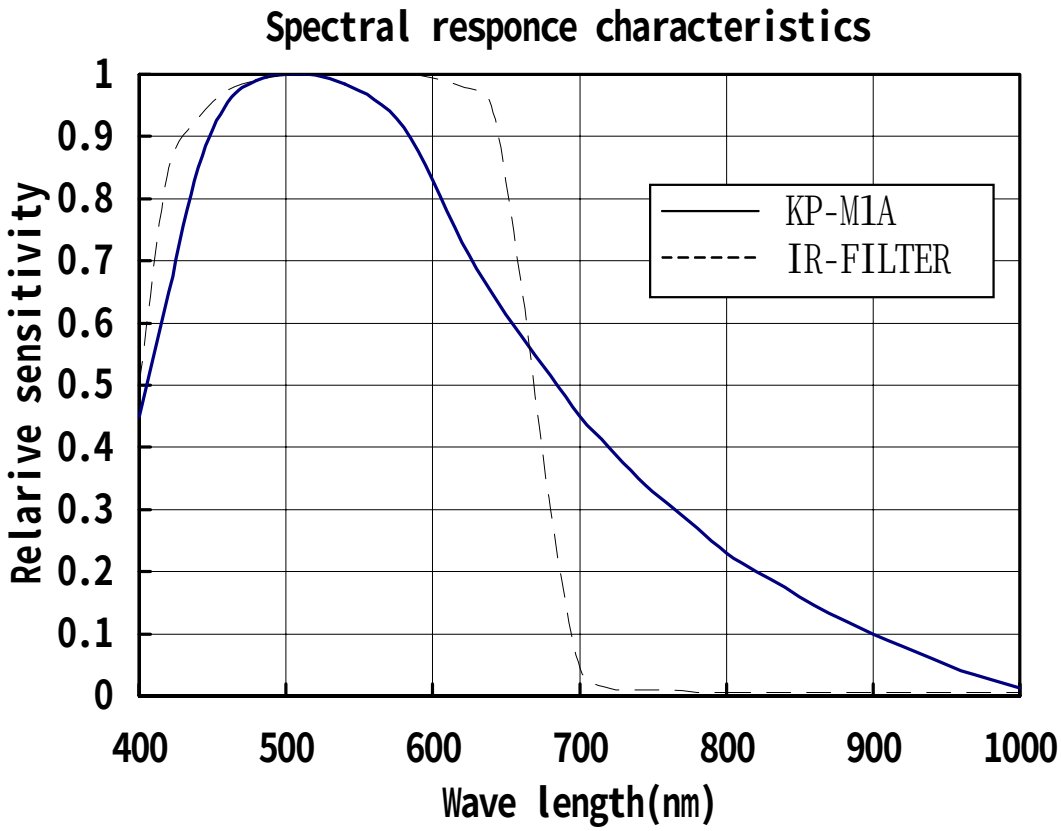
- Fixed pattern noise
- When the camera is operated in a high temperature , fixed pattern noise may appear on the entire screen.
- The higher the sensitivity of camera , the more this fixed pattern noise appears.
-
- Moire
- When fine patterns are shot , moire may be displayed.

◆

- The CE mark is required when exporting to Europe. Obtain the necessary authorization for the customer's system. Enclose the camera in a shielded case and use shielded cable.

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Spectral sensitivity (typical example)



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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 Kokusai Electronic guarantee that the equipment shipped from our factory conforms to the Hitachi Kokusai Electronic 's standard warranty conditions and perform quality control within the range necessary to perform the warranty.

Warranty and After-sales Service

(1) The guarantee period is one year after the date of purchase. However , the defects due to erroneous use or intentional act are excluded.

(2) As the defect after expiration of the guarantee period , Hitachi Kokusai Electronic will repair the equipment if the intended function is restored by the repair work , and the cost is changed to a customer.

(3) Hitachi Kokusai Electronic 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 the stable operation is required for a long time , it is recommended to perform periodical maintenance and inspection every year or every two years.

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