

Progressive Scan Type
Black and White Camera

KP-F102

OPERATION MANUAL

Please read this operation manual carefully for proper operation, and keep it for future reference.

Hitachi Kokusai Electric Inc.

CCDカメラ

KP-F102

取扱説明書

この取扱説明書には、あなたや他の人々への危害や財産への損害を未然に防ぎ、この機器を安全にお使いいただくために、守っていただきたい事項を示しています。ご使用になる前に、取扱説明書をよくお読みいただき、正しい使い方でご愛用ください。

お読みになった後も、この機器のそばなどいつも手元に置いてご使用ください。

株式会社 日立国際電気

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1. GENERAL

The KP-F102 is a high resolution monochrome (black and white) CCD camera utilizing a 2/3-inch size progressive scan pickup system, together with RS-232C control and full frame shutter. The output is non-interlace at 12 frames per second.

High resolution is supported by the 1.3 million picture elements (pixels), digital output, multi-step electronic shutter, external horizontal and vertical drive (HD and

VD) synchronization, partial scan, frame on demand and a host of other important functions. Control is via RS-232C, a de facto standard familiar to users of personal computers. The square lattice pixel CCD provides suitability for inclusion in high performance image processing systems.

2. MAJOR FEATURES

- RS-232C control
- Partial scan function
- Digital output is RS-644
- Frame shutter function
- Multiple step electronic shutter
- Frame-on-Demand function

3. COMPOSITION

Standard composition

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

Optional accessories

(1) Lens	
(2) Tripod adaptor,	TA-M1
(3) 12-pin plug,	HR10A-10P-12S(01)
(4) Junction box,	JU-F1 or JU-M1A
(5) Dummy glass (AR coated)	ARC1214
(6) Camera cables	2m: C-201KSM or KSS 5m: C-501KSM or KSS 10m: C-102KSM or KSS

4. NAME OF EACH SECTION

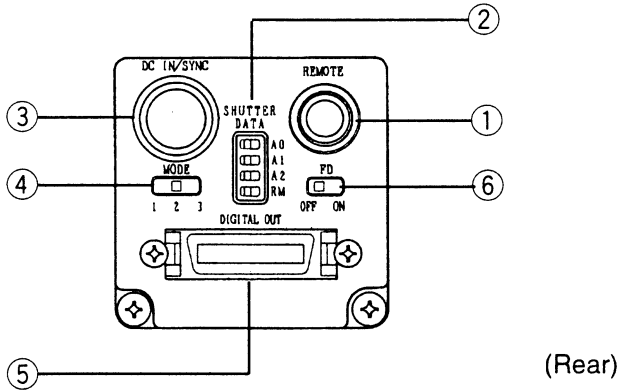


Fig. 1

(1) Remote connector

Connector for RS-232C control

(2) Shutter speed switches

Set shutter (readout) speed.

RM: Left position is 1/24 and right position is 1/12 second.

Set to 1/12 second (right position) when using electronic shutter or frame on demand functions.

(3) DC In/Sync connector

Connector for DC 12 V supply and external sync input.

(4) Mode switch

Set the following with Frame On Demand switch off.

1 : Electronic shutter off

2 : Electronic shutter on

3 : Do not use

Set the following with Frame On Demand switch on.

1 : Fixed shutter

2 : Two trigger

3 : Sync non-reset

(5) Digital output connector

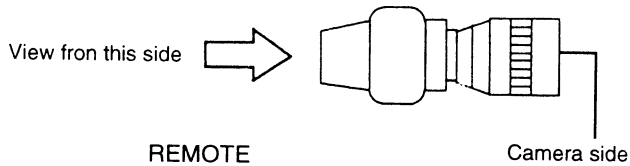
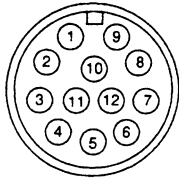
RS-644 digital data output.

(6) Frame On Demand switch

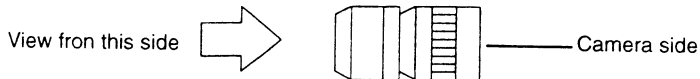
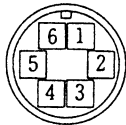
Set to on to use Frame On Demand function.

5. SIGNAL CONNECTION TO CONNECTOR

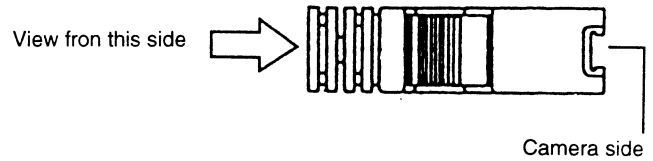
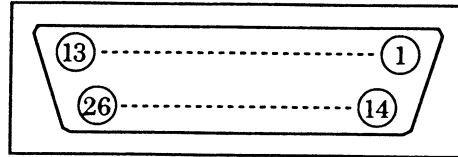
DC IN/SYNC
HR10A-10P-12S(01)
Product : 23810AX



REMOTE
HR10A-7P-6P(01)
Part code : JMH0092



DIGITAL OUT
DX30AM-26P
Part code : JMD0240



(1)Signal connections to DC IN and SYNC

Pin No.	Internal sync mode	External sync mode			
		HD/VD	Frame On-Demand		
			Fixed shutter	TWO Trigger	SYNC N. R.
1	GND	GND	GND	GND	GND
2	+12V	+12V	+12V	+12V	+12V
3	GND	GND	GND	GND	GND
4	—	—	—	—	—
5	—	EXT HD (GND)	—	—	—
6	—	EXT HD (SIGNAL)	—	—	—
7	—	EXT VD (SIGNAL)	TRIG-A (SIGNAL)	TRIG-A (SIGNAL)	TRIG-A (SIGNAL)
8	—	—	—	TRIG-B (GND)	—
9	—	—	—	TRIG-B (SIGNAL)	—
10	GND	GND	GND	GND	GND
11	+12V	+12V	+12V	+12V	+12V
12	—	EXT VD (GND)	TRIG-A (GND)	TRIG-A (GND)	TRIG-A (GND)

Note:

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

(2) Signal connections to DIGITAL OUT

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	DATA 0-H	8	DATA 3-L	15	DATA 7-H	22	VD-L
2	DATA 0-L	9	DATA 4-H	16	DATA 7-L	23	HD-H
3	DATA 1-H	10	DATA 4-L	17	DATA 8-H	24	HD-L
4	DATA 1-L	11	DATA 5-H	18	DATA 8-L	25	CLK-H
5	DATA 2-H	12	DATA 5-L	19	DATA 9-H	26	CLK-L
6	DATA 2-L	13	DATA 6-H	20	DATA 9-L		
7	DATA 3-H	14	DATA 6-L	21	VD-H		

- H : High

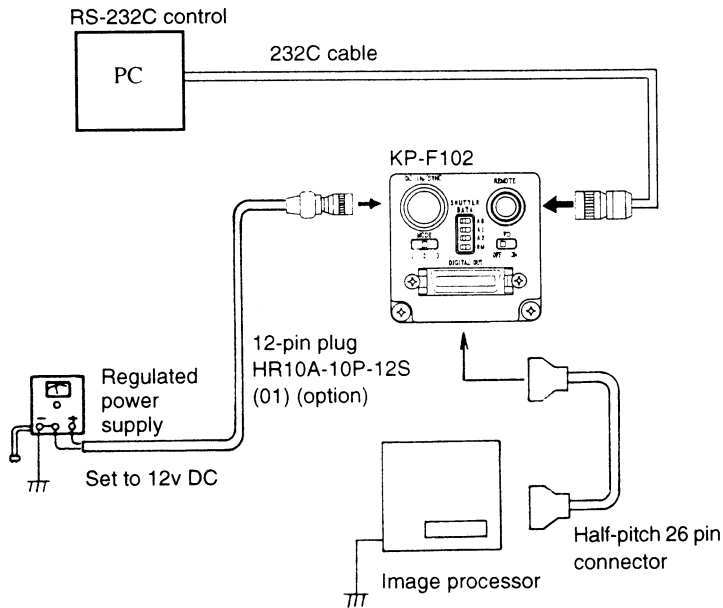
- L : Low

The digital out pin is not grounded.

Connect the ground terminal of a frame grabber or other equipment to the shield of the digital out cable.

6. HOW TO CONNECT CABLES

6-1 Basic connection

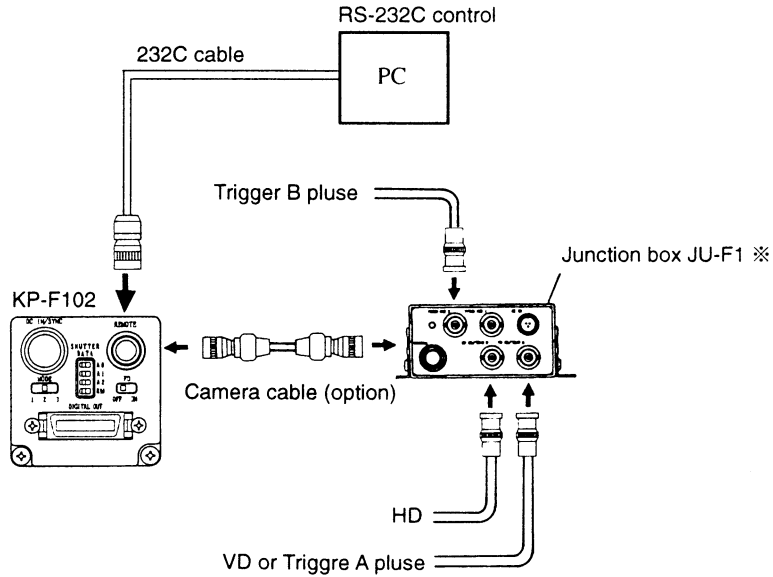


Note: The video signal cannot be fed simultaneously from both the VIDEO OUT connector and the DC IN/SYNC connector.

Fig. 2

- Supply sync signal (HD and VD) when using the camera with external drive.
- The permissible power supply range is 11 to 13 VDC. Supply stable power, free from ripple and noise.
- Be sure to confirm correct polarity before supplying power from an external power supply.
- For stable camera operation, ground external power supply and image processing equipment.

6-2 Connection of options



When operating the camera in external sync drive mode, connect the sync signal (HD/VD).

※ Note the following when using the JU-F1.

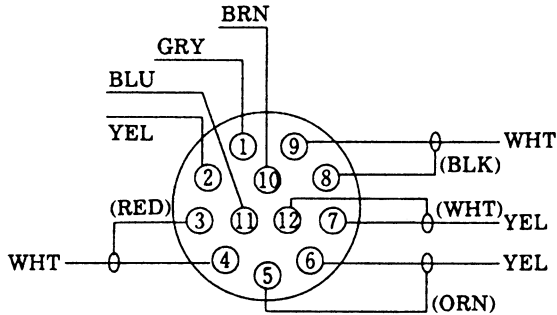
- 1) Apply the Trigger B pulse input to the VIDEO 2 connector.
- 2) The video signal output is not obtained from the VIDEO 1 and VIDEO 2 connectors.

Fig. 3

6-3 Optional cables

(1) Camera cable

Cables dedicated for connecting the camera head and the junction box JU-F1 are available as option.



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

Fig. 4

- 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 cable C-201KSM (2m).

Note

Use the following cables in European areas.

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

7. OPTICAL SYSTEM

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

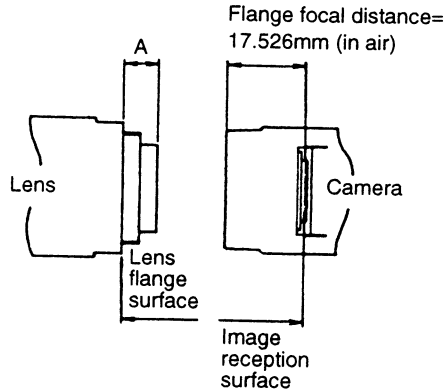


Fig. 5

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.

8. OPTICAL FILTER

This camera is provided with an IR cut filter.

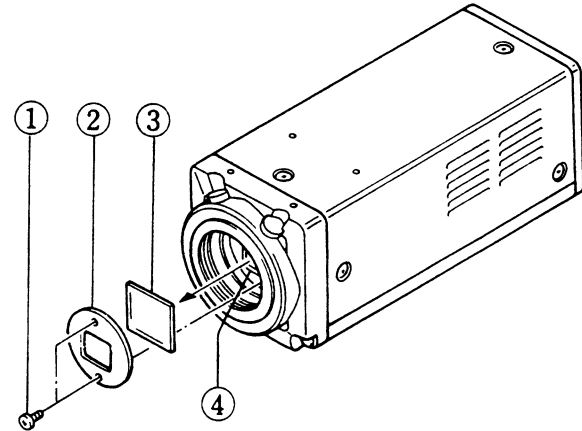


Fig. 6

How to remove the IR cut filter.

- (1) Remove two screws ① shown in Fig. 6, and filter holder ② will come off.
- (2) Remove the IR cut filter ③ from filter frame ④.
- (3) Then, reinstall and secure filter holder ② with two screws ①.

Caution

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

9. ARRANGEMENT OF INTERNAL SWITCHES

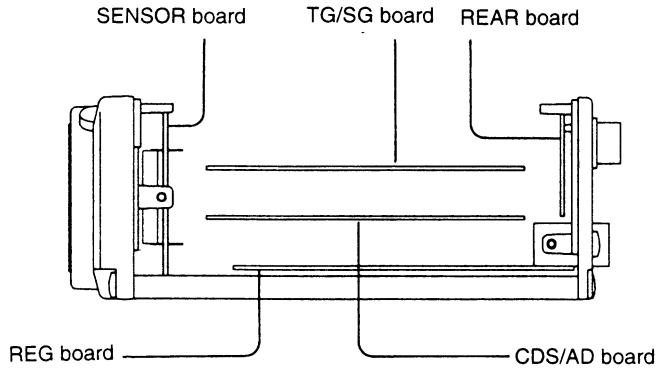
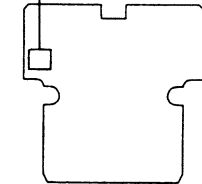


Fig. 7

Caution

1. Prior to switching the switch, be sure to turn off the power.
2. Do not turn on the power with the cover removed.
3. Do not touch to parts other than specified.

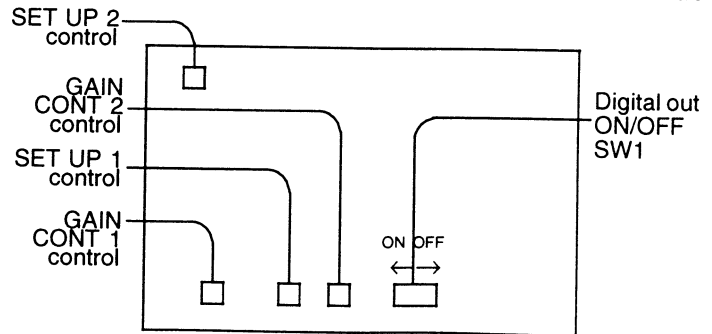
Sub voltage setting



Sensor board interior

Sensor side

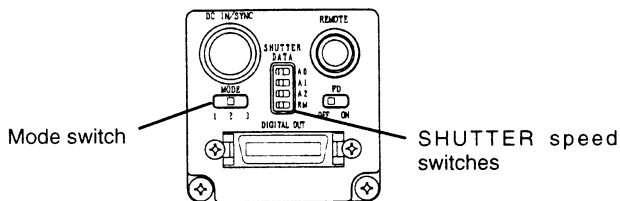
Rear side



CDS/AD board top

10. HOW TO USE ELECTRONIC SHUTTER

Set the FD switch to off and the mode switch to 2, then set the shutter speed switches.



Setting of shutter speed


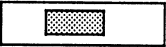

Speed (second)	1/30	1/60	1/125	1/250	1/1000
Setting position					
Speed (second)	1/2000	1/4000	1/10000		
Setting position					

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

11. SETTING OF FRAME-ON-DEMAND FUNCTION

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

1.  Set the Frame On Demand switch to on.
ON

2.  Set the mode switch.
1
-  2
-  3
- 3 : Sync non-reset

Note: In the same manner, set the electronic shutter speed for the fixed shutter and sync non-reset modes.

12. EXTERNAL SYNCHRONIZATION

When operating the camera by external drive 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.

- Input signals

HD and VD signals

HD : $f_{(H)}=12.528\text{kHz} \pm 1\%$

VD : $f_{(V)}=12\text{Hz} [f_{(V)}=f_{(H)} \div 1044]$

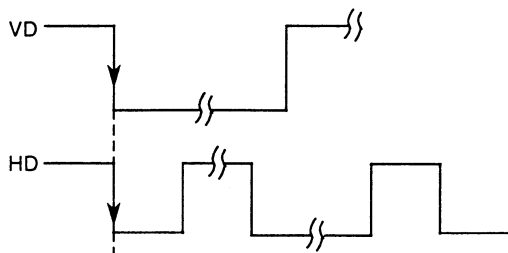
- Input level

HD 4 to 6Vp-p, negative

VD Corresponds to CMOS level 5 Vp-p $\begin{matrix} +0 \\ -1.0 \end{matrix}$
negative

- Input impedance 1k ohms

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

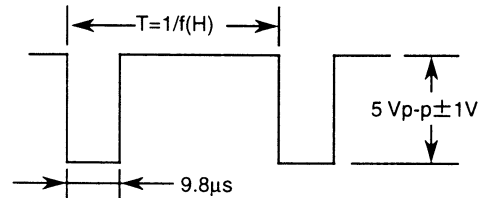


Adjust the phases so that the falling edges of HD and VD are in phase ($0 \pm 1.0\mu\text{s}$).

Fig. 8

- Input waveforms

- Horizontal drive signal (HD)



- Vertical drive signal (VD)

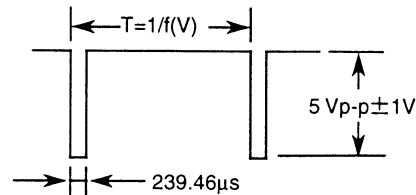


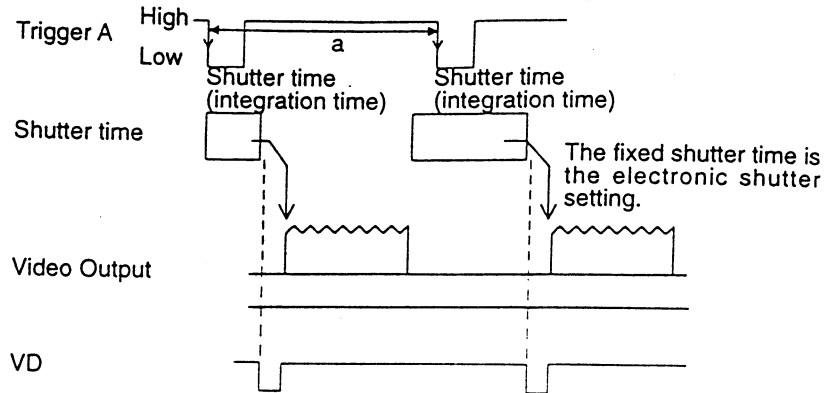
Fig. 9

13. FRAME-ON-DEMAND FUNCTION

Frame-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 three modes. However, one image output is obtained per trigger.

• Fixed shutter mode

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



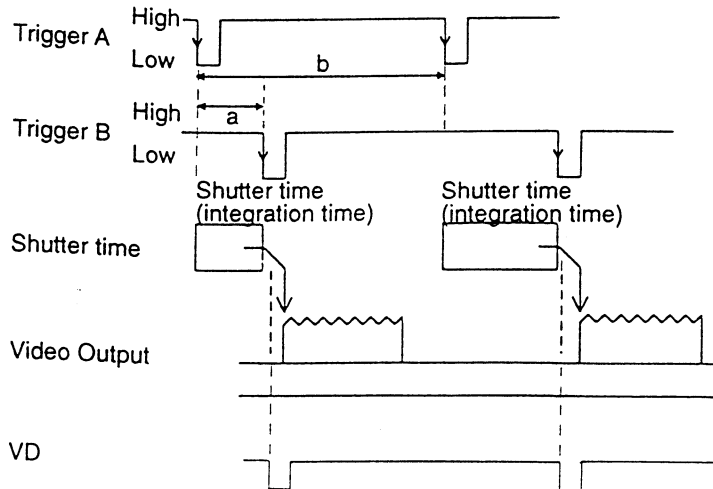
Trigger specifications

- Corresponds to CMOS level 5 Vp-p $\begin{matrix} +0 \\ -1.0 \end{matrix}$
- a: 85 ms + exposure time
Negative pulse (duty less than 50%)

Note : Use a sync signal free of noise.

•Two trigger modes

Two trigger pulses are input. Exposure starts at the Trig-A falling edge and ends at the Trig-B 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

- CMOS level 5 V_{p-p} +0
- a: 1/30s~1/10000s -1.0

Trigger A Negative pulse (duty less than 50%)
85 ms + exposure time

Trigger B Negative pulse (duty less than 50%)
85 ms + exposure time

Note : Use a sync signal free of noise.

• Sync non-reset mode

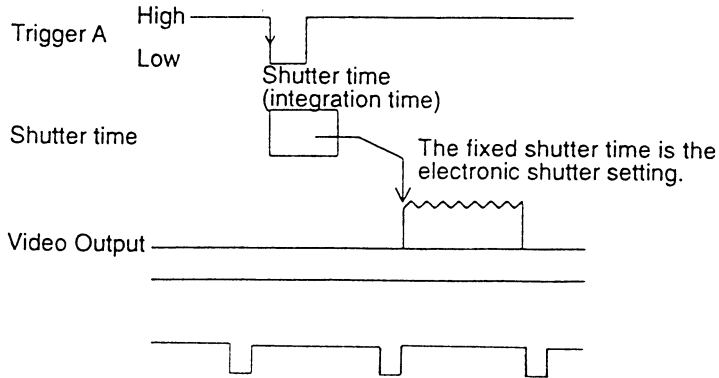
Apply one trigger pulse (TRIG-A) input.

The exposure at the pulse falling edge is the time set by the rear panel fixed shutter switch. After exposure, the video output is obtained at the next frame (V sync is not reset).

Trigger specifications

- CMOS level 5 Vp-p $\begin{matrix} +0 \\ -1.0 \end{matrix}$

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



16. RS-232C control

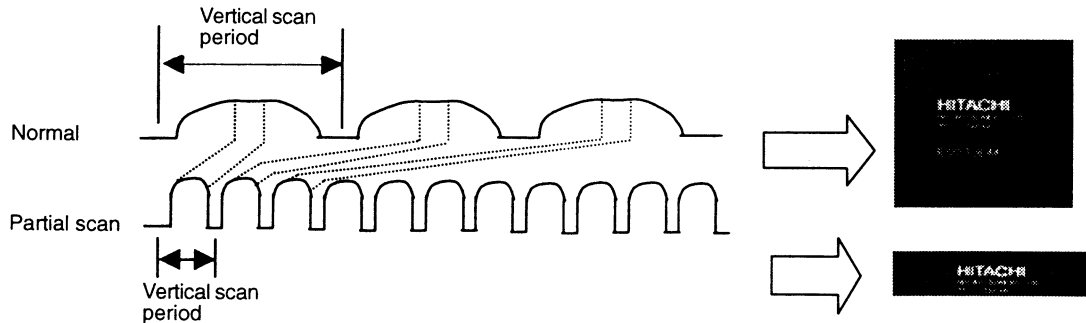
The KP-F102 can be controlled from the camera rear panel and from a personal computer via RS-232C. The main control items are indicated below. The RS-232C control mode is engaged automatically by connecting the computer serial interface (D-SUB 9 pin) to the 6 pin connector on the camera rear panel.

- FD (frame on demand)
Fixed shutter, two trigger, sync non-reset
- Gain
Gain 0 dB, 6 dB, 12 dB modes
Fine adjust
- Partial scan
Normal, fixed shutter
- Black level (adjust)
- V-binning

Consult dealer regarding protocol.

15. Partial scan function

The frame rate is increased by reading part of the CCD image.



Normal mode frame rate

Operating range(V direction)	Period T	Frame rate (frame/sec)	Remarks
16H	6.9	145	Shutter speed 1/250, 1/1000, 1/2000, 1/4000, 1/10000 and shutter off
32H	8.1	122	
64H	10.5	94	
128H	15.4	64	
256H	25.2	39	
512H	44.8	22	

Fixed shutter mode frame rate

Operating range(V direction)	Trigger period T (ms)	Remarks
16H	Exposure time + $6.9 \leq T \leq 83.3$	Shutter speed 1/30, 1/60, 1/125, 1/250, 1/1000, 1/2000, 1/4000, 1/10000 and shutter off
32H	Exposure time + $8.1 \leq T \leq 83.3$	
64H	Exposure time + $10.5 \leq T \leq 83.3$	
128H	Exposure time + $15.4 \leq T \leq 83.3$	
256H	Exposure time + $25.2 \leq T \leq 83.3$	
512H	Exposure time + $44.8 \leq T \leq 83.3$	

Note

The first frame image may be disrupted during partial scan operation.

Partial scan and V-BINNING function can not be activated simultaneously.

14. SPECIFICATIONS

(1) Imaging device:	Interline CCD	(13) Signal-to-noise ratio	50dB
No. of total pixels	1360(H)×1034(V)	(14) Electronic shutter	1/10000, 1/4000,
Pixel pitch	6.7(H)×6.7(V)μm		1/2000, 1/1000, 1/250,
No. of effective pixels	1300(H)×1030(V)		1/125, 1/60, 1/30s
(2) Sensing area:	8.71(H)×6.9(V) mm		(External switch
	(2/3-inch size)		selectable)
(3) Lens mount	C-mount		OFF mode: Normal
(4) Flange focal distance	17.526mm (Not		exposure (Factory
	adjustable)		setting)
(5) Hor. scanning frequency	12.528kHz	(15) Gamma correction	1
(6) Vert. scanning frequency	12Hz	(16) Frame-on-Demand	
(7) Sync system	Internal/external	function	ON/OFF: Externally
	(automatically switchable)		switchable Fixed shutter
(8) Int. sync operation	non-interlaced		and TWO trigger mode
(9) Ext. sync input	HD: 4 to 6Vp-p,		selectable by External
	VD CMOS level 5 Vp-p $\begin{matrix} +0 \\ -1.0 \end{matrix}$		switch.(Factory setting:
	negative		OFF)
	Input impedance: 1kΩ		External trigger input is
	Frequency deviation:		required.
	±1%		SYNC non-reset can be
(10) Video output	• Digital output RS-644		set.
	Data:single channel	(17) Power supply	12VDC±1V
	10bits, 20.2MHz	(18) Power consumption	400mA or less
(11) Sensitivity	400 lx, f4, 3200K	(19) Ambient conditions	Operating: 0 to 40°C,
(12) Minimum illumination	1 lx, f1.4, AGC:ON, no IR		90%RH or less Storage:
	cut filter		-10 to 50°C, 70%RH or
			less

- (20) Anti-vibration** 3G max. (3directins, 30 minutes each)
- (21) Resistance to shock** 30G
(Drop test, once each top, bottom, left and right)
- (22) Dimensions** 44(W)×44(H)×110(D) mm
- (23) Mass** 230g approx.

(24) RS-232C control

(a) Communication system

- Control system Asynchronous
- Transmission rate 9600 bps
- Data length 8 bits
- Start bit 1
- Stop bits 2
- Parity None
- Bit transfer LSB first

(b) Communication control method

Overall control of transmission is from the communication software. Data send/receive (BSC handshake) by sending text data to the camera control CPU.

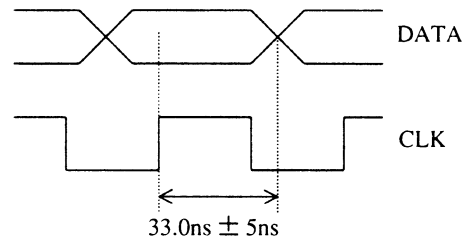
(c) Control items

① Shutter speed

(1/30, 1/60, 1/125, 1/250, 1/1000, 1/2000, 1/4000, 1/10000)

- ② FD(Frame-on-demand) (ON/OFF)
- ③ MODE (Fixed shutter, Two trigger, SYNC NON-RESET)
- ④ V-BINNING (ON/OFF)
- ⑤ GAIN 0dB, 6dB, 12dB mode/fine adjustable
- ⑥ BLACK-LEVEL Fine adjustable
- ⑦ Partial scan OFF/ON (ON: 16H, 32H, 64H, 128H, 256H, 512H)

(25) Digital output



*Specifications are subject to change without notice.

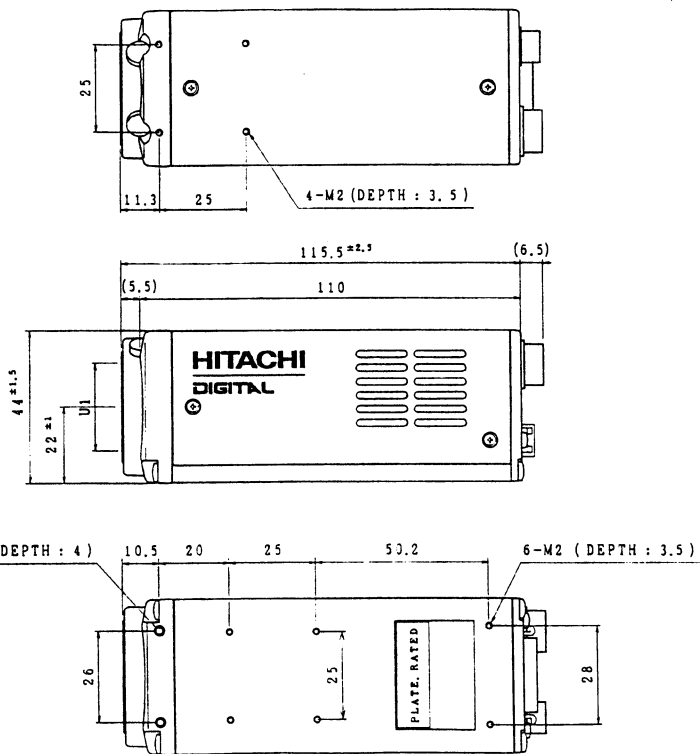
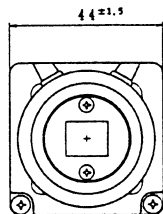
17. EXTERNAL VIEW

Camera KP-F102

Caution

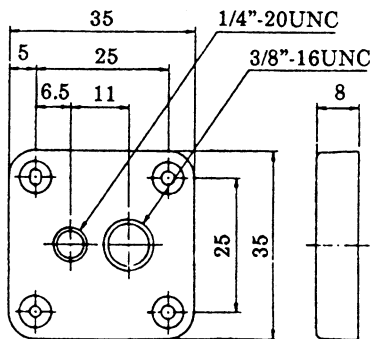
For installation of the camera use camera mounting holes A, B or C.

When a heavy lens is used, or when excessive shock or vibration is applied, fix the lens to the equipment, too.



UNIT : mm

Tripod adaptor TA-M1 (option)



UNIT:mm

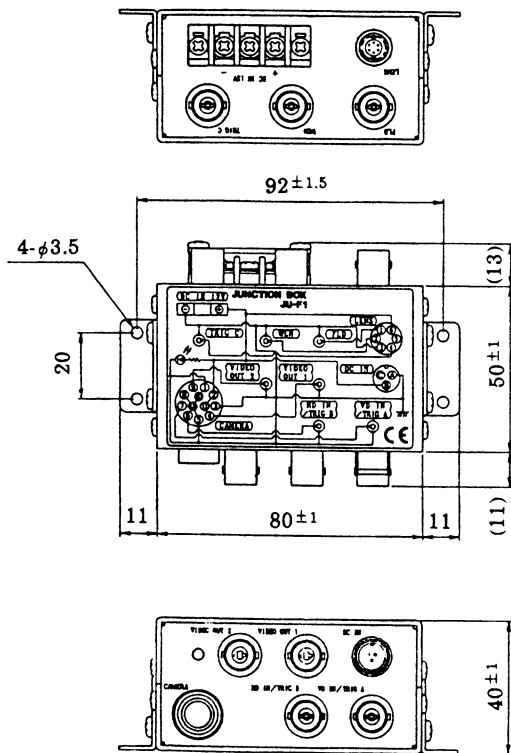
Secure the adaptor to camera mounting holes B or C, using four supplied screws(M2×5).

Note

If the screws are too long, they will cause trouble to the camera.

Be sure to check the length before use.

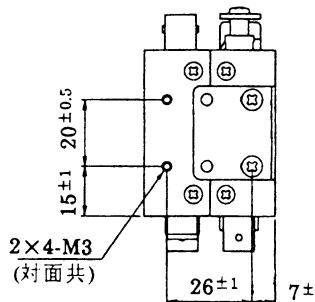
Junction box JU-F1(option)



Connect power supply to these terminal when the AP-130 is not used.

Notes:

- * Supply voltage ranged 11 to 13 V.
- * Make sure voltage polarity before connection of an external power supply.
- * Use an external power supply other than the AP-130 at your own risk.



※ See signal connections on pages 4 and 7.
 MASS : APPROX. 200g
 UNIT:mm

保証書

形式		製造番号	
KP-F102			
お買上げ年月日		保証 期間	1 年
※ 年 月 日			
お客様	ご芳名	様	
	ご住所	〒	
		TEL	
販売店	店名 住所	※	
		TEL	

※印欄に記入のない場合は無効となりますから、必ず記入の有無をご確認ください。

この製品は、厳密なる品質管理のもとで検査を経て、お届けしたものです。

お客様の正常なご使用状態で、万一故障した場合には保証規定により修理いたします。

- 本品についての故障修理その他お問い合わせはお買上げ販売店または最寄りのサービス窓口へご連絡ください。
- 本保証書は再発行いたしませんので、大切に保存してください。

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保証規定

- 弊社は保証期間内に万一製造上の不備に起因する故障が発生した場合は、弊社のサービス担当において無料で修理いたします。
 - 保証期間内に無料修理を受ける場合は、お買上げ販売店または弊社サービス窓口にて製品と本書をご提示の上、依頼してください。
 - 次のような場合には保証期間内でも有料修理になります。
 - (1) 使用上の誤りにより生じた故障
 - (2) 弊社のサービスマン以外の手による修理または改造により生じた故障
 - (3) 撮像素子(CCD)の焼付
 - (4) 高温環境(40℃以上)での連続使用による故障
 - (5) 他の機器から受けた障害(たとえば周囲の強力な磁界など)
 - お買上げ後の移動、輸送、落下冠水などによる故障
 - 火災、塩害、ガス害、異常電圧、地震、落雷、風水害、その他天災地変などによる故障
 - お客様のご要望により出張サービスを行った場合の出張料金
 - 本保証書にお買上げ年月日、販売店名の記入がない場合、あるいは字句が書き替えられた場合
 - この保証書のご提示がない場合
4. 本保証書は日本国内においてのみ有効です。
This warranty is valid only in Japan.