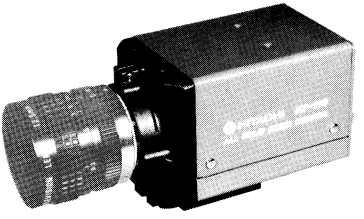
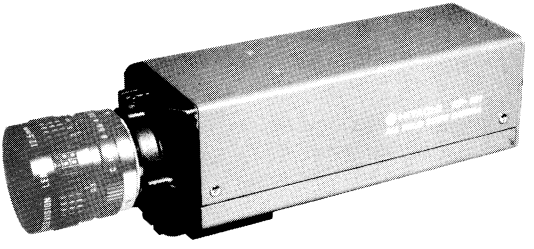
MODELS KP-180/181

ALL SOLID-STATE SHUTTER CAMERAS

OPERATION MANUAL



KP-180



KP-181

Hitachi Denshi, Ltd.

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER.
NO USER–SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Explanation of Graphical Symbols

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure; that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

NOTE FOR USERS IN THE UNITED KINGDOM:

IMPORTANT:

The wires of the mains lead are coloured in accordance with the following code:

Green and Yellow: EARTH
Blue: NEUTRAL
Brown: LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

- The wire which is coloured Green and Yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured green and yellow.
- The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured black.
- The wire which is coloured Brown must be connected to the terminal which is marked with the letter L or coloured red.

WARNING: This apparatus must be earthed.

MODELS KP-180/181
ALL SOLID-STATE SHUTTER CAMERAS
Operation Manual

1. INTRODUCTION

The Hitachi KP-180/181 are black-and-white TV cameras employing a solid-state imaging device instead of a conventional pickup tube.
The KP-180 consists of a camera unit and an AC adaptor AP-130. The KP-181 is a self-contained camera.

2. GENERAL

The Hitachi KP-180/181 are all solid state black-and-white TV cameras using a high sensitivity solid state imaging device and the electronic shutter.
Since the cameras can shoot objects on the conveyor or other moving objects without blur, they are ideally suited for video processing applications.
The solid state imaging device ensures no geometric distortion or burning, and also a low level of lag.

3. FEATURES

- There is no need to use a strobo because the electronic shutter circuit developed by Hitachi is adopted. Compared with mechanical shutters, the reliability of the electronic shutter is greatly improved.
- The speed of the electronic shutter is set to 1/600 sec and the blur occuring when shooting a moving object is 1/10 of the conventional cameras.
  The shutter mode and the normal mode is switchable according to the purpose of shooting.
- A high sensitivity solid state imagning device with 510 horizontal and 492 vertical picture elements provides a clear and sharp picture. [500(H) x 582(V) for CCIR]

Note: The model and serial numbers of your SHUTTER CAMERA are important for you to keep for your convenience and protection. These numbers appear on the name-plate located on the bottom of the products. Please record these numbers in the spaces provided below, and retain this manual for future reference.

Model No. _____ **Serial No.** _____

- The dynamic white suppress circuit ensures a high quality picture with a proper white level even for highly contrasted scenes.
- Internal and external sync modes.
  The external sync mode is automatically established when the external drive signals (HD, VD) or the composite video signal (VS) is supplied to the EXT connector.
- The horizontal drive signal (HD), the vertical drive signal (VD), and the composite sync signal (SYNC) are available from the KP-180/181, so that the camera can be used with external and peripheral equipment.
- The KP-180/181 can be used as an image processing sensor, since the pedestal level of the composite video signal is clamped at zero volts DC.
- No geometric distortion, no burning, and a low lag.
- The solid state imaging device provides long service life and high reliability.
- Usable as a visual sensor in various applications.

COMPOSITON

	KP-180	KP-181
(1) Camera	1	1
(2) EE/ES lens plug	1	1
(3) External sync plug	1	1
(4) Fuse 125V 0.63A	0	1
(5) Operation Manual	1	1

Option:

For the KP-180: AC adaptor AP-130
12V DC input plug R03-P3F

4. PRECAUTION

4.1 Protection of the solid-state imaging device

* Do not touch the faceplate of the solid-state imaging device. The image deteriorates with dirt and scratches.
* If the faceplate of the solid-state imaging device becomes dirty, do not wipe it with a dry cloth or a paper to avoid possible damage to the faceplate. Moreover, static electricity caused by cleaning can cause damage to the imaging device.
  When cleaning the faceplate, breathe on the faceplate until being clouded, then clean it with a cotton stick gently once in a second as shown in Fig. 1.

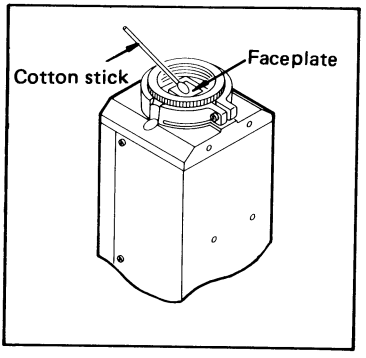


Fig. 1

* Mount the lens or the supplied cap on the camera to protect the imaging device from dust.

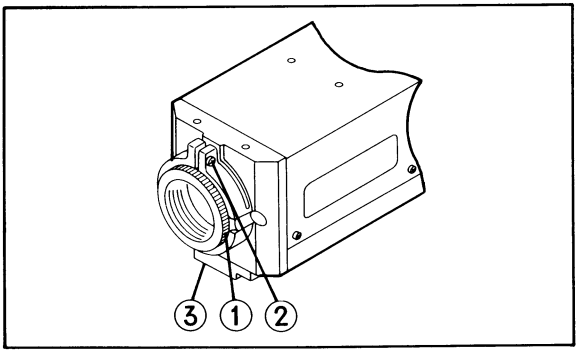
4.2 Protection of the camera

* Do not expose the camera to the direct sunlight, rain, or snow.
* Do not locate the camera near inflammable and explosive substances.
* Do not subject the camera to heavy shock or vibration.
* Although the camera can operate in the range of -10 to 50°C (14 to 122°F), the life may be shortened if it is used or stored in the higher temperature than 40°C (104°F) for a long period.
  Avoid continuous using of the camera for a long time in a high temperature place.
  To continuously use the camera for a long period, avoid installing it in such a high temperature place. Also avoid installing it in a high humidity place which may cause malfunction.

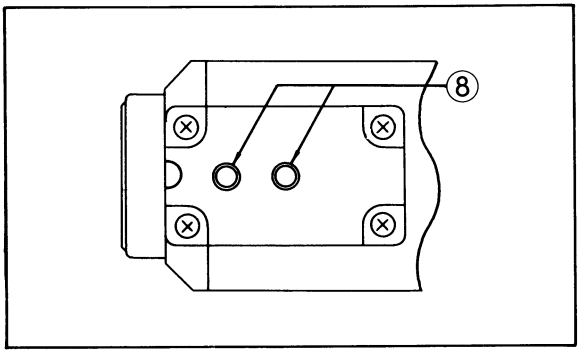
4.3 Connection

* When the KP-180 is operated on 12V DC from an external power supply:
  - Before turning on the POWER, check if the polarity is correct as shown in Fig. 5
  - Regulate the power in the range of 11 to 14V.
* Turn off the POWER, before connecting or disconnecting the connector, holding the plug, not the cable itself.
* When the camera is installed without using the tripod adaptor, use proper screws. Longer screws may cause damage to the thread groove of 2.5 mm.
* To operate several cameras in external sync mode, use an external sync generator.
* When several cameras are used at short distance, each other, use them in external sync mode or separate them each other as far as possible to avoid noise interference.

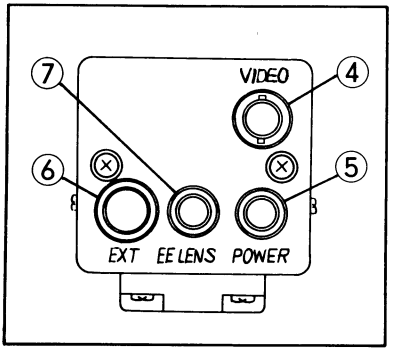
5. NAME OF PARTS, AND THEIR FUNCTIONS



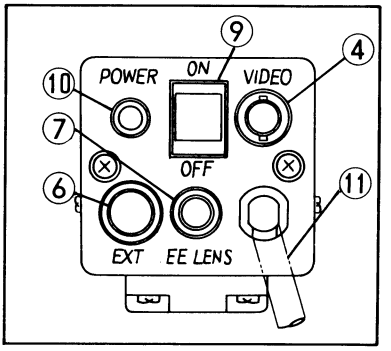
Front View



Bottom View



Rear View of the KP-180



Rear View of the KP-181

Fig. 2

① **Lens mount ring:**

Mount a C-mount lens.

② **Lens mount fixing screw:**

Used to secure the lens mount for flange back adjustment. (See Page 19.)

③ **Tripod adaptor:**

Used to secure the camera on a tripod with the fixing screws. This tripod adaptor can be mounted on the top of the camera. The camera can be directly mounted with four screws after removing the tripod adaptor.

④ **Video signal output connector (VIDEO):**

Provides the composite video signal from the camera to a video monitor or other units through a coaxial 75-ohm cable. (BNC connector)

⑤ **DC power connector (POWER) (KP-180 only):**

Connect the optional AC adaptor AP-130. (See Page 7.)

⑥ **External signal connector (EXT):**

Provides output signals to external equipment. (See Page 10.)
This connector is also used to connect an external sync signal.

⑦ **EE LENS connector:**

For connecting cable from an EE/ES lens. (See Page 9.)

⑧ **Camera mounting holes:**

Used to mount the camera (1/4-20 UNC). Depth of screw is 7 mm.

⑨ **Power switch (POWER ON/OFF) (KP-181 only):**

⑩ **Power indicator (KP-181 only):**

Light when the POWER switch is ON.

⑪ **AC power cord (KP-181 only):**

Connect to a mains supply.

Note:

When power switch is turned to ON soon after it is turned to OFF, the power may not be supplied correctly, because the protection circuit in the camera is activated. In this case, turn on power switch after several minutes.

Mounting on Tripod

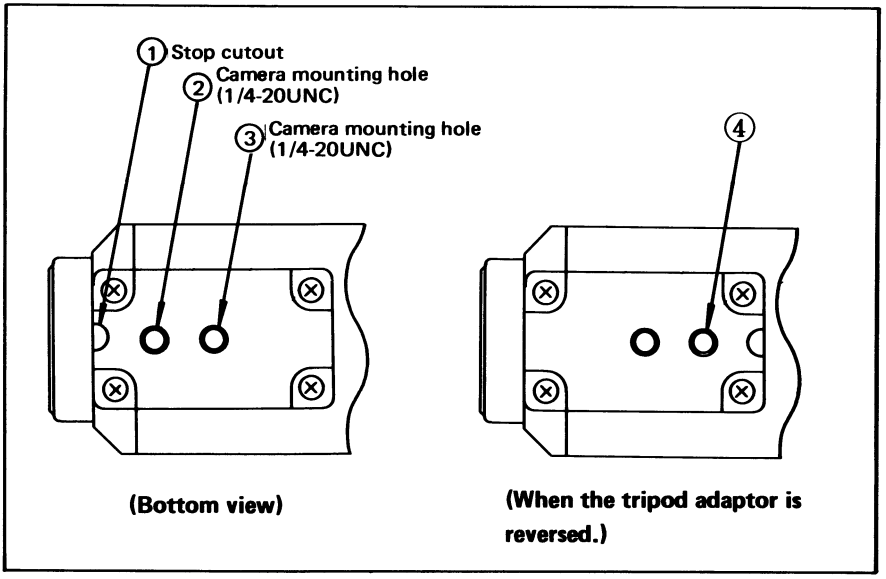


Fig. 3

The camera has two camera mounting holes (② and ③) as shown above.
To balance the camera, use the hole ③ for mounting a tripod when using a light-weight lens (100 g (0.22 lb) or less for the KP-180). In this case, the camera mounting hole ② can be used as a stop for the tripod.
When a lens is heavy (100 g to 1 kg (0.22 lb to 2.2 lb) for the KP-180), use the hole ②. In this case, the cutout ① can be used as a stop.
When a lens of the KP-181 is light-weight (500 g (1.1 lb) or less), reverse the tripod adaptor as shown above, and use the hole ④.

6. CONNECTIONS

6.1 Typical connections

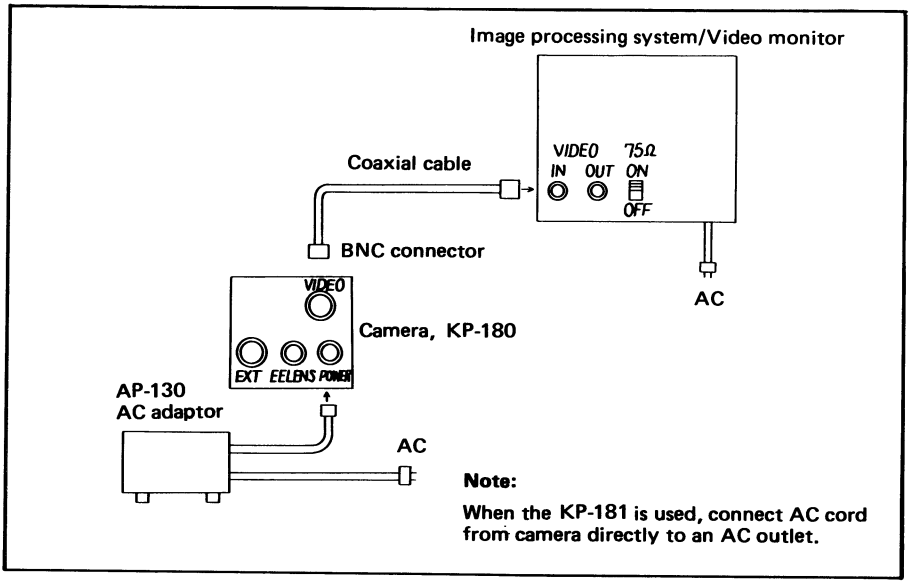


Fig. 4 Typical connection

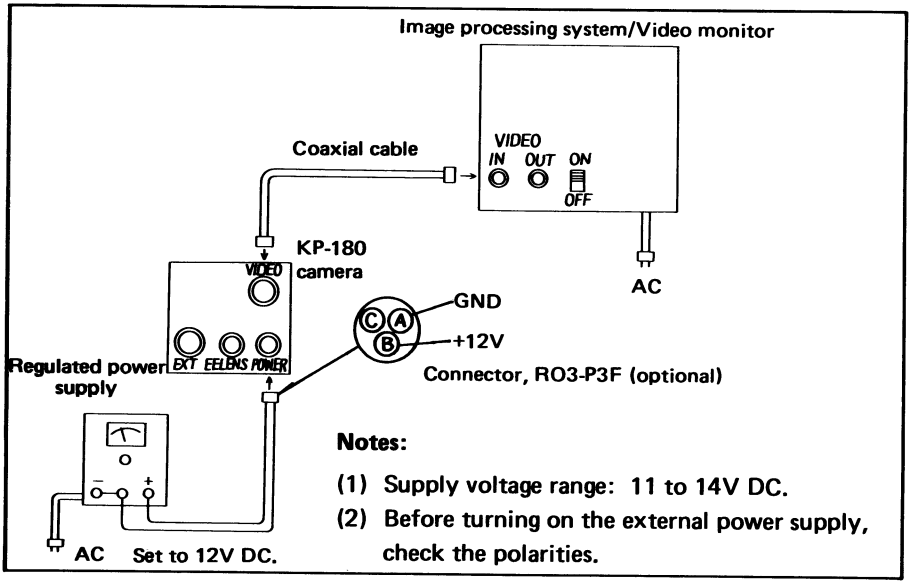


Fig. 5 Connection of regulated power supply

6.2 When connecting plural video monitors

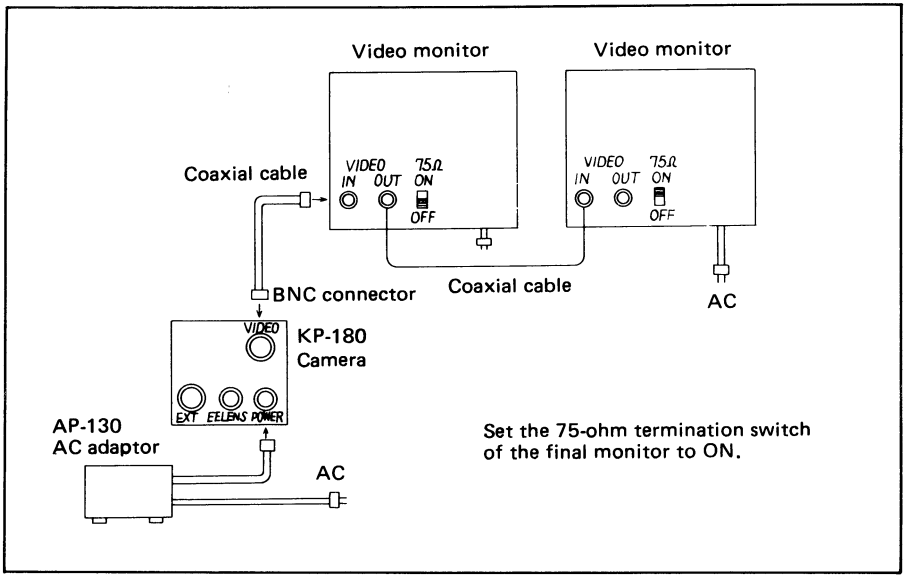


Fig. 6

6.3 When external drive signals are used.

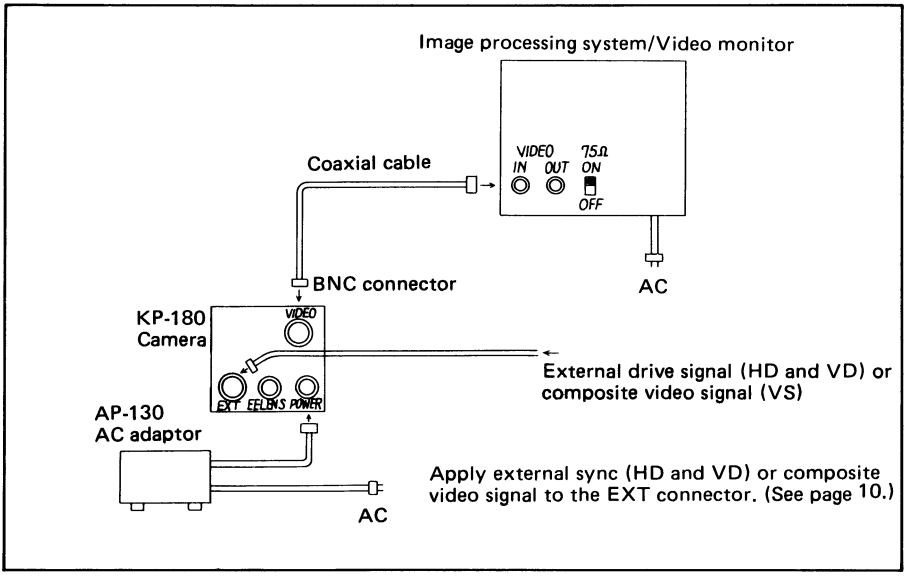


Fig. 7

7. CONNECTION OF EE(ES) LENS

When shooting an object with a slight change, in brightness the lens iris can be fixed. However, when brightness changes, the lens iris requires to be adjusted according to the illumination.

To automatically adjust the lens iris, an EE or ES lens is used.

Connect the cable connector of the EE or ES lens to EE LENS connector on the rear of the camera.

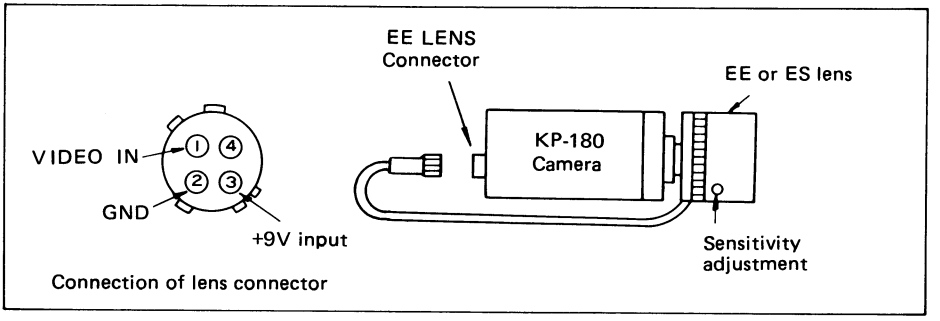


Fig. 8

Notes:

(1) The required power supply for the EE(ES) lens is 9V and 35 mA max. Use the applicable EE(ES) lens.
When an EE(ES) lens of different voltage and current is used, use an external power supply unit.

(2) Since most ES lenses have a sensitivity adjustment hole, adjust for the optimum sensitivity by a screwdriver.

8. CONNECTION OF THE EXT CONNECTOR

The EXT connector is an input/output connector which is supplied with external sync signal and feeds out horizontal drive signal (HD), vertical drive signal (VD) and sync signal (SYNC).
For details, refer to Items 9, 10 and 11.

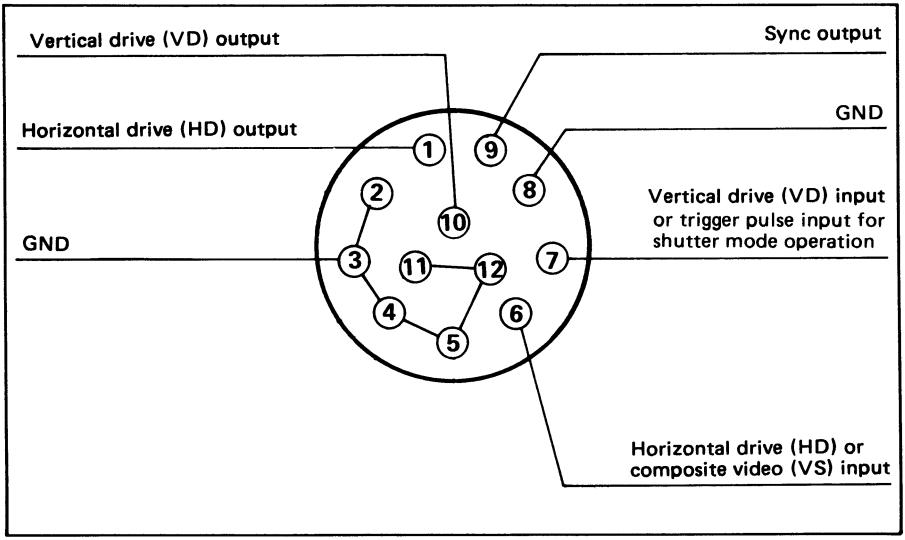


Fig. 9

9. EXTERNAL SYNC MODE (2:1 INTERLACE)

To drive the camera by the external sync signal, connect the sync drive signals (HD and VD) or the composite video signal (VS) to the EXT connector.
When the external sync signal is supplied, the sync mode is automatically switched to the external mode.

- Sync signals
  Horizontal drive (HD): $f_{(H)}$ 15,734 Hz ± 1% (EIA), 15,625 Hz ± 1% (CCIR)
  Vertical drive (VD): $f_{(V)}$ 59.94 Hz ($f_{(V)} = f_{(H)} \div 262.5$) (EIA),
  50 Hz ($f_{(V)} = f_{(H)} \div 312.5$) (CCIR)

  or composite video (VS)

○ Input level

Horizontal drive (HD):	2 to 4 Vp-p, negative
Vertical drive (VD):	2 to 4 Vp-p, negative
Composite video (VS):	1.0 Vp-p, sync negative

○ Input impedance: Terminated with a 75-ohm in the camera.

○ Sync drive signal waveform

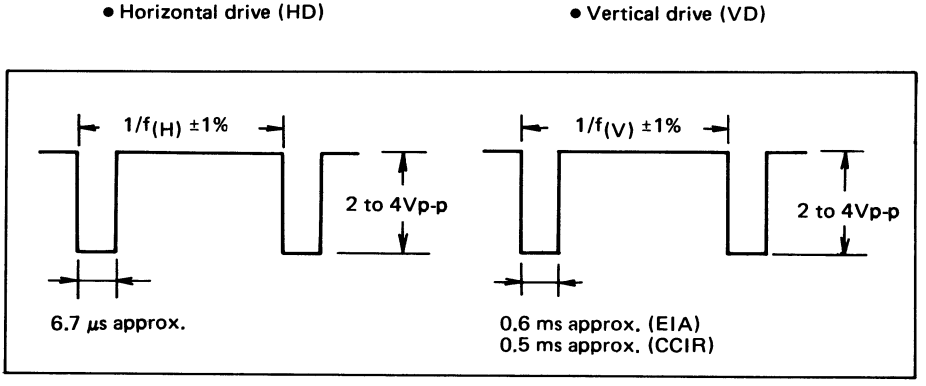


Fig. 10

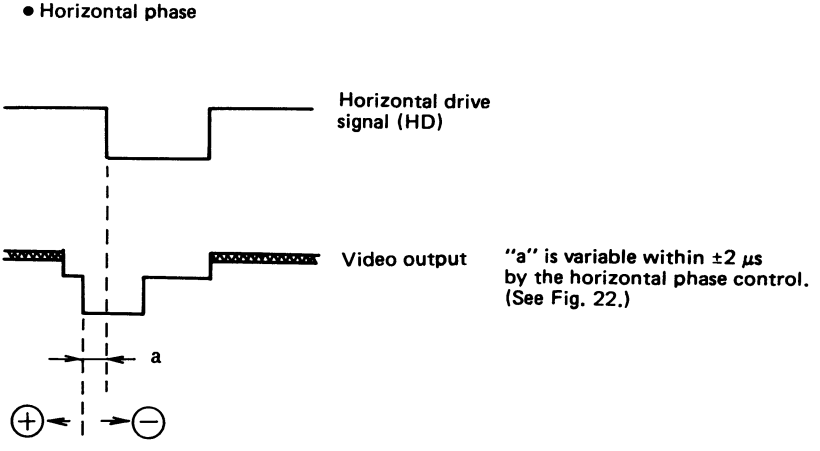


Fig. 11

Notes:

(1) When the camera is synchronized by the composite video signal, no signal needs to be connected to the vertical drive (VD) input pin (pin 7) of the EXT connector.

(2) This camera is designed for the 2:1 interlace.
If it is needed to use in the non-interlace mode, some modifications are needed and it is recommended to contact your local Hitachi Denshi sales office.

10. SYNC OUTPUT SIGNALS

The horizontal drive signal (HD), the vertical drive signal (VD), and the composite sync signal (SYNC) are supplied from the EXT connector. For connection, refer to section 8. CONNECTION OF THE EXT CONNECTOR.

- **Output waveform**

(1) Horizontal drive signal (HD, pin (1))

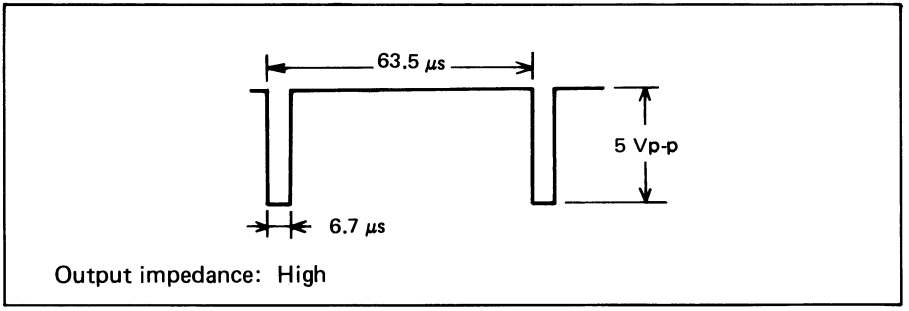


Fig. 12

(2) Vertical drive signal (VD, pin (10))

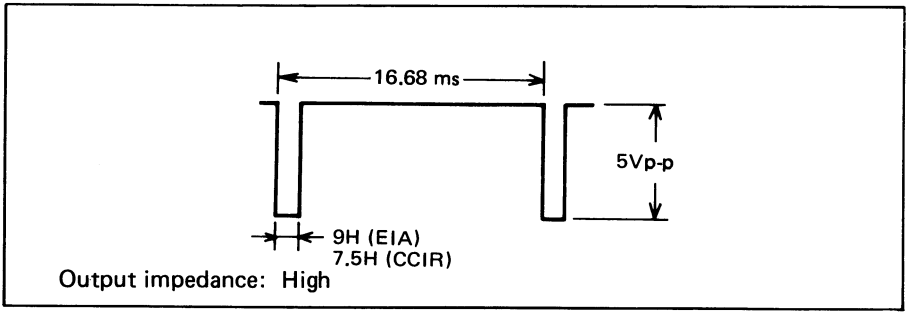
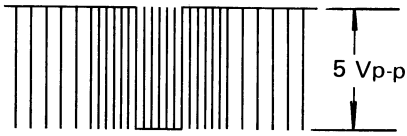


Fig. 13

③ Sync signal (SYNC, pin ⑨)



H. SYNC width: 4.75 μs (EIA), 4.65 μs (CCIR)
H. EQL width: 2.2 μs (EIA), 2.4 μs (CCIR)
V. SYNC width: 3H (EIA), 2.5H (CCIR)

Output impedance: High

Fig. 14

Notes:

(1) The output signals to be used for image processing and their impedance is high. The HD and VD signals cannot be used for other cameras driven on sync singals of 75-ohm impedance.

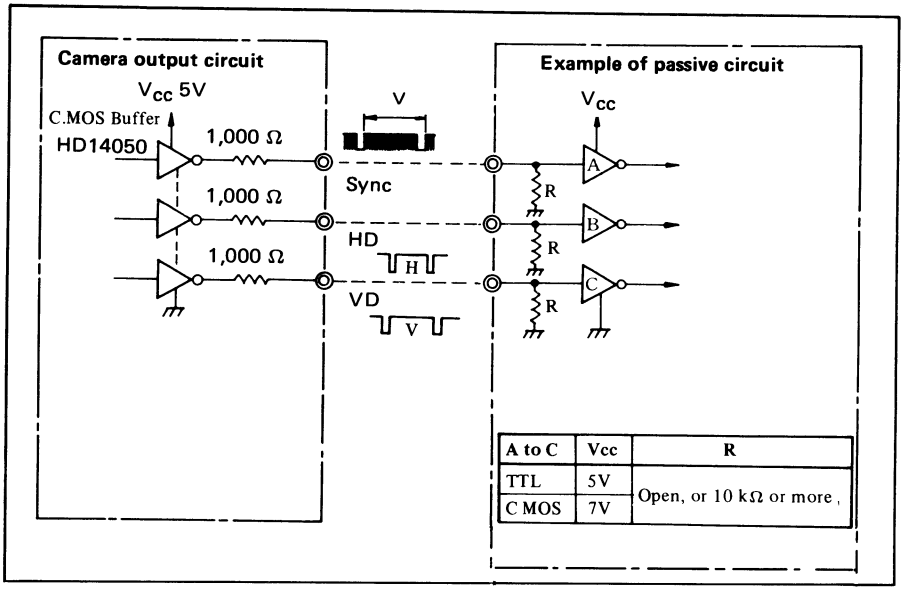


Fig. 15 Typical Connection between External Output Circuit and General Passive Circuit

11. OPERATING DESCRIPTION OF ELECTRONIC SHUTTER

The KP-180/181 employ the shutter function using the drive method of the imaging device.

(1) Operation of an electronic shutter camera

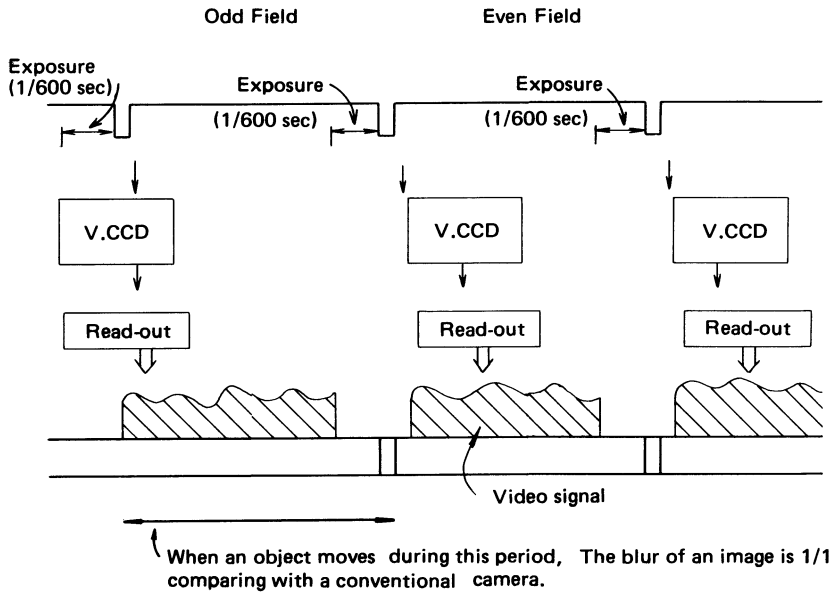


Fig. 16

No. of picture 60 per second (EIA), 50 per second (CCIR).

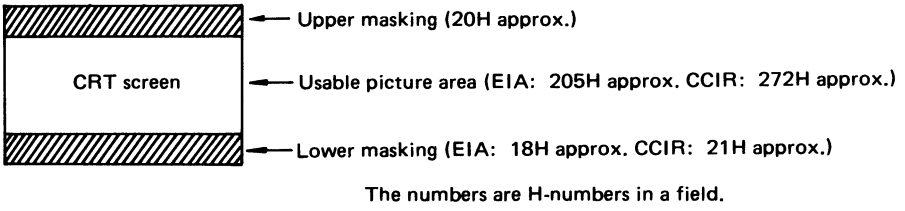
Exposure time 1/600 sec

Process a moving object in a field, not a frame.

Note:

The upper and lower portions of pictures shot in the shutter mode are masked as shown below.

Charges during shutter close generate unnecessary signals. These signals are masked for optimum pictures.



(2) External mode

1) Continuous HD, VD or VS input

In accordance with item 9 on Page 10, supply the horizontal drive signal (HD), the vertical drive signal (VD), or the composite video signal (VS) to the external input/output connector (EXT).

The camera is synchronized with the supplied external sync signal, and operates as shown in Fig. 17.

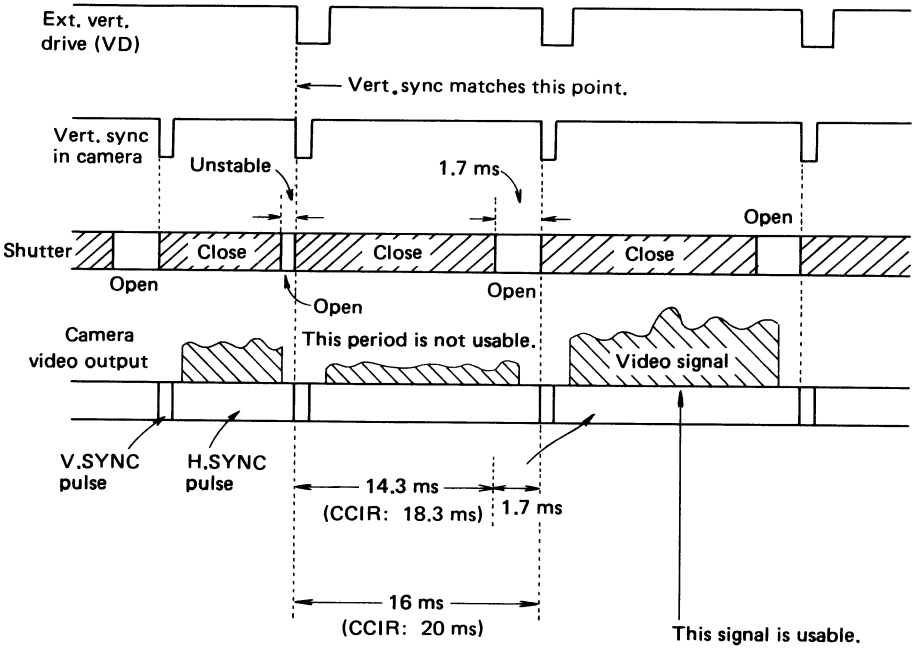


Fig. 17

2) Independent trigger input

When synchronizing the shutter intermittently, connect the trigger pulse. Fig. 18 illustrates the timing.

A picture is shot in for 1.7 ms after 14.3 ms from the falling portion of the vertical reset pulse, and the picture signal is taken out at this timing (the vertical period).

This signal is used.

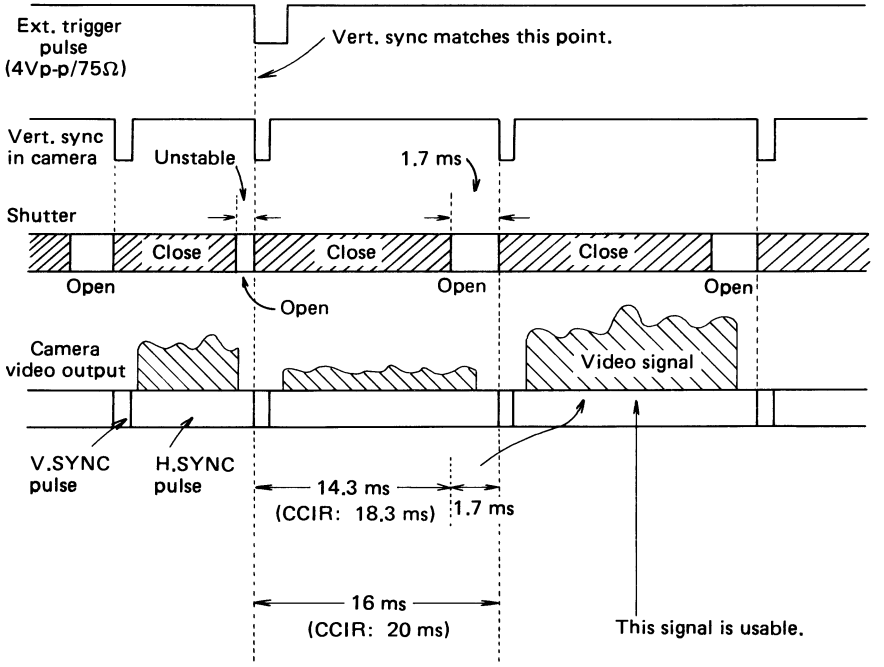


Fig. 18

Selection between the shutter mode and the normal mode

The shutter mode, which offers a picture with less blur and the normal mode providing a high sensitivity picture can be selected. When the shutter mode selection switch in Fig. 22 on page 21 is set to ON, the shutter mode is attained.

At the OFF position, the normal mode is attained.

12. ILLUMINATION AND LENS

(1) The standard illumination in the normal pickup condition is 80 lux at f4.
(In the normal pickup mode)
Use the figures in parentheses in the shutter mode.

(2) When there is a strong reflected light causing halation or extremely strong light causing white vertical stripes (vertical smear or blooming) adjust the illumination (position, angle, etc.) because Table 1 may not be applicable. If such reflection is not eliminated, adjust the lens stop appropriately corresponding to the purpose of shooting.

(3) When shooting an object which emits intense light such as sparks and arcs, the screen looks white due to the video signal saturation because the iris of ordinary lenses (f1.4 to f22) cannot control such excessive light. In such cases, a lens with a high f-number is recommended.
(Reference) Cosmicar C1616AES, 16 mm, f1.6 to 360 or equivalent.

Table 1 Guide to illumination and lens stop in the normal pickup condition

Illuminance of object (lux)	Lens stop
2,560 (51,200)	f 22
1,280 (25,600)	f 16
640 (12,800)	f 11
320 (6,400)	f 8
160 (3,200)	f5.6
80 (1,600)	f 4
40 (800)	f2.8
20 (400)	f 2
10 (200)	f1.4

( ): in the shutter mode.

Notes:

The values listed in Table 1 are obtained under the following conditions:

(1) Gain: Normal
(2) Gamma: OFF
(3) IR cut filter: Not provided
(4) Object: Gray scale chart of 90% reflectance
(5) Light source: Halogen lamp (3200 K)
(6) Video output level: 100%

Recommended lenses

A C-mount lens of 2/3 inch and 1-inch may be used on this camera. To ensure optimum performance the following lenses are recommended.

Table 2 Recommended Lenses

Category	Type No.	Focal length (mm)	Zoom ratio	f-number	Minimum object distance (m)	Weight (g)
Fixed	C814	8	–	1:1.4	0.2	150
	C815-3	8.5	–	1:1.5	0.2	110
	C1614	16	–	1:1.4	0.5	90
Fixed ES	C1614EX	16	–	1:1.4	0.5	160
Manual zoom	C6Z1218	12.5 to 75	6	1:1.8	1.0	320

When using other lenses, they must meet the following conditions. For further details, consult your local Hitachi Denshi sales office.

(1) The length "A" between the lens flange surface to the end of the projecting part should be less than 9.5 mm.

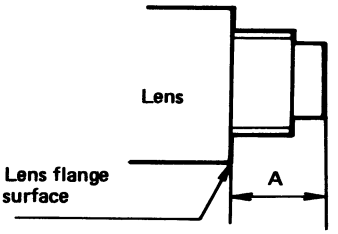


Fig. 19

(2) The lens should be lighter than the camera.
Since the camera is compact and lightweight, a heavy lens may cause unbalance, which may cause malfunction.

When the lens exceeds 1.5 kg, use a tripod to support the lens.

13. ADJUSTMENT OF THE FLANGE BACK

Depending on the lens used, optimum focusing may not be obtained even if the lens focus itself has been adjusted. In such cases, perform the flange back adjustment.

(1) Loosen the screw (2) (See section 5 NAME OF PARTS, AND THEIR FUNCTIONS), and then rotate the ring (1).

(2) Set the lens to infinity and then rotate the lens and lens mount ring together so that the object at least 20 meters (66 feets) away (far away as possible) is brought into focus.

(3) Stop rotating when the optimum focus is obtained, and fighten the screws.

14. SELECTING THE GAMMA CHARACTERISTIC

The gamma is changed by the gamma ON/OFF switch located at the edge of the VIDEO board (Fig. 22 on Page 21.)

(1) Gamma: OFF (Gamma = 1.0)

Linear output signal is obtained corresponding to the illuminance of the object. The setting is used in the case such as image processing.

(2) Gamma: ON (Gamma = 0.45)

The setting is used to define the dark position of the object which has weak contrast. It is useful to connect the camera directly to the video monitor for monitoring.

Note:

The gamma characteristic has been set to OFF at factory.

15. WHITE SUPPRESS CIRCUIT ON/OFF SWITCH AND GAIN SELECT SWITCHS

(1) White suppress circuit ON/OFF

The level of the video output signal corresponds to the incident light onto the solid-state imaging device.

When an object having an excessively bright portion is shot, the white level of the bright portion can exceed the rated level even if the iris is adjusted for a proper video output.

Therefore the white level is normally clipped at 110% approximately of the rated level.

The white suppress circuit suppresses the white level exceeding the rated level by 1/3 approximately to suppress the clip level.
The white suppress circuit is set to on or off by SW2 on the VIDEO board. (Fig. 22 on Page 21.)
The switch is set to ON at factory.

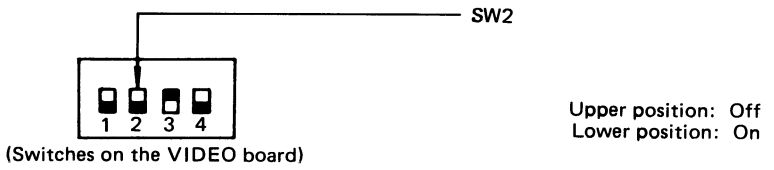


Fig. 20

(2) Gain select switches

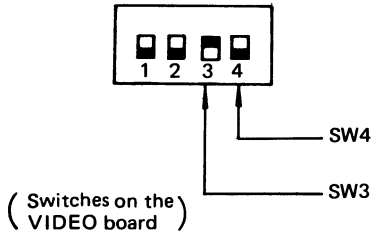
The following three gain modes are selected by the gain control switches on the VIDEO board.

i) Automatic gain control (AGC) mode (maximum gain: 6 dB).
The gain is automatically increased when the illumination of an object is lowered.

ii) High gain mode
The gain is always maintained higher than the normal gain by 6 dB.

iii) Normal gain mode
A picture with little noise is provided.

The above gain modes can be selected by switches SW3 and SW4 on the VIDEO board shown in Fig. 22 on Page 21.
The gain mode is set to the Normal gain mode at factory.



SW3	SW4	Gain mode
Lower	Lower	AGC
	Upper	High gain
Upper	Lower	Normal gain
	Upper	Not used

Fig. 21

Note:

AGC mode: Suitable for monitoring a dark object.
High gain mode: Suitable for using the camera as an image processing sensor or a measuring sensor shooting a dark object.
Normal gain mode: Suitable for shooting a well-illuminated object. A picture with little noise is ensured.

16. ADJUSTMENT OF THE PEDESTAL DC LEVEL

The pedestal DC level control for the video output signal is provided in the camera. This control can be adjusted according to input signal when the camera is used as an image processing sensor or a measuring sensor.
This control, located at the top left of the VIDEO board, is set to 0V DC at factory. (See Fig. 22)

17. LOCATIONS OF SWITCHES AND CONTROLS

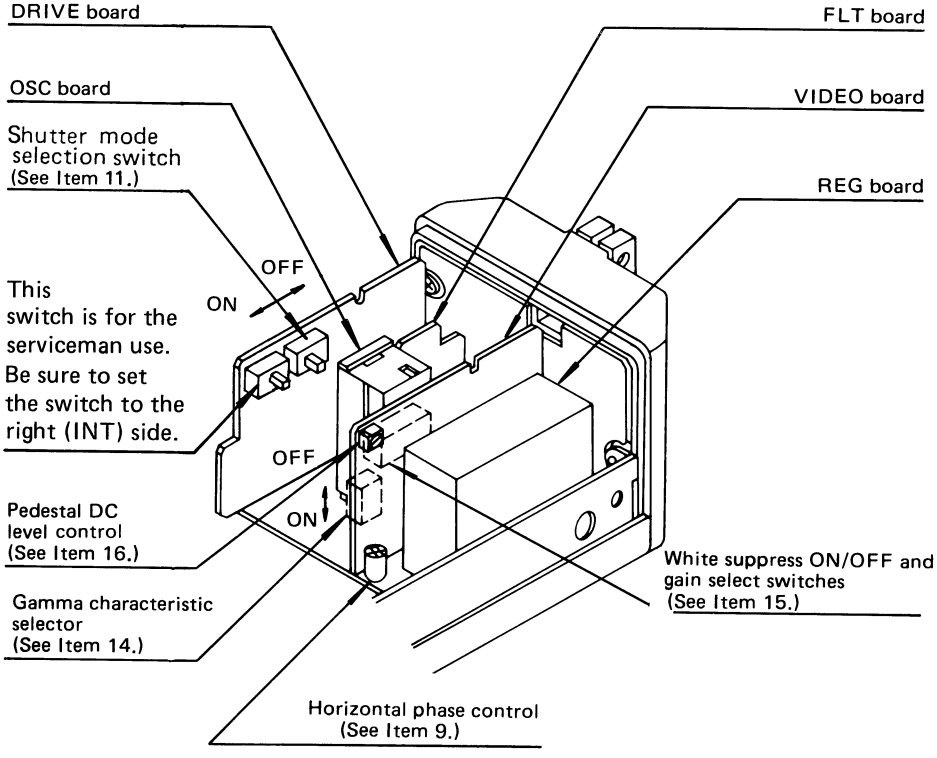
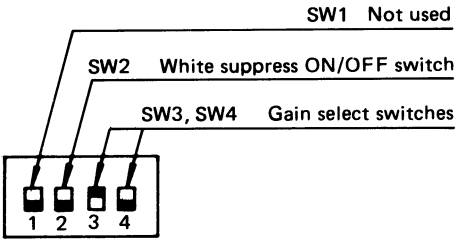


Fig. 22



SW3	SW4	Gain mode
Lower	Lower	AGC
	Upper	High gain
Upper	Lower	Normal gain
	Upper	Not used

18. SPECIFICATIONS

Imaging device:	Solid-state EIA: 510(H) x 492(V) elements CCIR: 500(H) x 582(V) elements
Scanning area:	6.6 x 8.8 mm^2 (equivalent to 2/3-inch vidicon)
Sync system:	Internal (None linelocked)/External sync
Scanning system:	2:1 interlaced scanning
Scanning frequency:	
(Horizontal)	EIA: 15,734 Hz CCIR: 15,625 Hz
(Vertical)	EIA: 59.94 Hz CCIR: 50 Hz
Shooting mode:	Shutter mode/Normal mode (Switchable)
Shutter speed:	1/600 sec.
Video output:	Composite video signal (VS), 1.0 Vp-p/ 75Ω, sync negative (BNC connector)
Resolution at center:	
(Horizontal)	370 TV lines
(Vertical)	350 TV lines
S/N:	46 dB (Gamma = 1, Normal gain)
Illumination:	
(Standard)	80 lux, f4 (Normal mode)
(Minimum)	Shutter mode: 60 lux, f1.4 (at High gain mode) Normal mode: 3 lux, f1.4 (at High gain mode)
Output signals for EE(ES) lens	
(1) Video output signal (V)	0.7 Vp-p/high impedance
(2) Power supply	DC +9V, 35 mA max.

Sync output signals:

(1) HD (Horizontal drive)	5 Vp-p/high impedance
(2) VD (Vertical drive)	5 Vp-p/high impedance
(3) Sync (Composite sync signal)	5 Vp-p/high impedance

Sync signal input:

(Horizontal drive)	4 Vp-p, negative, 15,734 (CCIR: 15,625) Hz±1%
(Vertical drive)	4 Vp-p, negative, 59.94 (CCIR: 50) Hz±1%
(Composite Video)	1.0 Vp-p/75Ω

Gamma:		1.0/0.45 (switchable)
Lens mount		C-mount
Ambient temperature/humidity:		
Rated range:		0 to 40°C, (32 to 104°F), RH 50 to 70%
Operation range:		-10 to 50°C (14 to 122°F), RH 90% or less
Storage:		-20 to +60°C (-4 to 140°F), RH 70% or less
Power requirements:	KP-180	12V DC,
	KP-181	U, C: 117V AC±10%, 60 Hz E: 220V AC±10% 50 Hz K: 240V AC±10% 50 Hz
Power consumption:	KP-180	Approx. 300 mA
	KP-181	Approx. 6 W
Dimensions:	KP-180	56(W) x 53(H) x 84(D) mm (2.2 x 2.1 x 3.4 in) (Excluding projection)
	KP-181	56(W) x 53(H) x 164(D) mm (2.2 x 2.1 x 6.5 in) (Excluding projection)
Weight: KP-180		Approx. 450g (10 lb) (excluding lens)
KP-181		Approx. 1.1 kg (2.4 lb) (excluding lens)

Specifications are subject to change without notice.

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* Subsidiaries of Hitachi Denshi, Ltd.

Printed in Japan 87111HN1443 ③
MGA1270