

MODELS KP-140/141/142/143

ALL SOLID-STATE
CCTV CAMERAS

OPERATION MANUAL



Hitachi Denshi, Ltd.

MODELS KP-140/141/142/143
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1. INTRODUCTION

The Hitachi KP-140 series are black-and-white TV cameras employing a solid-state imaging device instead of a conventional pickup tube.

KP-140 series are:

| | <u>Power supply</u> | <u>Synchronization</u> |
|--------|-------------------------|------------------------|
| KP-140 | 12V DC | Internal/external |
| KP-141 | Commercial AC source | Internal/external |
| KP-142 | 24V AC | Internal (line locked) |
| KP-143 | Commercial AC source | Internal (line locked) |

2. FEATURES

- * A high sensitivity solid-state imaging device with 510 horizontal and 492 vertical picture elements provides a clear and sharp picture. (500(H) x 582(V) for CCIR)
 - * Vertical smear and blooming are suppressed even for a strong incident light.
 - * 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. (KP-140/141)
- 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.

Note: The model and serial numbers of your CCTV CAMERA are important for you to keep for your convenience and protection. These numbers appear on the nameplate 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 horizontal drive signal (HD), the vertical drive signal (VD), and the composite sync signal (SYNC) are available from the KP-140/141 so that the cameras can be used with external and peripheral equipment.
- * Line locked vertical synchronization (KP-142/143)
The vertical sync phase can be locked with the power frequency and a stable vertical sync is obtained.
- * The KP-140 series can be used as an image processing sensor or a measuring 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.
- * The EE/ES lens output connector is provided.

3. COMPOSITON ////////////////////////////////////

| | KP-140 | KP-141 | KP-142/143 |
|------------------------|--------|--------|------------|
| (1) Camera | 1 | 1 | 1 |
| (2) EE/ES lens plug | 1 | 1 | 1 |
| (3) External sync plug | 1 | 1 | 0 |
| (4) Fuse 125V 0.63A | 0 | 1 | 1 |
| (5) Operation Manual | 1 | 1 | 1 |

Option:

For the KP-140 series: IR cut filter CAW500

For the KP-140: 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.

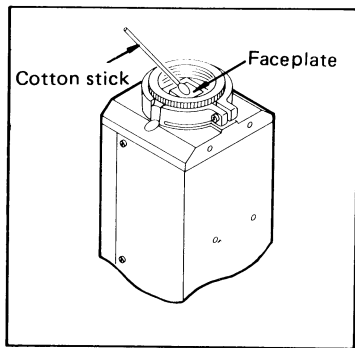


Fig. 1

- * 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.

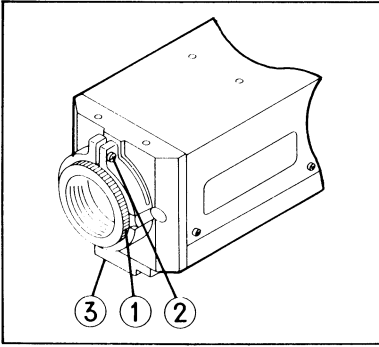
Avoid continuous using of the camera for a long time in a high temperature place.

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.

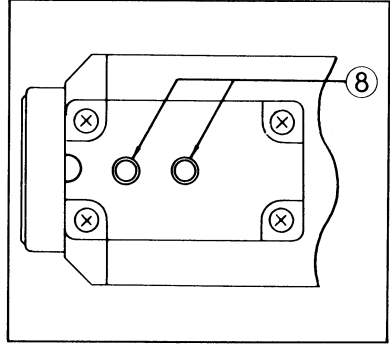
4.3 Connection

- * When the KP-140 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. (KP-140/141)
- * 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. (KP-140/141)

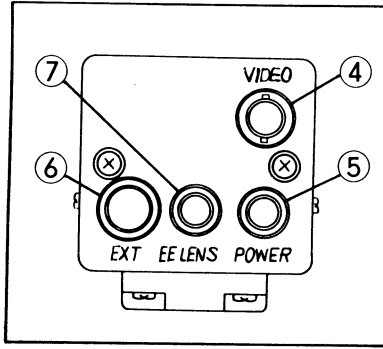
5. NAME OF PARTS, AND THEIR FUNCTIONS



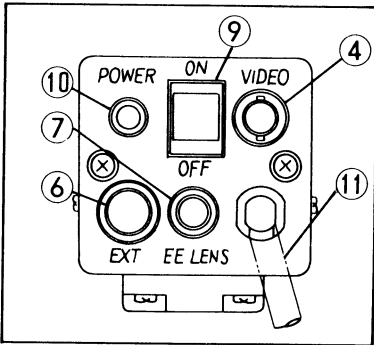
Front View



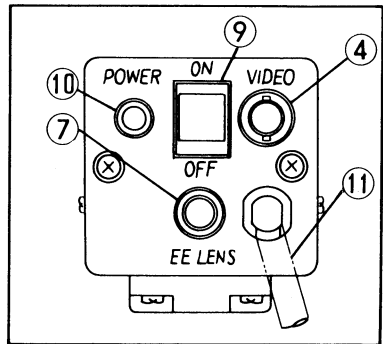
Bottom View



Rear View of the KP-140



Rear View of the KP-141



Rear View of the KP-142/143

Fig. 2

- ① **Lens mount ring:**
Mounts a C-mount lens.
- ② **Lens mount fixing screw:**
Used to secure the lens mount for flange back adjustment. (See Page 21.)
- 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-140 only):**
Connects the optional AC adaptor AP-130. (See Page 8.)
- ⑥ **External signal connector (EXT) (KP-140/141):**
Provides output signals to external equipment. (See Page 12.)
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 11.)
- ⑧ **Camera mounting holes:**
Used to mount the camera (1/4-20 UNC). Depth of the hole is 7 mm.
- ⑨ **Power switch (POWER ON/OFF) (KP-141/142/143):**
- ⑩ **Power indicator (KP-141/142/143):**
Lights when the POWER switch is ON.
- ⑪ **AC power cord (KP-141/142/143):**
Connect to a mains supply (KP-141/143).
Connect to 24V AC supply (KP-142).

Note:

When the 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 the power switch after several minutes.

Mounting on Tripod

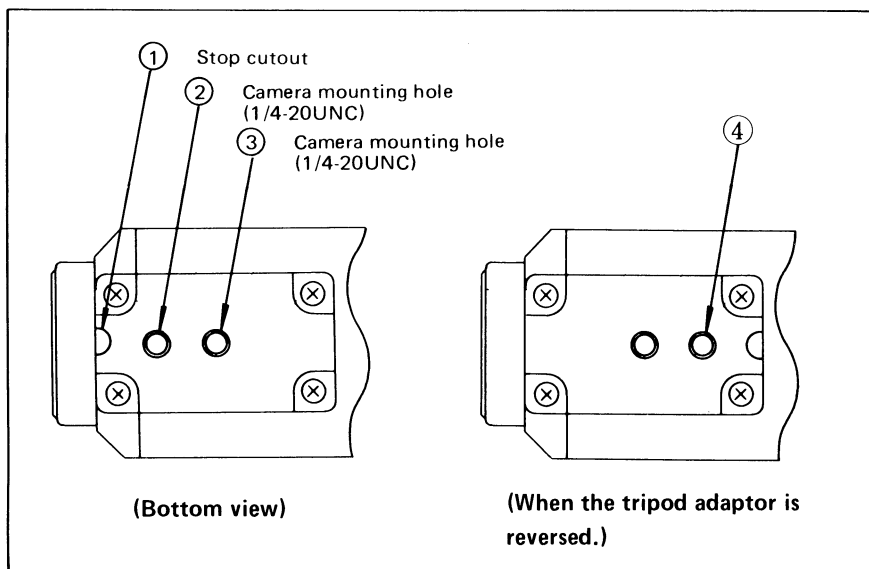


Fig. 3

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-140). 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-140), use the hole ②. In this case, the cutout ① can be used as a stop.

When a lens of the KP-141 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

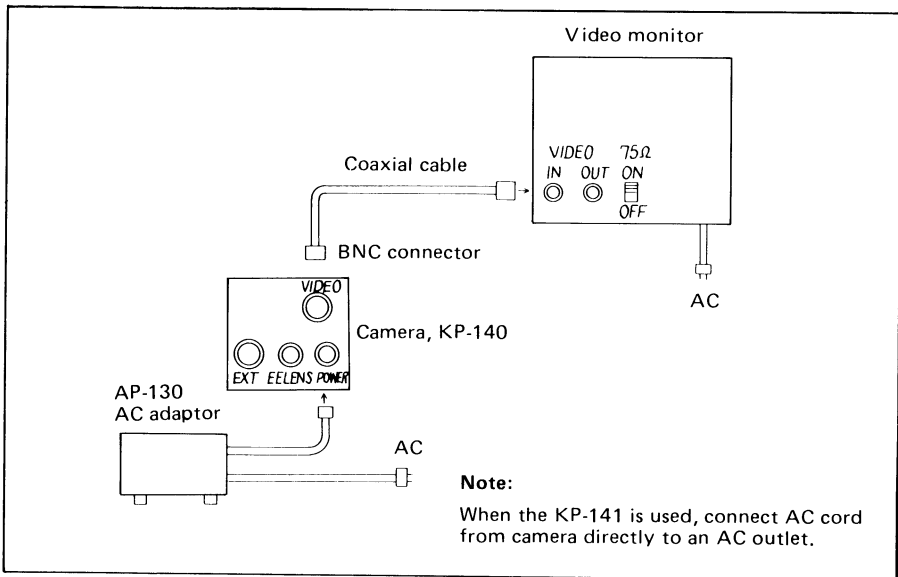


Fig. 4 Typical connection

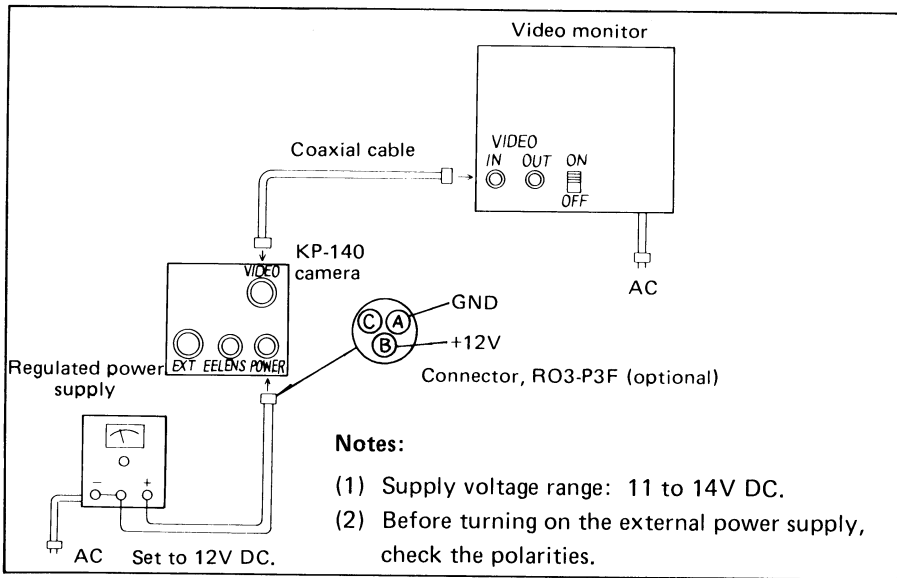


Fig. 5 Connection of regulated power supply (KP-140)

6.2 When connecting plural video monitors

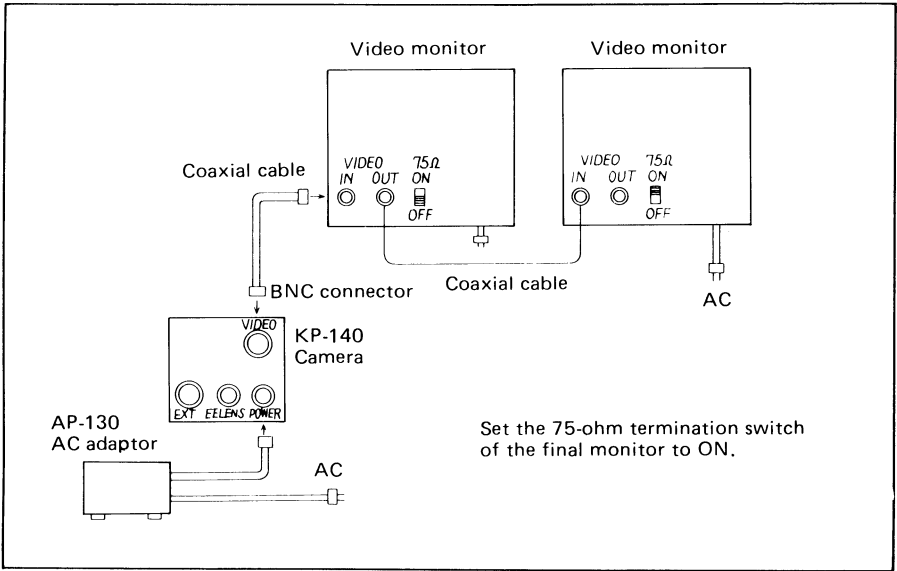


Fig. 6

6.3 When external drive signals are used. (KP-140/141)

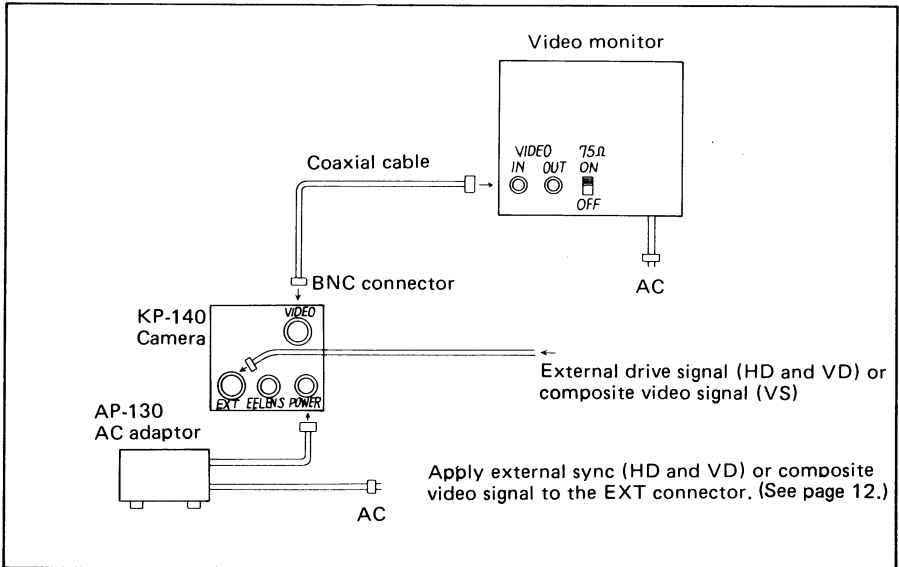


Fig. 7

6.4 Connection of KP-142/143

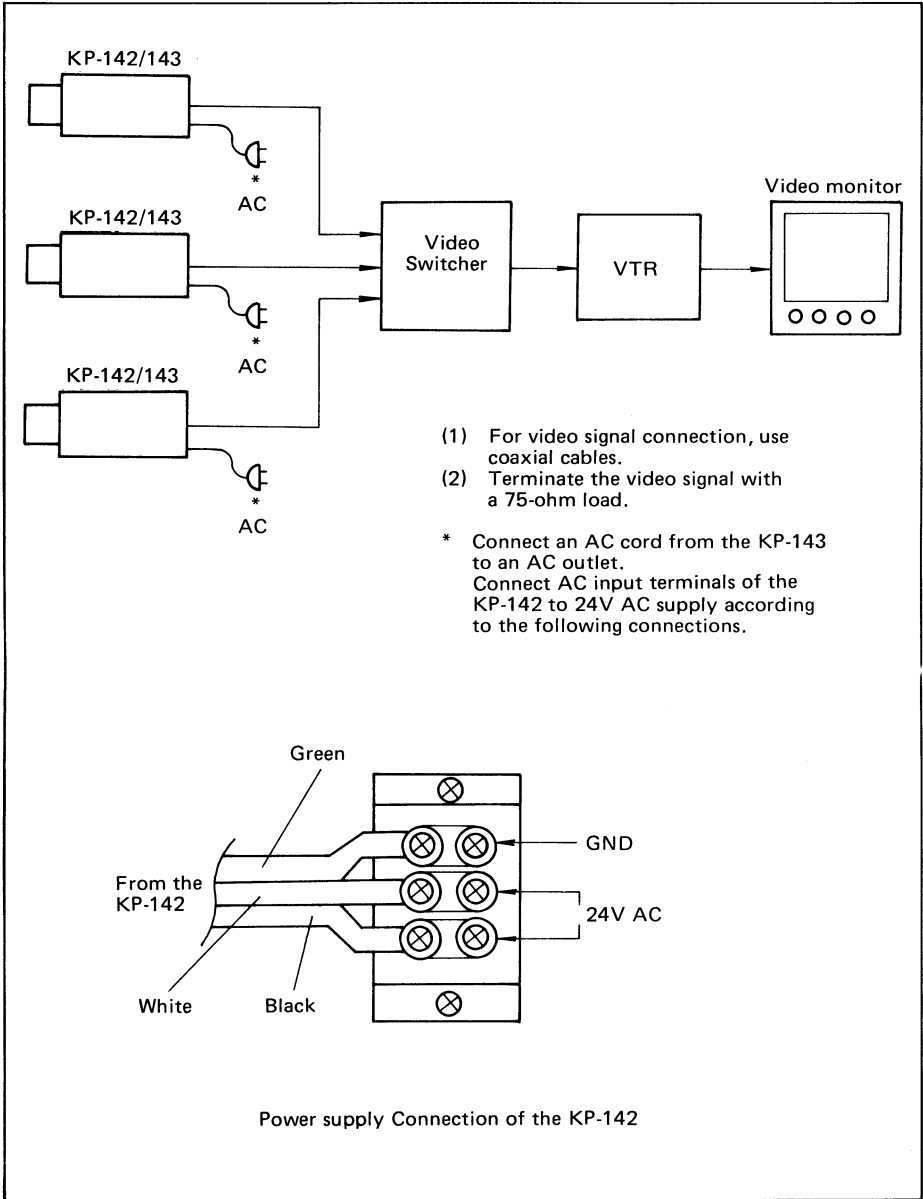


Fig. 8

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.

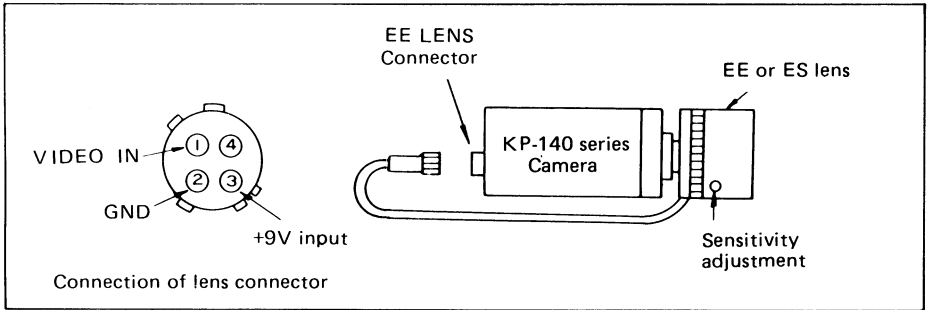


Fig. 9

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 (KP-140/141)

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.

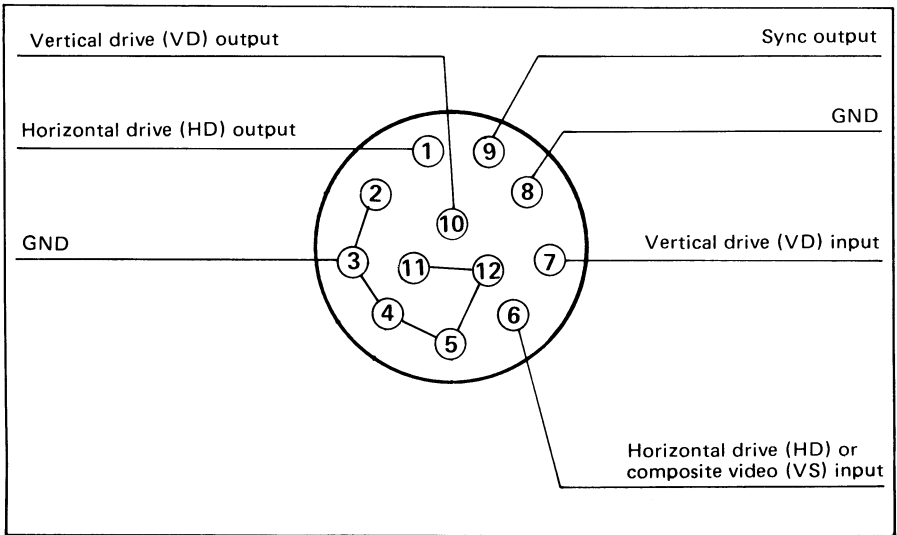


Fig. 10

9. EXTERNAL SYNC MODE (2:1 INTERLACE) (KP-140/141)

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): $f_{(H)} 15,734 \text{ Hz} \pm 1\%$ (CCIR: $15,625 \text{ Hz} \pm 1\%$)

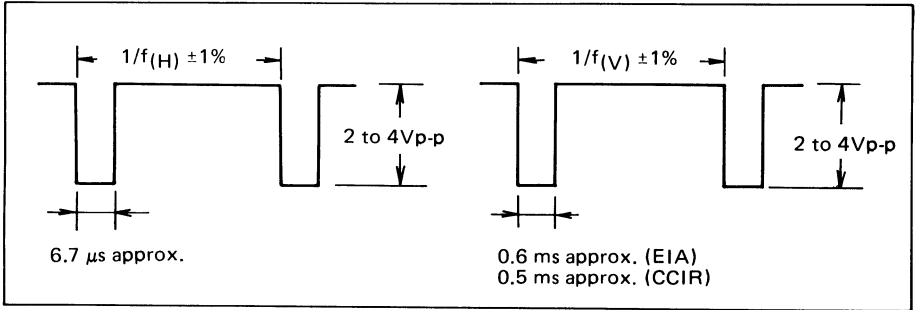
Vertical drive (VD): $f_{(V)} 59,94 \text{ Hz}$ ($f_{(V)} = f_{(H)} \div 262,5$) (CCIR $f_{(H)}$)
(CCIR: 50 Hz ($f_{(V)} = f_{(H)} \div 312,5$))

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

- Horizontal drive (HD)

- Vertical drive (VD)



- Horizontal phase

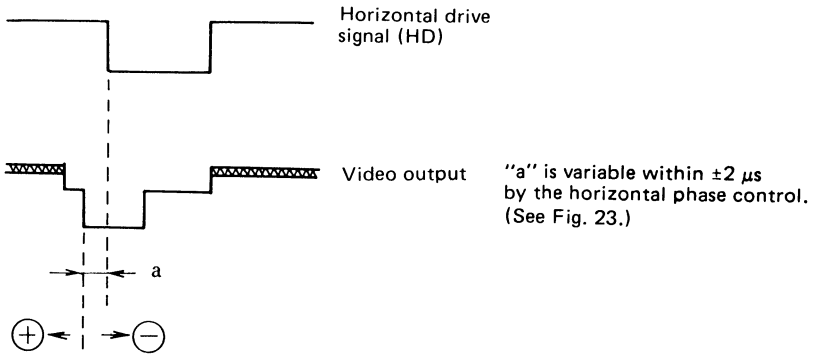


Fig. 11

Notes:

- (1) In case of operating the camera in the 2:1 interlace mode, check that the scanning selector is set to the 2:1 interlace "INT" position. (See Fig. 23.)
- (2) 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.
- (3) See Section 10 for the external sync signal in the non-interlace scanning mode.

10. NON-INTERLACE SCANNING (KP-140/141)

The scanning system can be selected to the 2:1 interlace scanning conforming to the standard TV system and the non-interlace scanning (only in the external sync mode).

(1) 2:1 interlace

In the usual state, the 2:1 interlace scanning is performed. This scanning mode is suitable for observation on a monitor since a high vertical resolution is obtained.

The camera is set to the 2:1 interlace mode at factory.

(2) Non-interlace (only in the external sync mode)

This scanning is performed when the camera is used as an image processing sensor or a measuring sensor.

Establish the non-interlace mode as follows:

(1) Supply an external sync signal.

- Sync signal

HD: 15,734 Hz \pm 1% (CCIR: 15,625 Hz \pm 1%)

VD: $f_{(HD)} \div 262$ (Hz) (CCIR: $f_{(HD)} \div 312$ (Hz))

- Input level: 2 to 4 Vp-p, negative

- Input impedance: 75 Ω

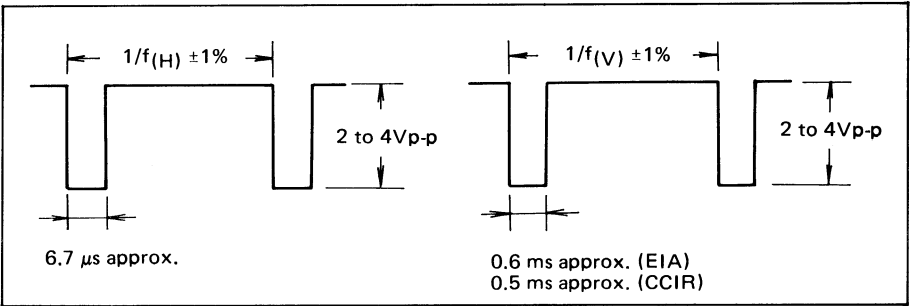
(2) Set the scanning selector to NON.

(This switch, located on the DRIVE board, is set to INT at factory. See Fig. 23.)

○ Sync drive signal waveform (non-interlace scanning).

● Horizontal drive signal (HD)

● Vertical drive signal (VD)



● Horizontal phase

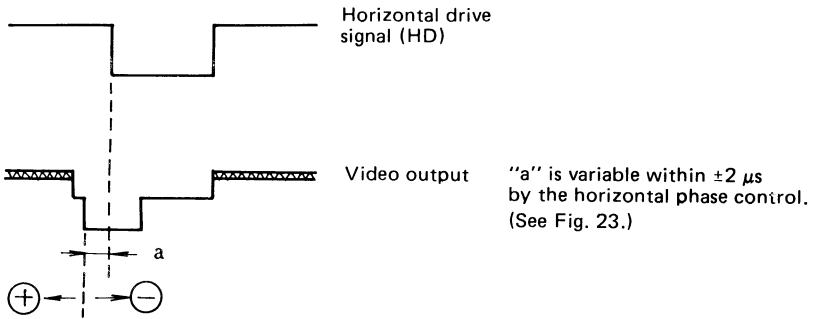
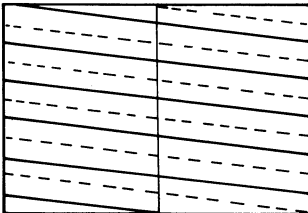
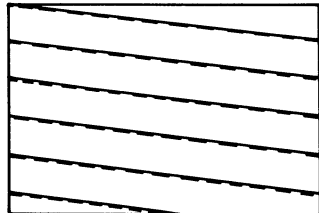


Fig. 12

2:1 interlace scanning

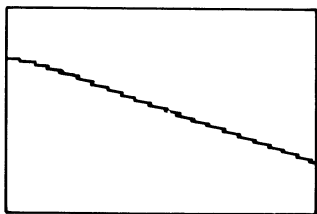


Non-interlace scanning

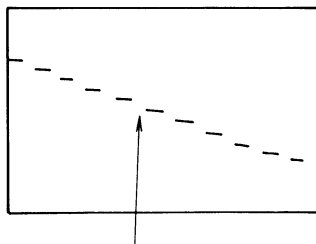


A slanting object is displayed on a monitor screen as follows.

2:1 interlace mode



Non-interlace mode



Reproduction lines are half those of the 2:1 interlace scanning.

Fig. 13

Notes:

- (1) The vertical resolution in the non-interlace is 190 TV lines.
- (2) The video output level in the non-interlace mode is half that in the 2:1 interlace mode.
- (3) When the camera is used in the non-interlace mode, be sure to supply an external sync signal to the camera and set the scanning selector to NON.

11. SYNC OUTPUT SIGNALS (KP-140/141) ////////////////////////////////////

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)

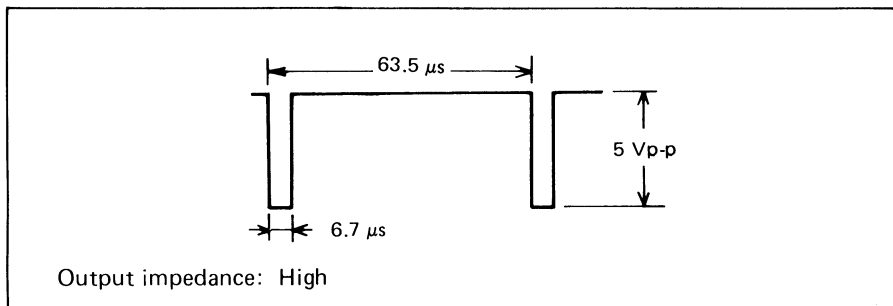


Fig. 14

- ② Vertical drive signal (VD, pin ⑩)

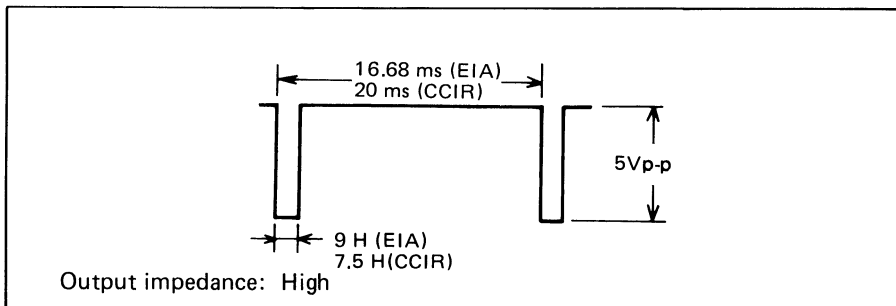


Fig. 15

③ Sync signal (SYNC, pin ⑨)

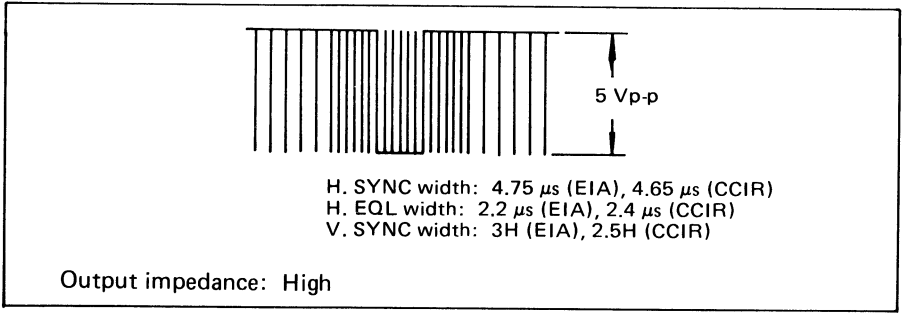


Fig. 16

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 signals of 75-ohm impedance.

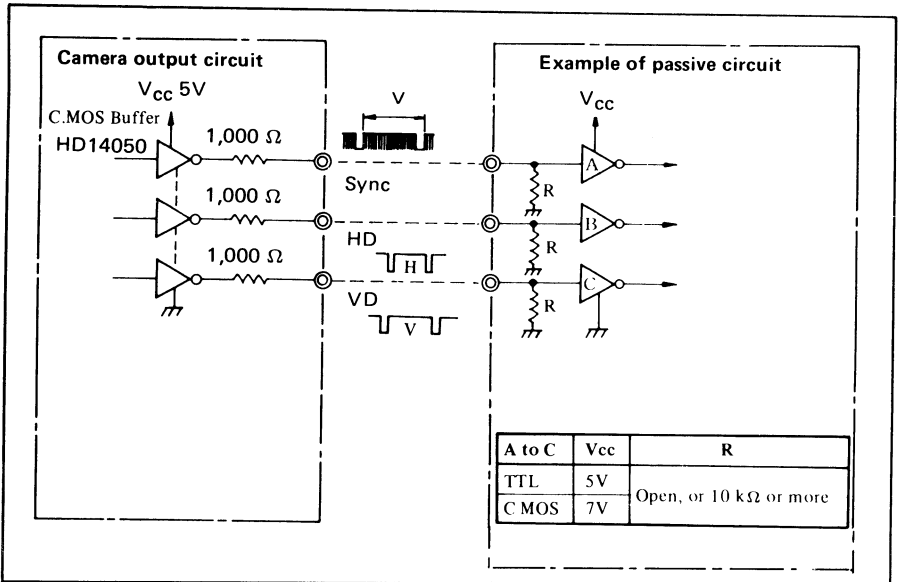


Fig. 17 Typical Connection between External Output Circuit and General Passive Circuit

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.

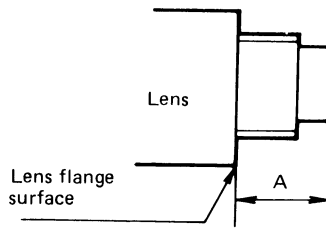


Fig. 19

- (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 feet) away (far away as possible) is brought into focus.
- (3) Stop rotating when the optimum focus is obtained, and tighten 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. 23 on Page 25.)

- (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 SWITCHES //

- (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. 23 on Page 25.)

The switch is set to ON at factory.

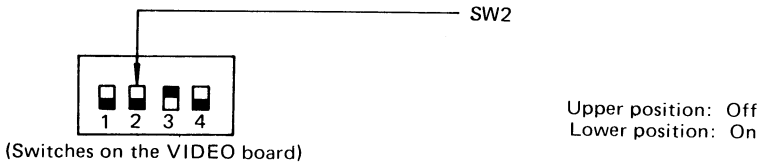


Fig. 20

(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. 23 on Page 25.

The gain mode is set to the Normal gain at factory.

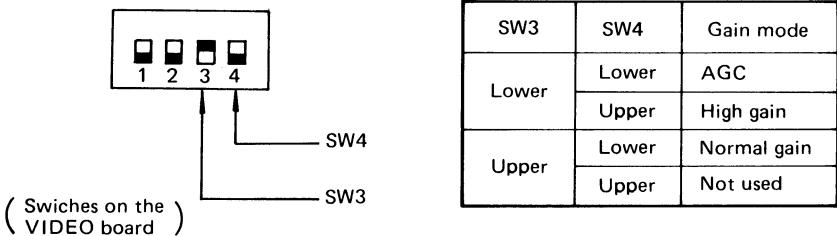


Fig. 21

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. 23.)

17. VERTICAL SYNC PHASE ADJUSTMENT (KP-142/143) ////////////////////////////////////

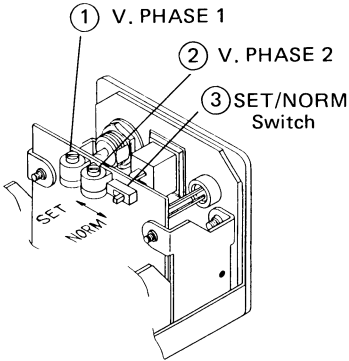


Fig. 22

Matching the vertical synchronization with the power frequency is called the line lock.

For example, when a non-line-lock type camera is switched by the video switcher for recording in a system shown in Fig. 8 on Page 10, the vertical sync signal is disturbed at the time of switching.

When the KP-142/143s of line lock type are used, however, the vertical sync phase can be locked with the power frequency and a stable vertical sync is obtained.

A single-phase AC power, which is usually used for a camera, is converted from a three-phase AC power. The vertical sync phases of cameras should be adjusted to that of a reference camera, since the phases of the converted single-phase AC power are displaced by 120° each other in a large building. This is the vertical phase adjustment.

Vertical sync phase adjustment between two cameras

Use one camera as a reference, and adjust the vertical sync phase of the other to that of the reference camera as follows.

- 1) Set the NORM/SET switch (③) of the camera to be adjusted to SET.
- 2) Alternately switch the video signals of the two cameras by the video switcher. Adjust the V. PHASE 1 and 2 controls (① and ②) so that the vertical sync is not disturbed on a monitor. (A dual-trace oscilloscope is recommended for more precise adjustment. In this case, set the trigger mode of the oscilloscope to LINE, and adjust so that the vertical sync signals of the video outputs are synchronized.)

3) After completion of the adjustment, set the NORM/SET switch to NORM.

Notes:

1. In case of the vertical sync phase adjustment among three cameras or more, adjust the cameras one after another.
2. When the vertical sync signals of the adjusted cameras are observed on the oscilloscope, the phases may be displaced each other by several H's. However, this does not cause any trouble in a practical operation.
3. The NORM/SET switch ③ should be set to SET only at setup.

SET: The lock time constant is short for easy setup.

In this mode, the camera is affected by power noise.

NORM: The lock time constant is long.

The camera operates stably against power noise.

4. The V. PHASE 1 and 2 controls (① and ②) can vary the phase by approximately 180° each, 360° in total.

CAUTION

1. The KP-142/143 is synchronized to the power frequency 60 (or 50) ± 1 Hz, and covers a normal fluctuation of the power frequency. However, the camera may not cover a large fluctuation caused from the power generated by an engine generator, etc.
2. It takes over 10 seconds until a stable synchronization is obtained after the power is turned on. This is not a trouble, because the lock time constant is made long to stabilize the camera against power noise.

18. LOCATIONS OF SWITCHES AND CONTROLS

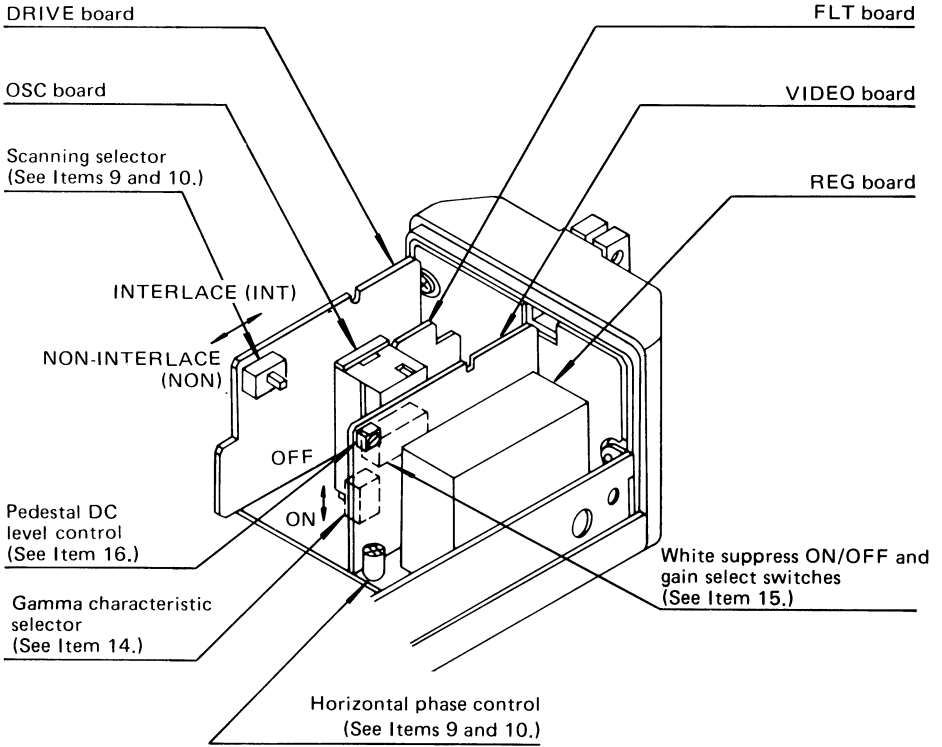
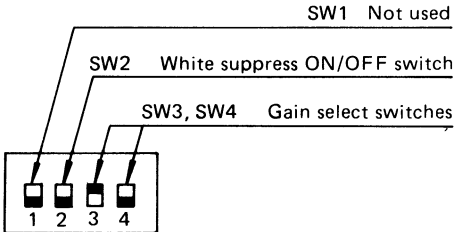


Fig. 23



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

19. SPECIFICATIONS

- (1) **Imaging device:** Solid-state
EIA: 510(H) x 492(V) elements
CCIR: 500(H) x 582(V) elements
- (2) **Scanning area:** 6.6 x 8.8 mm² (equivalent to 2/3-inch vidicon)
- (3) **Sync system:**
 - KP-140/141: Internal (Nonlinelock)/External
 - KP-142/143: Internal (Linelock)
- (4) **Scanning system:** 2:1 interlace
- (5) **Scanning frequency:**
 - KP-140/141: EIA: 15,734 Hz 59.94 Hz
CCIR: 15,625 Hz 50 Hz
 - KP-142/143: EIA: 15,750 Hz 60 Hz
CCIR: 15,625 Hz 50 Hz
- (6) **Video output:** Composite video signal (VS), 1.0 V_{p-p}/75Ω, sync negative (BNC connector)
- (7) **Resolution at center:**
 - (Horizontal) 380 TV lines
 - (Vertical) 350 TV lines
- (8) **S/N:** 46 dB (Gamma = 1, Normal gain)
- (9) **Illumination:**
 - (Standard) 80 lux, f4
 - (Minimum) 1.5 lux, f1.4 (AGC ON, 50 IRE output)
- (10) **Output signals for EE(ES) lens:**
 - (1) **Video output signal (V)** 0.7 V_{p-p}/high impedance
 - (2) **Power supply** DC +9V, 35 mA max.
- (11) **Sync output signals (KP-140/141):**
 - (1) **HD (Horizontal drive)** 5 V_{p-p}/high impedance
 - (2) **VD (Vertical drive)** 5 V_{p-p}/high impedance
 - (3) **Sync (Composite sync signal)** 5 V_{p-p}/high impedance
- (12) **Sync signal input (KP-140/141):**
 - (Horizontal drive) 4 V_{p-p}, negative, 15,734 (CCIR: 15,625) Hz±1% or composite video 1.0 V_{p-p}/75Ω

| | | |
|------|------------------------------|--|
| | (Vertical drive) | 4 Vp-p, negative, 59.94 (CCIR: 50) Hz±1% |
| (13) | Gamma: | 1.0/0.45 (switchable) |
| (14) | Lens mount: | C-mount |
| (15) | 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 |
| (16) | Power requirements:; | |
| | KP-140 | 12V DC |
| | KP-141 | U, C: 117V AC±10% 60 Hz E: 220V AC±10% 50 Hz K: 240V AC±10% 50 Hz |
| | KP-142 | U: 24V AC±10% 60±1 Hz E/K: 24V AC±10% 50±1 Hz |
| | KP-143 | U: 117V AC±10% 60±1 Hz E: 220V AC±10% 50±1 Hz K: 240V AC±10% 50±1 Hz |
| (17) | Power consumption: | |
| | KP-140 | Approx. 300 mA |
| | KP-141 | Approx. 6W |
| | KP-142/143 | Approx. 6.5W |
| (18) | Dimensions: | |
| | KP-140 | 56(W) x 53(H) x 84(D) mm (2.2 x 2.1 x 3.4 in) (Excluding projections) |
| | KP-141 | 56(W) x 53(H) x 164(D) mm (2.2 x 2.1 x 6.5 in) (Excluding projections) |
| | KP-142/143 | 56(W) x 53(H) x 192(D) mm (2.2 x 2.1 x 7.6 in) (Excluding projections) |
| (19) | WEight: | |
| | KP-140 | Approx. 450g (10 lb) (excluding lens) |
| | KP-141 | Approx. 1.1 kg (2.4 lb) (excluding lens) |
| | KP-142/143 | Approx. 1.2 kg (2.6 lb) (excluding lens) |

*Specifications are subject to change without notice.



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