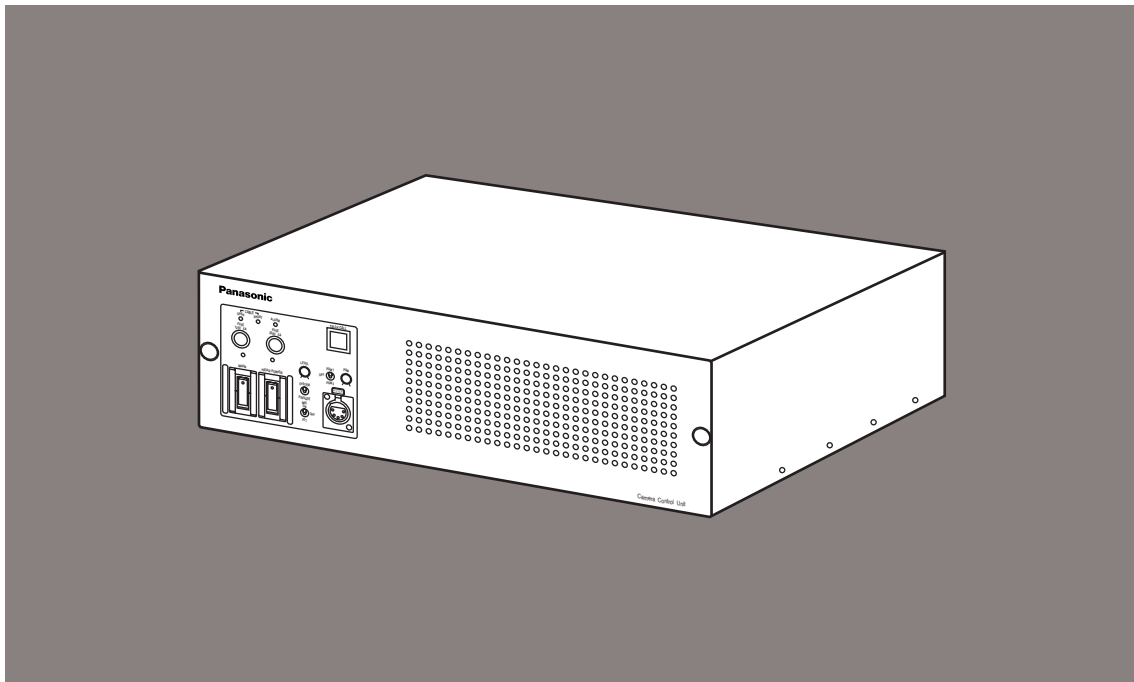# Operating Instructions

Camera Control Unit

Model AK-HCU931P

Panasonic®

Before attempting to connect, operate or adjust this product, please read these instructions completely.

Safety precautions

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

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

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 (service) instructions in the literature accompanying the appliance.

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

CAUTION:
TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD AND ANNOYING INTERFERENCE, USE THE RECOMMENDED ACCESSORIES ONLY.

For CANADA

This class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

FCC Note:
This device complies with Part 15 of the FCC Rules. To assure continued compliance follow the attached installation instructions and do not make any unauthorized modifications.

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION:
Invisible Laser radiation is emitted from the Optical fiber connector when this product is turned on.
Don't look into directly into the Optical fiber connector of this product.

CAUTION:
This product uses a semiconductor laser system and is a laser class 1 product complies with Radiation Performance Standards, 21CFR SUBCHAPTER J.
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
Don't make any modifications.
Don't repair by yourself.
Refer servicing to qualified personnel.

Class 1 Laser Product
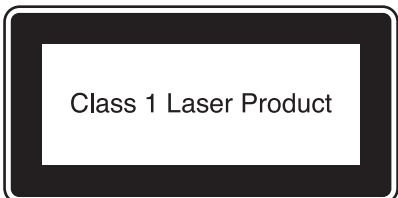
indicates safety information.

Contents

Overview

By connecting this unit to the multi-format camera (model AK-HC931P), multi-format images can be input and output. (Some of the functions are available as options.)

The unit is connected to the multi-format camera, and it is connected to the remote operation panel (ROP) and master setup unit (MSU) using dedicated multi-purpose cables (available as optional accessories).

When the designated multi-purpose cables are used, the distance between from the CCU to the ROP and MSU can be extended up to 50 meters.

Accessories

Rack-mounting adapters (×2)
Mounting screws (M4×8 mm) (×6)
BNC termination resistor (×1)
Communication connector (×1)
Power cord (×1)

Operating precautions

- **Handle the unit carefully.**
  Dropping the unit or subjecting it to strong impact may cause malfunctioning and/or accidents.
- **Operate the unit within a temperature range of 32°F to 104°F (0°C to +40°C).**
  Operation in locations below 32°F or above 104°F may adversely affect the internal parts.
- **Be absolutely sure to turn off the power before connecting or disconnecting the cables.**
- **Do not use the unit outdoors.**
- **Install the unit at a distance of at least 3.3 ft (1 meter) from the monitor.**
- **Maintenance**
  Disconnect the power plug, and wipe the unit with a dry cloth. To remove stubborn dirt, soak a cloth in diluted kitchen detergent and wring it out well, and then wipe the unit gently.

Caution
- Avoid using benzine, paint thinners or other volatile substances.
- If a chemically treated cloth is to be used, read the precautions for its use carefully.

Parts and their functions

■ Camera control unit front panel
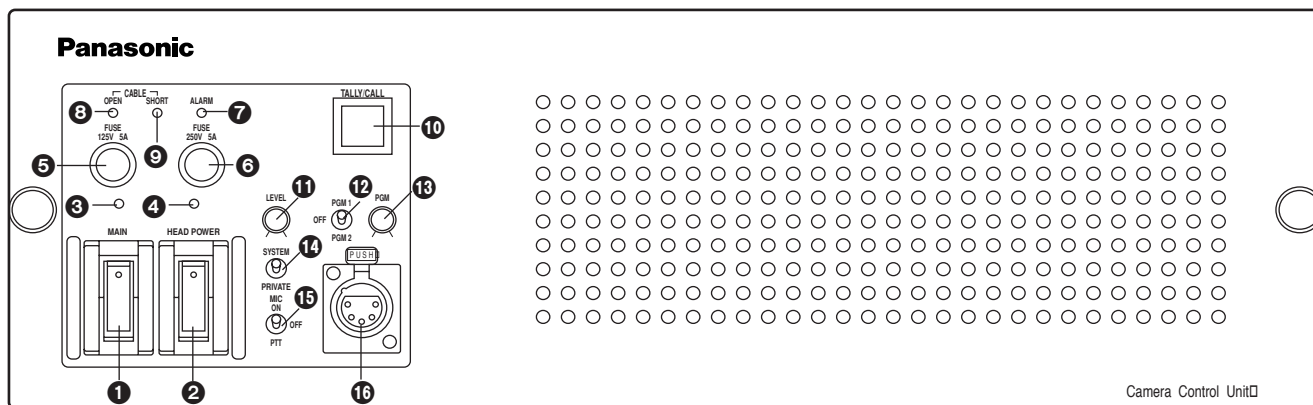
❶ CCU power switch [MAIN]
This is the power switch of the camera control unit (CCU). The CCU, ROP and other units will not operate unless this switch is set to ON.
Up:	ON
Down:	OFF

❷ Camera power switch [HEAD POWER]
This switch supplies power to the camera. However, if the ROP has been connected, power is supplied to the camera only when this switch and the camera power switch on the TOP are both set to ON.
Up:	ON
Down:	OFF

❸ CCU power ON LED
Lighted:	The CCU power is ON.
Off:	The CCU power is OFF.

❹ Camera power ON LED
Lighted:	This indicates that power is being supplied from the CCU to the camera.
Off:	This indicates that power is not being supplied from the CCU to the camera.
Even if the camera power switch is ON, this LED remains off if no power is supplied to the camera.
This is due to one of the following reasons: ① the supply of power to the camera has been turned off by the ROP, ② one of the optical fiber cables has been disconnected or ③ something is wrong with the camera, and the power supply was turned off.

❺ CCU power fuse
This is the CCU main power fuse.

❻ Camera head power fuse
This is the camera head power supply fuse.

❼ Alarm LED [ALARM]
Lighted:	This LED indicates that the CCU's fan has stopped and that something is wrong with the power supply.
Off:	Normal
If the LED remains lighted, turn off the main power and have the unit repaired.

❽ Camera cable open alarm LED [CABLE / OPEN]
Lighted:	The cable between the CCU and camera has been disconnected.
Off:	Normal

❾ Camera cable short-circuit alarm LED [CABLE / SHORT]
Lighted:	The cable between the CCU and the camera has short-circuited.
Off:	Normal

❿ TALLY indicator/CALL switch [TALLY/CALL]
This indicator lights when the R/G tally signal is input. It is also a CALL switch for calling the camera, ROP and MSU.

⓫ INCOM volume control [LEVEL]
This is used to adjust the standby INCOM volume.

⓬ INCOM PGM selector switch
This is used to select the PGM input signals which are to be mixed with the standby INCOM.

⓭ INCOM PGM level control [PGM]
This is used to select the level of the PGM signals which are to be mixed with the standby INCOM.

⓮ INCOM selector switch
This is used to select the call party of the standby INCOM.
PRIVATE:	For making private calls to the camera.
COMM:	For connecting the standby INCOM with the system INCOM.

⓯ INCOM MIC selector switch [MIC]
ON:	The INCOM microphone is set to ON.
OFF:	The INCOM microphone is set to OFF.
PTTN:	The INCOM microphone is set to ON only while the INCOM MIC selector switch is held down.
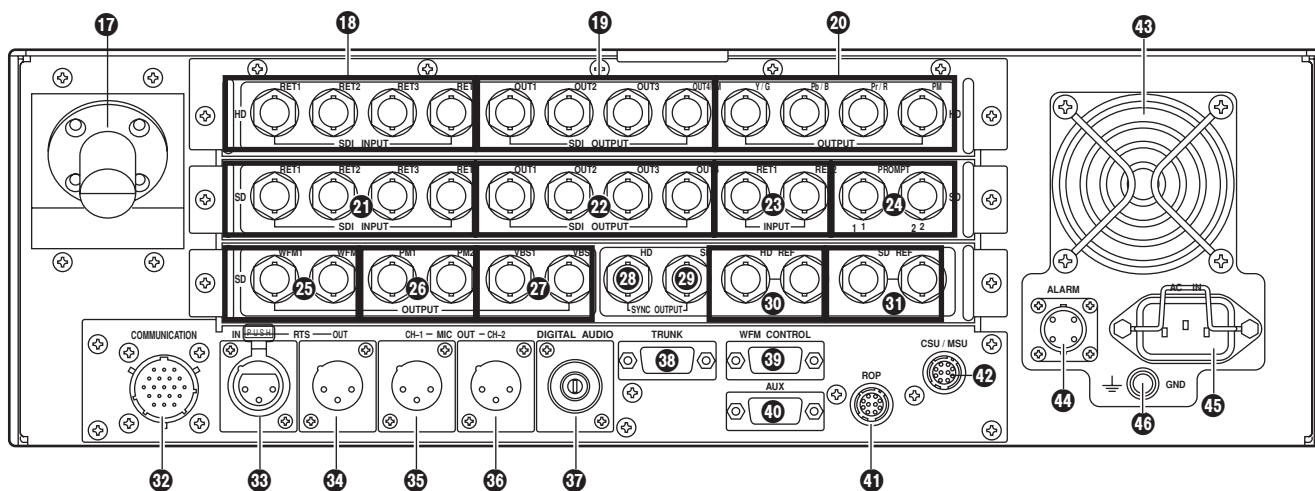
⓰ Standby INCOM jack
This is connected to INCOM 1 line, and it enables calls to be made to the camera's INCOM 1 line.
Even when the camera power is OFF, calls can still be made to the camera's INCOM 1 line.

Parts and their functions

■ Camera control unit rear panel

⑰ Optical fiber connector
FXW.3K.93C.CLM made by LEMO

Pin No.	Function	Polarity	Signal flow	Cable color
1	Optical fiber		CAM→CCU	Yellow (01)
2	Optical fiber		CCU→CAM	Yellow (02)
3	Control wire, hot	+	CAM↔CCU	Black
4	Control wire, cold	–	CAM↔CCU	Red
5	AC 240 V live	+	CCU→CAM	Orange
6	AC 240 V neutral	–	CCU→CAM	White

⑱ HDTV digital return video 1, 2, 3, 4 input connectors [HD DIGITAL RET 1, 2, 3, 4] (Option)
These connectors (BNC) are for inputting the return video signals of the HDTV serial digital interface.

⑲ HDTV digital video 1, 2, 3, 4 output connectors [HD DIGITAL OUT 1, 2, 3, 4] (Option)
These connectors (BNC) are for outputting the video signals of the HDTV serial digital interface.

⑳ HDTV analog component video output connectors [HDTV ANALOG Y/G, Pb/B, Pr/R] (Option)
The HDTV analog signals of the camera are output from these connectors (BNC).
G/B/R or Y/Pb/Pr video signals can be selected by the master setup unit (MSU) or remote operation panel (ROP).
SDTV PM output connector [PM]
This is the HDTV PM output (1Vp-p) connector.

㉑ SDTV digital return video 1, 2, 3, 4 input connectors [SDTV DIGITAL RET 1, 2, 3, 4]
These connectors are for inputting the return video signals of the SDTV serial digital interface.

㉒ SDTV D1 digital video output connectors [SDTV DIGITAL OUT D1 1, 2 3]
These connectors are for outputting the D1 format video signals of the SDTV serial digital interface.
There are 3 connectors (BNC).

㉓ Analog return video 1, 2 input connectors [ANALOG RET 1, 2]
These connectors (BNC) are for inputting the SD analog return video signals.

㉔ PROMPT-IN connectors [PROMPT1,2]
These are the prompter signal input connectors (BNC).
Input SDTV composite video signals as the prompter signals.

㉕ SDTV waveform monitor output connectors [SDTV WFM 1, 2]
These connectors (BNC) are for outputting the camera video signals which are to be displayed on the SDTV waveform monitor.

ROP/MSU monitor selection	SDTV WFM output
R	R
G	G
B	B
SEQ	RGB 3 waveforms
ENC	Composite video

Parts and their functions

■ Camera control unit rear panel
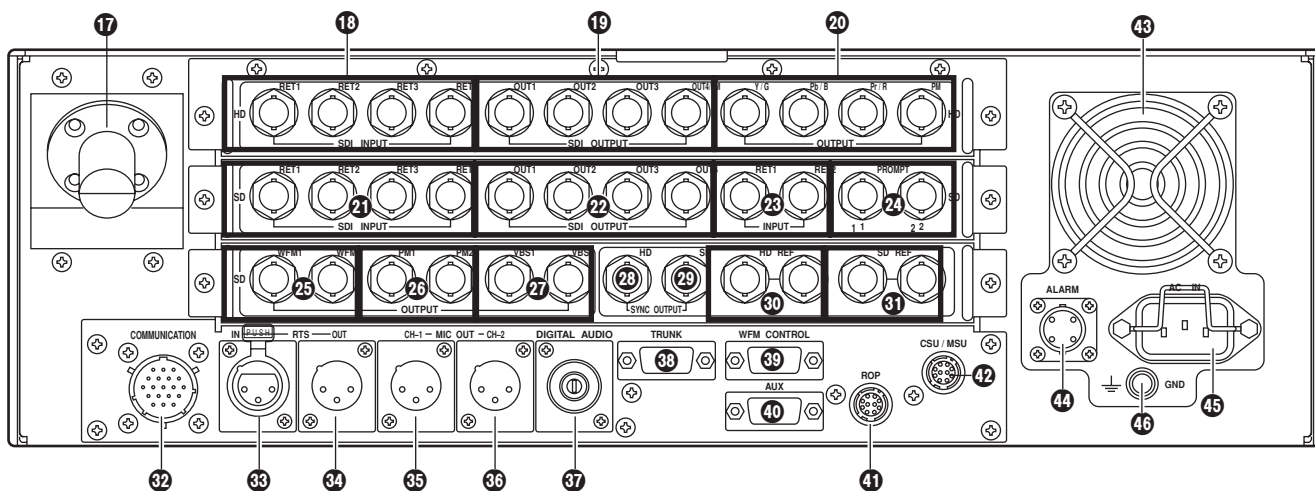
㉖ SDTV picture monitor video output connectors [PM 1, 2]

These connectors (BNC) are for outputting the video signals which are to be displayed on the SDTV picture monitor.

ROP/MSU monitor selection	SDTV PM1 output
R	R+alarm display
G	G+alarm display
B	B+alarm display
SEQ	Y and skin tone zebra pattern
ENC	Composite video

㉗ SDTV analog composite video output connectors [SDTV VBS]

These connectors (BNC) are for outputting the SDTV analog composite video signals (with sync) of the camera.

㉘ HDTV analog SYNC output connector [HD SYNC]

The HDTV analog sync signal of the camera is output from this connector (BNC). Its amplitude is +/-0.3 V (75Ω termination).

㉙ SDTV analog SYNC output connector [SDTV ANALOG SYNC]

The SDTV analog sync signal of the camera is output from this connector (BNC). Its amplitude is 2 Vp-p (75Ω termination).

㉚ HDTV genlock input connectors [HD REF]

These are the HDTV genlock input connectors (BNC). The bridging connection between the two connectors enables one to be used for input purposes and the other for output purposes.
Input the HDTV tri-level sync signal as the genlock signal.

㉛ SDTV genlock input connectors [SDTV REF]

These are the SDTV genlock input connectors (BNC). The bridging connection between the two connectors enables one to be used for input purposes and the other for output purposes.
Input the BB video signal as the genlock signal.

㉜ INCOM/tally connector [COMMUNICATION]

The external INCOM or tally system is connected here.
INCOM/tally connector (KPT02E14-19P made by Japan Aviation Electronics Industry)

Pin No.	Function	Polarity	Signal flow
A	Shield		
B	INCOM 1	+	CCU→SYSTEM
C	INCOM 1	−	CCU→SYSTEM
D	INCOM 1	+	SYSTEM→CCU
E	INCOM 1	−	SYSTEM→CCU
F	INCOM 2	+	CCU→SYSTEM
G	INCOM 2	−	CCU→SYSTEM
H	INCOM 2	+	SYSTEM→CCU
J	INCOM 2	−	SYSTEM→CCU
K	PGM1(H)	+	SYSTEM→CCU
L	PGM1(C)	−	SYSTEM→CCU
M	PGM2(H)	+	SYSTEM→CCU
N	PGM2(C)	−	SYSTEM→CCU
P	NC		
R	Red tally		Contact
S	Green tally		Contact
T	NC		
U	NC		
V	Tally common		

PGM output level: 0 dBm/600Ω
INCOM level: 0 dBm/600Ω

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■ Camera control unit rear panel
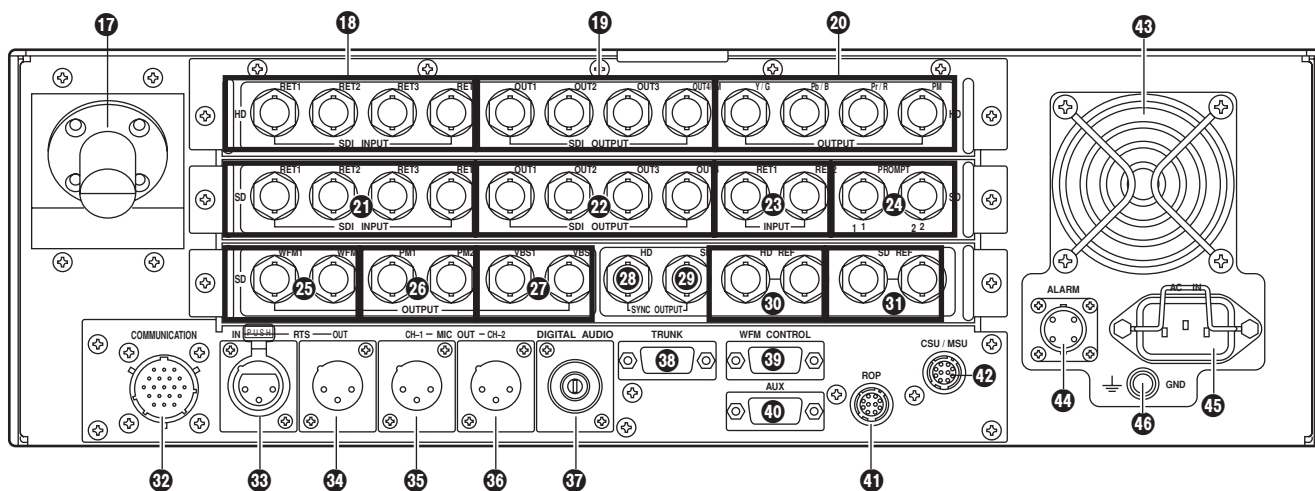
㉝ RTS input connector [RTS IN]

The RTS system is connected to this connector.
The microphone level is −4 dBm/200Ω.
RTS input connector (HA16PRK-3S made by Hirose)

Pin No.	Function	Polarity	Signal flow
1	Common		
2	Channel 1 (+DC)		
3	Channel 2		

㉞ RTS output connector [RTS OUT]

The unit is connected to the RTS system from this connector.
The microphone level is −4 dBm/200Ω.
RTS output connector (HA16RD-3P made by Hirose)

Pin No.	Function	Polarity	Signal flow
1	Common		
2	Channel 1 (+DC)		
3	Channel 2		

㉟ ㊱ Mic 1, 2 output connectors [MIC OUT CH-1, CH-2]

These are the microphone 1 analog output connectors of the camera.
The microphone level is 0 dBm/600Ω.
Mic output connector (HA16RD-3P made by Hirose)

Pin No.	Function	Polarity	Signal flow
1	Shield		
2	Hot	+	CCU→SYSTEM
3	Cold	−	CCU→SYSTEM

㊲ Digital audio output connector [DIGITAL AUDIO]

This is the camera microphone 1 and 2 output connector (BNC) for AES/EBU digital audio interface specifications.
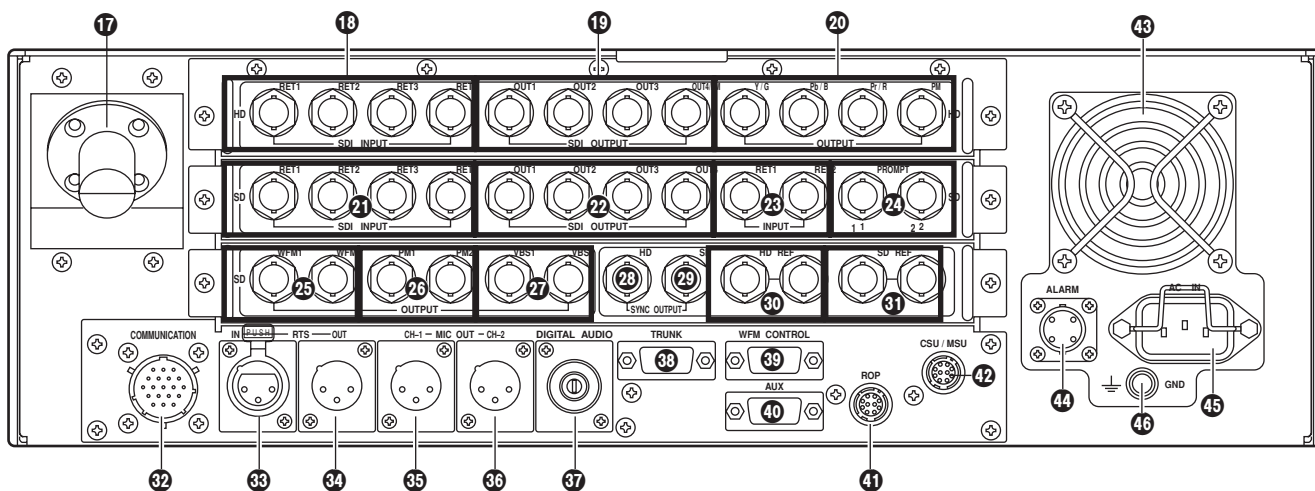
㊳ TRUNK connector [TRUNK]

This connector enables two sets of RS-422 data to be transmitted.

Pin No.	Function	TRUNK number	Signal flow
1	TX (−)	TRK 2	CAM→CCU 0
2	TX (+)	TRK 3	
3	RX (+)	TRK 0	CCU→CAM 0
4	RX (−)	TRK 1	
5	GND		
6	RTS (−)	TRK 6	CAM→CCU 1
7	RTS (+)	TRK 7	
8	CTS (+)	TRK 4	CCU→CAM 1
9	CTS (−)	TRK 5	

Parts and their functions

■ Camera control unit rear panel

❸❾ Waveform monitor control connector [WFM CTL]

This connector is used for controlling the waveform monitor. Since the interface is different, first check the WFM setting on the SYSTEM menu of the ROP or MSU before connecting the waveform monitor.

Waveform monitor control connector (SDAB-9S made by Hirose)

Pin No.	Signal	Function used by SDTV	Function used by HDTV
1	STAIRCASE	10 V output/input channel switching	5 V pull-up, 110 k
2	RGB ENABLE	TTL level low when SEQ is selected by monitor selector switch on ROP or MSU, for parade display	TTL level low
3	THREE LINE OR FIELD	Open	TTL level low when ENC.SEQ is selected by monitor selector switch on ROP or MSU
4	N.C.	Not connected	Not connected
5	CH1	Open	TTL level low when G or SEQ is selected by monitor selector switch on ROP or MSU
6	CH2	Open	TTL level low when B or SEQ is selected by monitor selector switch on ROP or MSU
7	CH3	Open	TTL level low when R or SEQ is selected by monitor selector switch on ROP or MSU
8	N.C.	Not connected	Not connected
9	GND	GND	GND

❹⓿ AUX connector [AUX]

This connector is for establishing the down-converter mode from the external system by remote control.

Side panel, squeeze and letter-box are available as the down-converter modes.

AUX connector (SDAB-9S made by Hirose)

Pin No.	Signal	Function
1	GND	
2	MODE2	When shorted: 4:3 aspect ratio
3	MODE2	When open: 16:9 aspect ratio
4	MODE1	Refer to table below for the down converter mode.
5	MODE1	
6	N.C.	
7	TALLY R	Contact
8	TALLY G	Contact
9	TALLY COM	

Down-converter mode	MODE1	MODE2
LOCAL	OPEN	OPEN
Letter-box (LB)	MAKE	OPEN
Squeeze (SQ)	OPEN	MAKE
Side panel (SP)	MAKE	MAKE

Parts and their functions

■ Camera control unit rear panel
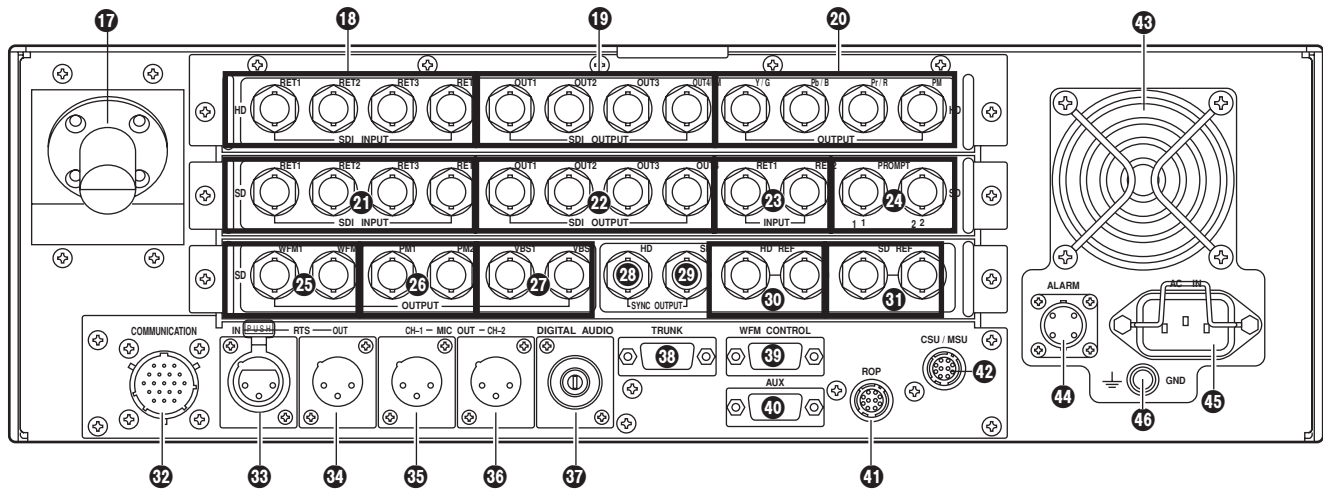
㊶ ROP connector

The remote operation panel (ROP) is connected to this connector.

ROP connector (HR10A-10R-10S)

Pin No.	Function	Polarity	Signal flow
1	ROP CONT (H)	+	CCU→ROP
2	ROP CONT (C)	−	CCU→ROP
3	ROP DATA (H)	+	ROP→CCU
4	ROP DATA (C)	−	ROP→CCU
5	POW REM/CD A		CCU→ROP
6	INCOMT/CD B		CCU→ROP
7	INCOMR/CD C		CCU→ROP
8	INCOMG/CD D		CCU→ROP
9	+12V	+	CCU→ROP
10	GND		

㊷ CSU/MSN connector

The camera selector unit (CSU) is connected to this connector.

CSU connector (HR10A-10R-10S made by Hirose)

Pin No.	Function	Polarity	Signal flow
1	CSU CONT (H)	+	CCU→CSU
2	CSU CONT (C)	−	CCU→CSU
3	CSU DATA (H)	+	CSU→CCU
4	CSU DATA (C)	−	CSU→CCU
5	TALLY R		CCU→CSU
6	TALLY G		CCU→CSU
7	HEAD POWER		CCU→CSU
8	ALARM 1		CCU→CSU
9	ALARM 0		CCU→CSU
10	GND		

㊸ Fan

This dissipates the heat generated inside the CCU to keep the unit cool.

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Parts and their functions

■ Camera control unit rear panel
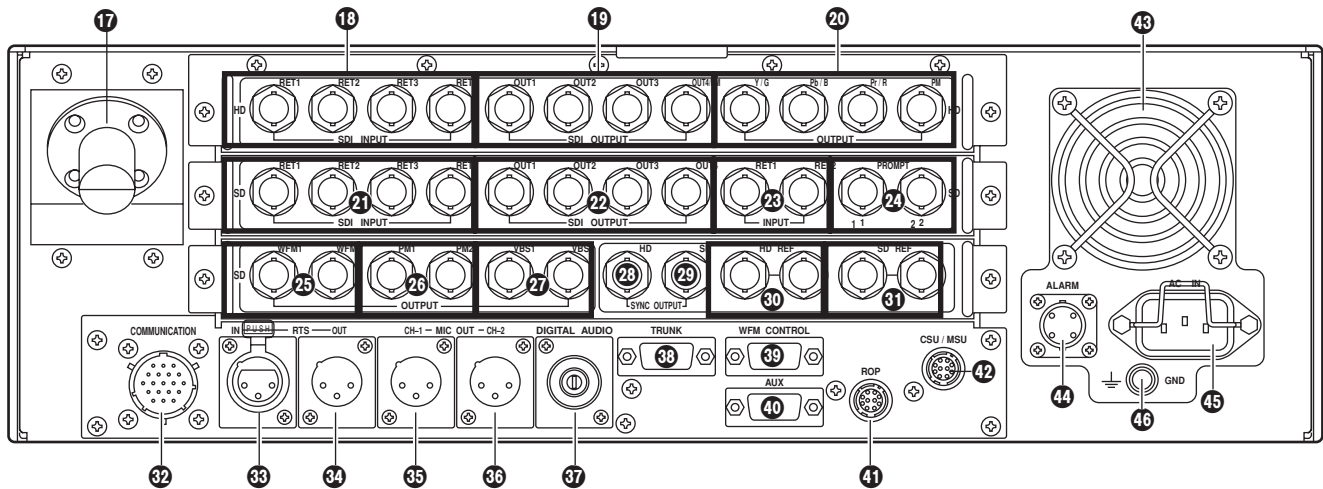
㊹ Alarm connector [ALARM]

This connector is for outputting the alarm signals to the external system when any problem with the supply voltage has occurred inside the CCU or the CCU fan has stopped.

When the power supplied to the AC fan or DC fan inside the CCU has been shut down, pins 3 and 4 of this connector are shorted.

If power is supplied to the CCU and any of the DC power supplies inside the CCU fails to output the supply voltage, it means that pins 1 and 2 of this connector are shorted.

Alarm connector (RM-12BRB-4PH made by Hirose)

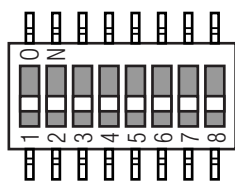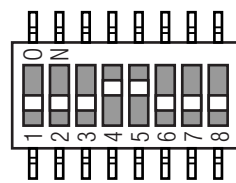| Pin No.	Function
1	POWER ALARM (H)
2	POWER ALARM (L)
3	FAN ALARM (H)
4	FAN ALARM (L)

㊺ AC inlet [AC IN]

AC 120 V, 50/60 Hz

㊻ Ground terminal [GND]

■ How to switch between 1080i camera mode and 720p camera mode

1. Turn off the power of CCU.
2. Turn the knobs and remove the front panel.
3. Switch the SW281 (MODE SW) on the Control board as follows:
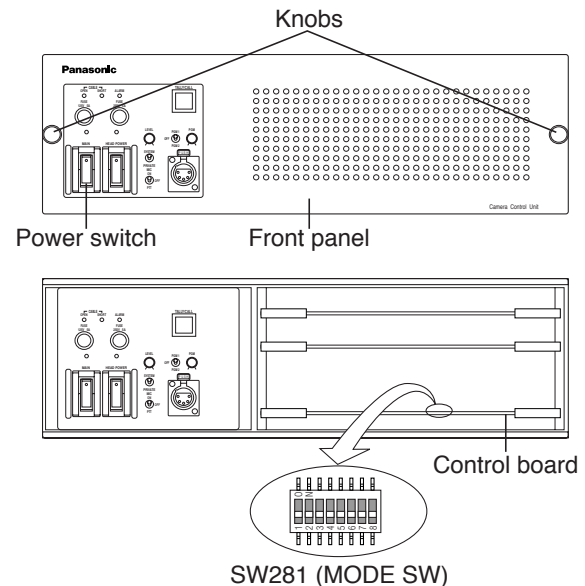

720p camera   1080i camera

- The factory setting is "720p camera".

4. Install the front panel, and turn on the power to complete setting.

Knobs

Power switch   Front panel
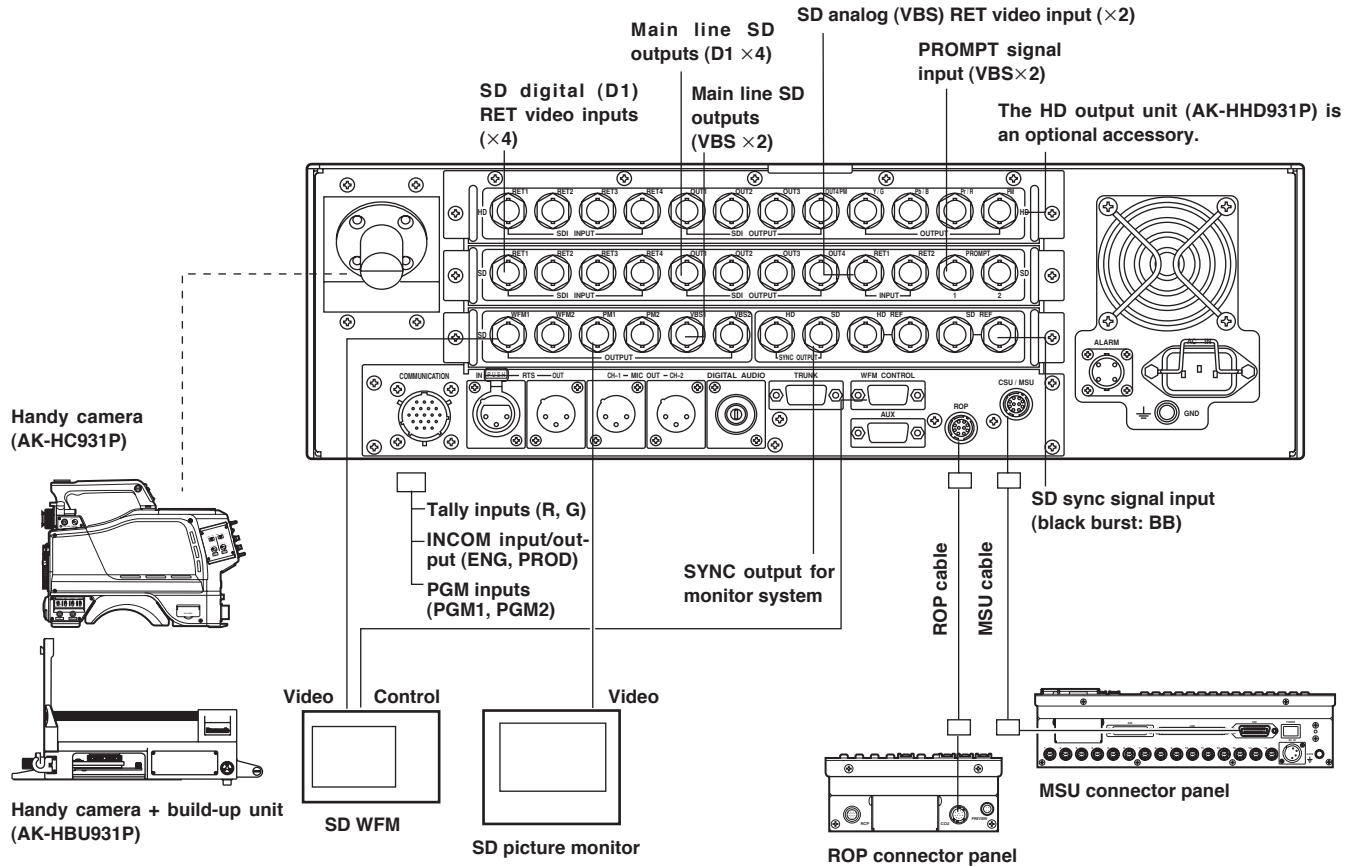
Control board

SW281 (MODE SW)

Connections

Connections for SD system

Dedicated ROP cables (available as optional accessories) are used to connect the CCU connector on the ROP unit and the ROP connector on the rear panel of the CCU (this unit).
After all the equipment has been connected, set the main power switch on the CCU to ON. Then turn on the camera's power.
<Notes>
● When the camera is not connected, the functions that can be controlled by the ROP and MSU are limited to the CCU control items.
● The camera power of the CCU must be turned off without fail before disconnecting the camera or ROP.

SD analog (VBS) RET video input (×2)

Main line SD outputs (D1 ×4)

PROMPT signal input (VBS×2)

SD digital (D1) RET video inputs (×4)

Main line SD outputs (VBS ×2)

The HD output unit (AK-HHD931P) is an optional accessory.

Handy camera (AK-HC931P)

Tally inputs (R, G)

INCOM input/output (ENG, PROD)

PGM inputs (PGM1, PGM2)

SYNC output for monitor system

ROP cable

MSU cable

SD sync signal input (black burst: BB)

Video   Control   Video

Handy camera + build-up unit (AK-HBU931P)

SD WFM

SD picture monitor

ROP connector panel
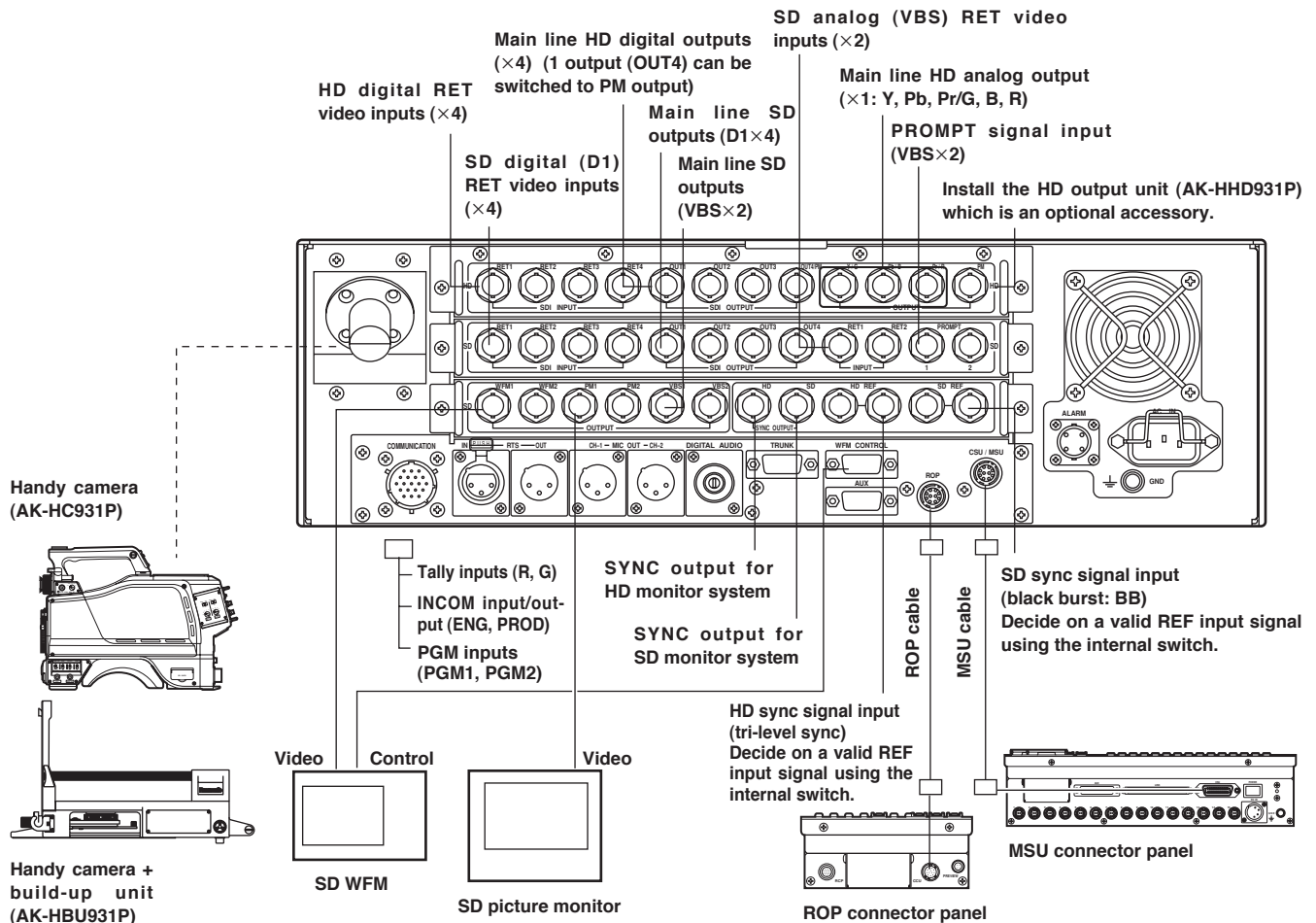
MSU connector panel

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Connections

Connections for HD/SD system

Dedicated ROP cables (available as optional accessories) are used to connect the CCU connector on the ROP unit and the ROP connector on the rear panel of the CCU (this unit).
After all the equipment has been connected, set the main power switch on the CCU to ON. Then turn on the camera's power.
<Notes>
● When the camera is not connected, the functions that can be controlled by the ROP and MSU are limited to the CCU control items.
● The camera power of the CCU must be turned off without fail before disconnecting the camera or ROP.
● To configure the HD system, the HD output unit (AK-HHD931P), available as an optional accessory, must be installed.

SD analog (VBS) RET video inputs (×2)

Main line HD digital outputs (×4) (1 output (OUT4) can be switched to PM output)

Main line HD analog output (×1: Y, Pb, Pr/G, B, R)

HD digital RET video inputs (×4)

Main line SD outputs (D1×4)

PROMPT signal input (VBS×2)

SD digital (D1) RET video inputs (×4)

Main line SD outputs (VBS×2)

Install the HD output unit (AK-HHD931P) which is an optional accessory.

Handy camera (AK-HC931P)

Handy camera + build-up unit (AK-HBU931P)

Video   Control   Video

SD WFM

SD picture monitor

Tally inputs (R, G)
INCOM input/output (ENG, PROD)
PGM inputs (PGM1, PGM2)

SYNC output for HD monitor system

SYNC output for SD monitor system

**HD sync signal input (tri-level sync)
Decide on a valid REF input signal using the internal switch.**

ROP cable

MSU cable

**SD sync signal input (black burst: BB)
Decide on a valid REF input signal using the internal switch.**

ROP connector panel

MSU connector panel

External dimension drawing

459

424

132

Panasonic

Camera Control Unit

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Specifications

```
Power supply:        AC 120 V
Power consumption:   80 W (when unit is operated on its own)
```

indicates safety information.

Video input/output signals
SD digital signal (D1)
SD analog signal (VBS)
HD digital signal (optional)
HD analog signal (Y, Pb, Pr/GBR): Output only (optional)
PROMPT signal (VBS): Input only

Sync input signals
HD reference signal (tri-level sync)
SD reference signal (BB) (Select one of these signals using the internal switch.)

Audio output signals
Analog audio output (MIC 1, 2)
Digital audio output (MIC 1, 2)

Switch functions
Refer to "Parts and their functions" (page 4).

Operating temperature range
0 to +40 ˚C (+32 to 104 ˚F)

Storage temperature range
−20 to +60 ˚C (−4 to 140 ˚F)

Operating ambient humidity
Less than 85%

Weight
Approx. 20.0 kg (44 lbs)

Dimensions (W×H×D)
420×132×459 mm (excluding protrusions)
(16-9/16×5-1/4×16-9/16 inches)

Rack mounting
Attach the rack mounting adapter firmly by using a crosshead screwdriver as follows:

Mounting screws (×6)

Rack mounting adapter

Panasonic ®