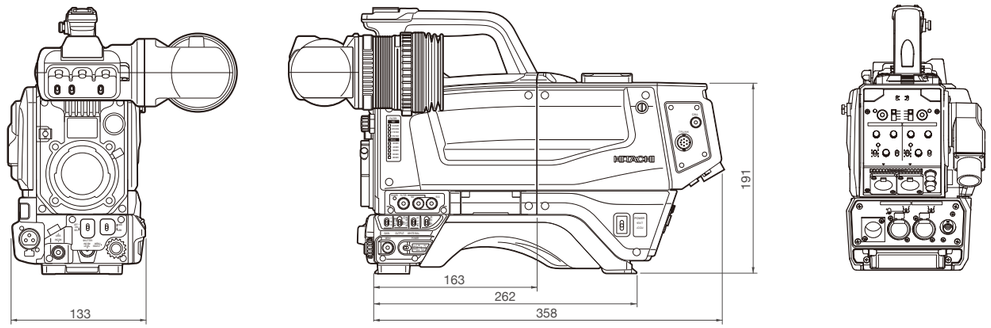
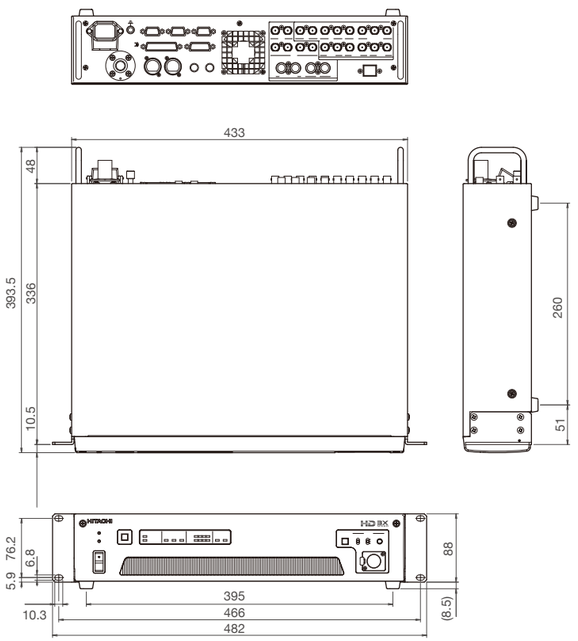
DIMENSIONS (SK-HD1500)



DIMENSIONS (CU-HD1500)



⚠ CAUTION : To ensure safe operation, please read the instruction manual before using this product.

These Specifications are subject to change without notice.

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Hitachi Kokusai Electric

HITACHI

High speed HD Camera

SK-HD1500

HD 3X SPEED



Hitachi's SK-HD1500 High speed HD Camera
Studio and Field Production Camera

High Speed HD Camera
SK-HD1500
HD 3X SPEED

Latest Advanced High Speed Scan Sensors

Advanced 16 bit ADC and 38 bit DSP

Slow Motion Camera with 3x and 1x speed simultaneous HD Outputs

The SK-HD1500 is HITACHI's fifth-generation, triple-speed, slow-motion HDTV Studio and Field production camera. It has been especially developed in response to increased market demand for the acquisition of high-quality HDTV images in sports and action events.
The pristine image starts with an excellent signal-to-noise ratio of -58dB which is attained by employing the latest Ultra-Advanced, High-speed/Sensitivity CCDs, state-of-the-art 16-bit analog to digital converters and patented HITACHI digital processing technologies.
The camera system outputs these slow-motion frame rates: 1080i/180 or 1080i/150, 720p/180 or 720p/150. It simultaneously outputs normal speed images [1080i/60, 1080i/50, 720p/60, 720p/50] from its camera control unit (CCU) thus allowing dual recording of 2 different HD signals. The SK-HD1500 can effectively be deployed in camera positions within a venue replacing normal frame-rate HD cameras costing just as much.

Digital signal transmission via Hybrid Fiber Optical Cable

Hitachi has brought to market the first 6Gbps, fully digital optical transmission system in an HDTV production camera. It is the most accurate transport available for the 10-bit, 1080i 150/180 images from the camera head to the camera control unit. All command audio and video signals to and from the camera are digitally transmitted hence, totally immune to EMI/ RFI interference.

Camera power and cable condition supervision are also performed when using standard SMPTE311-type Hybrid Fiber Cable. Full Auxiliary (up to 4 digital, HD or SD) video return and individual trunk video function for one HD-SDI that use the space band of 1.5Gbps except triple speed band of 4.5 Gbps are with a total of the SK-HD1500 transmission system. The maximum HFOC length with applied camera power and fully operational facilities is 4,000m (13,200 feet) with no utility power.

Unique to cameras in the SK-HD1500's price range are optical power meters at the camera head (via engineering menu) and on the front of the CU-HD1500 camera control unit. These meters indicate the optical condition of both the receive and, transmit signals independently to accurately depict the proximity to the "digital cliff", maximum cable distance or provide basic fiber cable diagnostics in the field.

*HFOC distance with applied CCU power differs depending on the system configuration. It is dependant on the type of lens used, viewfinder, studio adaptor, teleprompter and other accessories that may be connected and thereby consuming power otherwise available for the camera head.



Superb High Definition picture reproduction & enhancement tools

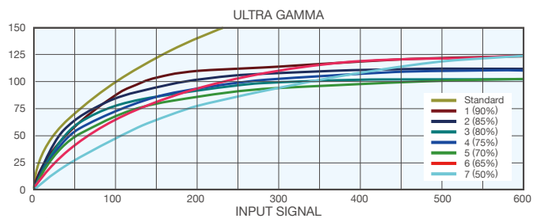
Luminance response tools

Selectable gamma tables
In addition to normal gamma point and balance adjustments, the SK-HD1500 offers a multi-point gamma table that provides the user with exposure control over just the darkest points in the image. It enables adjustment of the initial gamma gain to optimize the reproduction of dark scene components. Hitachi's DSPs assure that no additional noise components are introduced in the image even with the most aggressive Gamma Table settings. Additionally, this function does not change any of the other parameters of the video signal thus maintaining overall exposure, detail, color reproduction and composition.


Standard Gamma


High Gamma Table ON (Simulated image)

Ultra Gamma
This function dramatically increases the exposure latitude of the camera in shooting conditions where the intensity of lighting and scenery varies widely. Seven different ultra-gamma responses are pre-programmed to suit just about every possible adverse shooting condition.

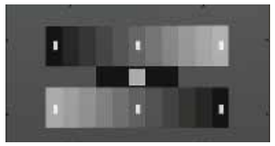


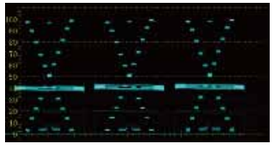
Black stretch
Black stretch function allows for better reproduction of dark or underexposed areas by evenly raising the luminance response without changing the pedestal or white clip/ knee settings. It is especially useful in high contrast image venues, outdoors or sport productions.

Linear and auto-knee
Like the peak video level control function of the white clip; the linear knee function is made up of the actual knee (level compression) point and its slope which improve overexposed portions of the picture by compressing the video past a certain point. These points are user adjustable.
The auto knee provides the perception of a wider dynamic range by dynamically compressing (varying knee and slope) the video level in accordance to the strength of its over-exposure.

Lens optimization

Gray-Scale automatic setup
The SK-HD1500 offers the Gray-Scale Automatic Setup function to optimize the optical parameters that could negatively affect the image you are trying to capture and faithfully reproduce. The Gain, Gamma, and Flare are the video signal functions that vary from lens to lens.





Automatic vertical modulation shading adjustment
The SK-HD1500 assures that with any lens used, an even, chroma response will be attained by the automatic vertical modulation shading correction function. At the simple push of a button, this function provides separate memory of lens' modulation shading characteristics to optimize the X1 and X2 lens extender positions.







Knee Saturation
The Knee Saturation function dynamically restores color saturation to scene highlights above the Knee point. Color-saturated highlights lost in overexposed scenes are now visible. This function provides excellent results ; for example when imaging : high-contrast, sunny outdoor scenes, fireworks, concerts, theatre stage lighting, and colored night scenes.


Knee Saturation OFF


Knee Saturation ON (Simulated image)

Lens Files
The SK-HD1500 can store 8 lens files which include various lens correction data such as vertical modulation shading.This lens correction data can also be stored in a card (SD card), where it can be recalled when necessary.

Color reproduction excellence

Triple-masking
The triple-masking function includes the 12-vector, linear matrix and, Skin-tone masking provide the user wide latitude in subject image color control. The 12-vector color corrector provides independent control of the hue and saturation for six primary and six secondary combinations of colors. The 6-axis linear matrix provides overall color control thereby providing the user with excellent and precise color rendition control.

Preset Masking
The preset masking function reproduce various image color such as STANDARD(Hitachi standard)/ITU-709/SMPTE240M/SMPTE-WIDE/NTSC/EBU.

Skin-tone masking
The Skin-tone masking function provides "fine Painting" (hue and saturation) of Skin tones without affecting other colors in the scene. This functions additional and independently from the linear and 12-vector-masking functions thereby adding an additional color-correction (Triple-masking) Channel to the overall image color control.


Skin tone masking OFF


Skin tone masking ON (Simulated image)

Chroma Saturation
In addition to the extensive colorimetry controls offered in the SK-HD1500, the overall color saturation can be varied to achieve "dramatic" or artistic "effects" .


Original Image


Color corrected (Simulated image)

Picture sharpness enhancement

Absolute detail control
Hitachi provides 3 major detail controls designed to precisely place, control and shape the picture sharpness characteristics of the SK-HD1500.

Master Detail items
Master Detail items are available to adjust various parameters of the detail signal to taste or to achieve a desired "look" in your productions. Some of these adjustments are ; H/V detail, crisp, level dependence, knee detail, limiter, source, frequency and balance.

Skin-tone Detail
The Skin-tone Detail functions allow a flesh color-based softening of the image to achieve the impression of more youthful TV personalities. 2 individual memories exist as well as a function to automatically detect the hue, saturation and luminance of the Skin-tone to be affected. This function is not limited to Skin-tones only ; it can increase or decrease the sharpness of any pair of colors in the image.


Skin-tone Detail OFF


Skin-tone Detail ON (Simulated image)

High-chroma detail
The High-chroma detail adjustments allow precise control of the detail level in highly color-saturated portions of the picture such as the petals of a rose or a colorful fabric.


High-chroma detail OFF


High-chroma detail ON (Simulated image)

ACCESSORIES

Optical and image capture functions

Advanced Flicker Reduction Function

The video flicker seen in a modern HDTV slow-motion camera is mainly caused by the asynchronous frequencies between the camera's CCD scanning and the charge-discharge cycles of artificial lights typically used in stadiums, arenas and auditoriums.
The SK-HD1500 can minimize the observed flicker in the image by its unique, automatic flicker-frequency detection algorithms which use the actual level fluctuations in the captured video frames to correct the flicker in real-time.
The optimum reduction in flicker can be thus easily obtained by adjusting the detection response and method via the SK-HD1500 operational menu.

Versatile CCD drive functions

Three modes of shutter operation are provided in the SK-HD1500 camera system :

- Four PRESET electronic shutter speeds, for stopping action or fast moving objects in the image.
- LOCK SCAN to image non-synchronous displays without flicker.
- Automatic Electronic Shutter (AES) maintains the video level when the maximum F-stop shooting condition is reached.

Motorized and remotely controlled optical filters

In traditional photography, ND filters are used for depth of field control. Four optical ND filters are provided as standard on a motorized, remotely controlled filter wheel. These are: Clear, 4-point Cross, 1/16ND, 1/64ND.

Focus Assist

Advanced Focus Assist Functions are available to support the camera operator in finding the right focus regardless of the viewfinder model used. The Area Marker detects edges inside area, while a focus indicator shows the actual detail level by a horizontal line. A Focus Indicator Gauge can further be set to lock the maximum achieved level for a few seconds.

Quick focus + Precision Focus (Auto Focus)

The Quick Focus function automatically opens the iris then sets the video level with the electronic shutter. The resulting shallow depth of focus, allows the cameraman to set the exact focus with ease.
Lenses with Precision Focus(Auto Focus) technology are supported equally.

ECC(Electronic Color Correction)

Due to the wide gain characteristics of the SK-HD1500, the ECC function corrects color temperature electronically by providing preset gains to equal color temperature gradations of 3200K, 4300K, 5600K, 6300K and 8000K.The ECC can be controlled by the remote control panel and the base station like an optical filter. The setting can be stored in the Scene files and its status can be displayed on the view finder and the monitor output.

Full auto mode

The AES and automatic iris maintain the video level even with rapidly changing light intensity. These functions are accessed via the menu system or the shutter buttons provided on the RU-1500JY and SU-1000 remote control panels. Full-time Auto White balance (FAW) corrects in real-time color temperature variations due to changing types of lighting conditions on the scene object.

Ease of use characteristics & functions

Viewfinder options

Three viewfinder options are offered with the SK-HD1500 camera system. Black & White CRT-type viewfinders are manufactured for ENG (2-inch) and OB (5-inch). These are of high-brightness and contrast making them ideal for easy visibility in field production.
A 9-inch color TFT-LCD screen viewfinder is offered for critical viewing such as encountered in studio productions.



The SK-HD1500 incorporates heavy duty mounts for both the ENG and Studio viewfinders.

Viewfinder markers & functions

The SK-HD1500 provides an excellent gamut of thoughtful viewfinder markers and functions to aid the camera operator in providing outstanding results during a TV program production.
All VF parameters can be stored in 4 dedicated memories which can catalog preferences for different operators, programs, shooting conditions or events.
Programmable functions include; color/mono, detail, crisp, safety zone, 2 movable markers, center cross-hair, 2 movable effects boxes, variable aspect ratio side panels, side panel contrast/ bright, 2-mode zebra and variable line display level polarity.

Programmable soft-switches (CS-1, CA-CS)

The operator or cameraman/woman can assign Zebra, marker, VF Detail, Quick Focus or FAW to the CS-1 switch via the operation menu. The CA-CS switch can take on the functions of VF Detail on/off, marker-1 or marker-2 on/off.

Viewfinder status displays

Iris F-stop, Lens Externder position, Shutter speed, Optical and ECC filter in use, and Gain setting are all displayed or defeated via menu selection. Menu selection also includes the over-level or between range-type zebra are also provided.

Comprehensive control panel

In Studio and Field production, the panel provides the camera operator with a wide array of controls for intercom audio, program audio, aux video switching controls, script lamp connector, dual-tally and call functions the norm in high-end broadcast cameras. These functions along with available 100VA of teleprompter monitor power and dedicated prompter SD signal make the SK-HD1500 a logical choice for sophisticated productions.

Camera head inputs & outputs

The camera head provides 2 buffered HD-SDI, 1 SD analog teleprompter out, and 1 HD-SDI switchable as Monitor or VF and RET video output via BNC connectors. The MIC-1 channel is switchable with balanced XLR input connector located at the front of the camera (shotgun mic) or at the rear of the CA-HF1500. All the microphone inputs provide phantom power supplies and accept mic or line levels. These IOs satisfy a wide variety of production requirements.

High-quality, Wide-band, Optical Digital Transmission and Camera Control System

The CU-HD1500 and the CA-HF1500 constitute the camera control and transmission system for the new multi-standard camera SK-HD1500. The Camera Control Unit CU-HD1500 provides significantly reduced power consumption and improved functionality. SDI（1080i/720p/480i/ 576i ）inputs/outputs are offered as standard. This flexible system is capable of providing many modern HD/SD-SDI video signals required by today's HDTV program production demands.

Constructed full complement of Serial Digital Interfaces is provided as standard.
Digital inputs/outputs:

- HD-SDI OUT x6 （For High-speed motion output Link A/B/C x2 ）
- HD-SDI OUT x2 [Embedded audio available]
- HD-SDI or SD-SDI OUT x4 [x2/x2 Embedded audio available] (SD-SDI 16:9/4:3 switchable)
- HD-SDI or SD-SDI WFM OUT x1 [Embedded audio available]
- HD-SDI or SD-SDI PIX OUT x1 [Embedded audio available]
- HD-SDI or SD-SDI RET In x6 [x4 for VF / x2 for Floor monitor]

Analog inputs/outputs:

- PROMPT IN x1
- GL IN x1

High-performance SDTV down-converter

- Due to the use of an independent and separate processor located in the CU-HD1500, detail can be adjusted for the SD video outputs without affecting the HD video signal outputs.
- SD aspect ratio is switchable between 16:9 and 4:3.

HD up-converter
The HDTV up-converter for displaying the SDTV return signals in the HD Viewfinder is provided as standard with the CU-HD1500. The up converter is of a line-correction type capable of displaying 1080 effective scanning lines. In addition, AUX and Return color signals can be displayed in the TFT-LCD color viewfinders offered.

High-quality digital transmission using optical fiber cable.
An HFOC (Hybrid Fiber Optic Cable) is used to connect the camera adaptor (CA) and the camera control unit (CCU). The 6Gbps signals are transmitted using two spectra of 3G-SDI to ensure high-quality and wide-band transmission.

The effective HFOC length can be up to 4,000m (13,200 feet) with no utility power and up to 10km with normal single mode fiber (2 required per camera).
SDI Embedded audio Two channels of MIC audio can be embedded in HD-SDI/SD-SDI output.
(SMPTE 299M/272M)

TRUNK DATA (RS-422 or RS-232C (option))

TRUNK VIDEO (1080i)

CU-HD1500 Front Panel



CU-HD1500 Rear Panel



SPECIFICATIONS

High Speed HD Camera
SK-HD1500
HD 3X SPEED

High speed camera head SK-HD1500/CA-HF1500

	SK-HD1500	SK-HD1500-S2
CCD	2/3-inch, IT-CCD Total pixels : 2,010 (H) × 1,120 (V) 2.3 million pixels Effective pixels : 1,920 (H) × 1,080 (V)	
Native Scan	1080i 150/180	
Prism	F1.4	
Optical Filter	1x motorized filter wheel with 4 filter positions 1: Clear, 2: Cross, 3:1/16ND, 4:1/64ND ECC (Electronic Color Correction) with 5 settings (3200K, 4300K, 5600K, 6300K, 8000K)	2x motorized filter wheels with 5 filter positions ND CAP, 1 : Clear, 2 : 1/4ND, 3 : 1/16ND, 4 : 1/64ND CC A : CROSS, B : 3200K, C : 4300K, D : 6300K, E : 8000K ECC (Electronic Color Correction) 5600K.
ECC Filter	3200 K, 4300 K, 5600 K, 6300 K, 8000K	
Lens mount	B4 Bayonet	
HD Resolution	1100TVL	
HD SNR	Typical 58dB : 1080i 50/60 54dB : 1080i 150/180 (Hi speed x3) (HD-SDI output decode Y channel Band : 27.5 MHz)	
Std Sensitivity	F9 at 2000lx (1080i/150), F8 at 2000lx (1080i/180) (Using 3200K, 89.9% reflectance)	
Analog-to-Digital Conversion depth	16-Bit	
Gain selection	L (low) : -3/0dB M (medium): 0/+3/+6/+9/+12/+15/+18/+21dB H (high) : +3/+6/+9/+12/+15/+18/+21/+24 dB	
Shutter	1/250, 1/500, 1/1000, 1/2000 second	
Lock scan	150i : 1/150 to 1/2008 second 180i : 1/180 to 1/1983 second	
Geometric distortion	Overall : 0 % (excluding lens characteristics)	
Registration Overall	0.01 % (excluding lens characteristics)	
Dimensions	133 (W) x 191 (H) x 262 (D)	
Power Consumption	42W Camera head and adaptor (without VF)	
MASS	4.7Kg, 10.36lbs Camera head and adaptor (without VF)	
Input & Output	MON/RET OUT : BNC x 1, HD-SDI REMOTE : 4-pin Multi connector for remote control unit VF : 20-pin Multi connector LENS : 12-pin Multi connector MIC : 3-pin XLR connector SD Memory Card Slot	

2-inchviewfinder VF- 402 (59.94Hz) / VF-402E (50Hz)

Construction	Metal Die-cast chassis & mount 2-inch BW 16:9 CRT Diopter (CRT Focus Ring) VF angle rotation X-Y mechanical movement
Resolution	650 TV lines
Functions	BRIGHT, CONTRAST, PEAKING knob VR (front facing)
Internal tally	Red/Green
Tally switch	Tally switch OFF NORMAL HIGH

9-inch viewfinder VF-L90HD

Construction	1080i/720p field frequency= 50/59.94Hz
Number of pixels	1280(H) x 768(V) normal scan (16:9)
Color temperature	6500K
Input Signals	Analogue Y/Pb/Pr/SYNC
Functions	BRIGHT, CONTRAST, PEAKING knob VR power on/off, tally on/off, Marker on/off, (center marker, 4 : 3 marker, area marker)
Internal tally	Red/Green
Dimensions	230 (W) x 185 (H) x 86 (D)
Mass	1.6kg, 3.5lbs
Attachment (Option)	AT-951 (mass : 1.6kg, 3.5lbs AT-90 (mass : 0.7kg, 1.54lbs)

High speed camera control unit CU-HD1500 (INPUT)

GEN LOCK IN	B-BST 0.45Vp-p/75Ω (loop through) or HDTV tri-level sync 0.60Vp-p/75Ω (loop through)	BNC x1
DIGITAL RET IN (A) 1/2/3/4	HD-SDI or SD-SDI ・1080i : SMPTE274M ・720p : SMPTE296M ・SD SDI: SMPTE259M-C	BNC x4 x4：for VF
PROMPT IN	VS or VBS 1.0Vp-p/75Ω (loop through)	BNC x1
INTERCOM (HEAD SET)	-60dBm	XLR-5pin(Female)
COMMUNICATION		D-sub 15pin
・INTERCOM	0dBm, 600Ω at 4Wire 0dBu or -15dBu ,200Ω at 2Wire Clear-Com and RTS compatible	PD/ENG
・PGM	0dBm/600Ω	
・R/G TALLY	Contact or Voltage selectable	
REMOTE 1	1.5Vp-p	4pin
REMOTE 2	1.5Vp-p	4pin
REMOTE 3	Remote	RJ-45

＊Recommended Video-Server：EVS, BLT

High speed camera control unit CU-HD1500 (OUTPUT)

DIGITAL OUT For High-speed motion output HD-SDI LINK A/B/C	Link A (x2), Link B (x2), Link C (x2) ・1080i/720p : SMPTE292M	BNCx6 (x3+x3)
DIGITAL OUT HD1 (1/2)	HD-SDI (Embedded 2-Chnl audio available) ・1080i/720p : SMPTE292M	BNC x2
DIGITAL OUT HD/SD1 ～ HD/SD2 (1/2)	HD-SDI or SD-SDI selectable (HD-SDI : 1.5G) (Embedded 2-Chnl audio available) ・1080i/720p : SMPTE292M ・SD-SDI : SMPTE259M-C	BNC x4 (x2+x2)
DIGITAL OUT HD/SD3 (WFM)	HD-SDI or SD-SDI selectable WFM (Embedded 2-Chnl audio available) ・1080i/720p : SMPTE292M ・SD SDI : SMPTE259M-C	BNC x1
DIGITAL OUT HD/SD3 (PIX)	HD-SDI or SD-SDI selectable PIX (Embedded 2-Chnl audio available) ・1080i/720p : SMPTE292M ・SD-SDI : SMPTE259M-C	BNC x1
MIC OUT 1	0dBm/600Ω	XLR-3pin
MIC OUT 2	0dBm/600Ω	XLR-3pin
INTERCOM (HEAD SET)	0dBu MAX+15dB	XLR-5pin (Female)
Remote 1	1.5Vp-p	4pin
Remote 2	1.5Vp-p	4pin
Remote 3	Remote	RJ-45
COMMUNICATION		D-sub 25pin
・INTERCOM	0dBm, 600Ω at 4Wire 0dBu or -15dBu, 200Ω at 2Wire	
TALLY OUT(R/G)	Contact 24Vdc, 10mA	D-sub 9pin
WFM CONTROL	WFM 0-7 0/5V	D-sub 15pin
MIC REMOTE	MIC1, 2 Gain	D-sub 15pin

System configuration chart

