

# SONY®

High Definition Video System

*Digital* **HDVS**®

**HDCAM**™



Sony Digital Recorder and Player  
**HDW-2000 Series**

# HDCAM-Mainstream Workhorse in HDTV Production





Since introducing its first model in 1997, Sony has enhanced the HDCAM™ Series of products, continually reinforcing its support to the emerging DTV agendas around the world. Followed by the introduction of the HDW-F900 multi-frame rate camcorder and its companion HDW-F500 VTR, HDCAM has revolutionized the world of movie making, now popularly recognized by the name CineAlta™.

With the rapid proliferation of HD in video productions, Sony introduced its second generation of HDCAM products, the HDW-2000 Series VTR and its counterpart HDW-750 camcorder. These models continue to present a cost-effective and feature enhanced HD solution, focused on streamlining the migration process to full DTV operations. The HDW-2000 Series includes invaluable functions such as legacy playback of standard definition BETACAM™ formats and internal up/down-conversion\*<sup>1</sup> capabilities – crucial features for bi-directional exchange of program material between the co-existing SDTV and HDTV infrastructures.

Today, Sony further enhances its HDCAM product line with the addition of the HDW-S2000\*<sup>2</sup> and HDW-D2000 VTRs, and the HDW-730S camcorder – all cost-effective models tailored to meet the evolving needs of high definition production. Incorporating the fundamental functions of the HDW-2000 Series, the HDW-S2000 and HDW-D2000 broaden the choice of HDW models, allowing users to select the most appropriate HDCAM VTR for each specific need. The HDW-S2000 and HDW-D2000 provide a different combination of BETACAM format playback capabilities - the HDW-S2000 replays BETACAM SX™, BETACAM SP™, and BETACAM, while the HDW-D2000 plays back MPEG IMX™ and Digital BETACAM™. Both models record and playback 1080 HD pictures in interlace 50i, 59.94i and progressive 25PsF, 29.97PsF modes. They also allow playback of 24PsF and 23.98PsF HDCAM material, serving as a cost-effective entrance to CineAlta operations.

With a rich choice of models, and the high quality and operability that the HDCAM format is renowned for, the HDW-2000 Series VTR offers an economically well-balanced solution for HDTV programming.

\*<sup>1</sup> Down conversion is not available for tapes played back at 23.98 or 24 frames.

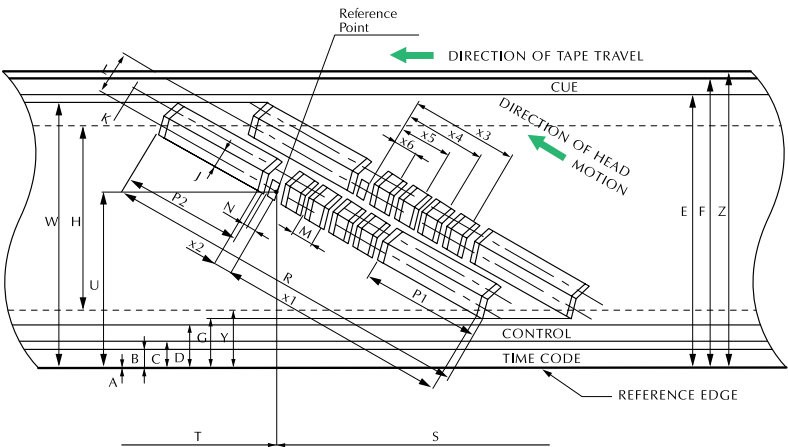
\*<sup>2</sup> The HDW-S2000 refers to both the HDW-S2000 and HDW-S2000P.



# Features

## High-Definition Picture Quality with HDCAM Format

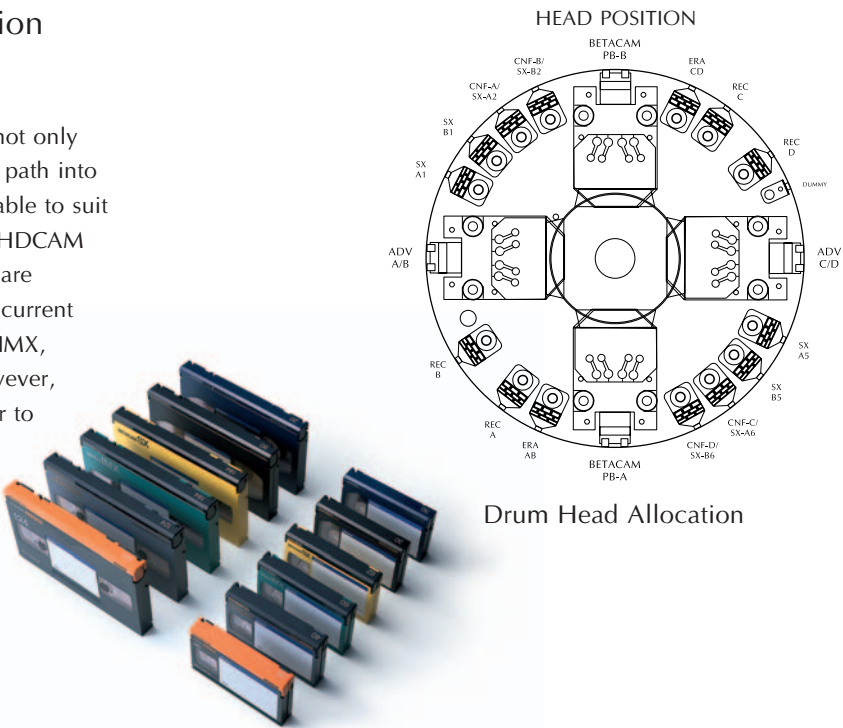
The HDW-2000 Series recorders/player adopt the proven HDCAM format, recording high-definition component digital signals using the state-of-the-art HDCAM compression technology. This excellent compression scheme maintains a high video bit rate of 140 Mb/s (data rate on tape of 185 Mb/s). The format combines superb picture quality with the high reliability and robustness of 1/2-inch tape integrated into a design approach inherited from the BETACAM Series.



## Compact, Affordable High-Definition Video Cassette Recorder/Player with Legacy Playback

The HDW-2000 Series high-definition VTRs are not only affordable, they also provide a smooth migration path into the HDTV world. Five different models are available to suit budgetary and operational needs. In addition to HDCAM recording/playback, the HDW-2000 Series VTRs are equipped with backward playback capability for current 1/2-inch tape formats\*; Digital BETACAM, MPEG IMX, BETACAM SX, BETACAM SP and BETACAM. However, the HDW-2000 eliminates this capability in order to provide utmost cost efficiency. With its affordability and different choice of feature sets, the HDW-2000 Series is destined to be a true workhorse in broadcast stations and ENG applications.

\* Playback-compatible formats vary by product.



### HDW-2000 Series Line-up

		Recording Format	Playback Format
HDW-2000	HD Digital Video Cassette Recorder	HDCAM	HDCAM
HDW-M2000	HD Digital Video Cassette Recorder	HDCAM	HDCAM, Digital BETACAM, MPEG IMX, BETACAM SX, BETACAM SP, BETACAM
HDW-D2000	HD Digital Video Cassette Recorder	HDCAM	HDCAM, Digital BETACAM, MPEG IMX
HDW-S2000	HD Digital Video Cassette Recorder	HDCAM	HDCAM, BETACAM SX, BETACAM SP, BETACAM
HDW-M2100	HD Digital Video Cassette Player	—	HDCAM, Digital BETACAM, MPEG IMX, BETACAM SX, BETACAM SP, BETACAM
HDW-M2100P			

## Wide Array of Signal Formats\*<sup>1</sup>

The HDW-2000 Series can playback a wide variety of legacy SDTV VTR formats in addition to the HDCAM format. Since the HDW-2000 Series can output signals in 1080i, 576i and 480i, each format is reproduced in its corresponding vertical resolution.

As an even greater advantage, the HDW-2000 Series has up and down converters built-in so a program originated for SDTV can be up converted for HDTV transmission, and materials that were made in the HD format can be down converted as "Super-sampled" SD images. This is a distinct

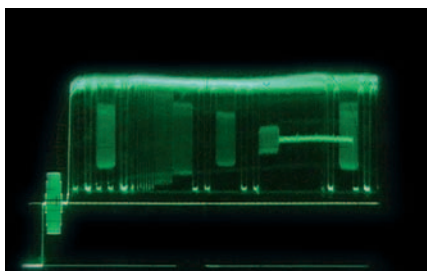
advantage of the HDW-2000 Series. The "Super-sampled" HD origination produces standard definition 480 and 576-line NTSC/PAL signals which are superior to those originated in standard definition (their horizontal and vertical MTFs are higher and the associated scanning aliasing is less). Furthermore, a 720P progressive output is available for integration into 720P-based systems.\*<sup>2</sup>

\*1 Excludes the HDW-2000.

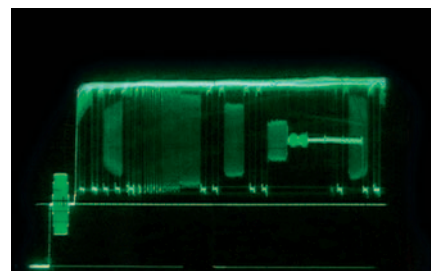
\*2 For output of the 720P signal, an upgrade of software, hardware, or both may be required. Please consult your nearest Sony office.



Multi-burst Chart



Conventional 480/576-line  
Digital VTR



"Super-sampled" HDCAM  
Down-Converted signals

## Interlace, Progressive Switchable Operation

The HDW-2000 Series recorders provide recording and playback capability of the HDCAM format in 1080/59.94i, 1080/50i, 1080/29.97PsF and 1080/25PsF frame rates.\*<sup>1</sup>

The HDW-2000 Series also allows legacy playback of both 480/59.94i and 576/50i on the same deck\*<sup>1</sup>. This flexibility makes the HDW-2000 Series an extremely effective tool for international programming. Furthermore, to meet the increasing needs of 24P program creation, the 23.98PsF/24PsF recordings can be converted to a 25PsF signal with appropriate conversion of time code.\*<sup>2</sup>

\*1 The frame rate of the source tape cannot be converted at the output between 1080/59.94i and 1080/50i or between 480/59.94i and 576/50i. Playback of a 576-line analog BETACAM tape on the HDW-M2000/S2000/M2100 (NTSC model), and playback of a 480-line analog BETACAM tape on the HDW-M2000P/S2000P/M2100P (PAL model) is for monitoring purpose only.

\*2 Requires audio pitch correction. Down conversion and/or "pull-down" of tapes played back at 23.98PsF or 24PsF frame rate are not provided.

## Long Recording Time on a Single Cassette

Utilizing the HDCAM format's high-density recording capability and compression technology, the HDW-2000 Series provides a long recording time of 124 minutes at 1080/59.94i and 149 minutes at 1080/50i per one L cassette. Small size cassettes can also be used, which provide 40 minutes recording at 1080/59.94i and 48 minutes at 1080/50i. This flexibility allows the HDW-2000 Series to cover a wide range of applications including news, sports and production.

## Digital Audio and Dolby® Recording

The HDCAM format records four channels (two AES/EBU stereo pairs) of non-compressed digital audio (20 bit at 48 kHz). The HDW-2000 Series recorders can also record non-audio data streams within the audio recording area by packaging the data within an AES/EBU wrapper. Furthermore, the HDW-2000 recorders can record Dolby-E and Dolby AC-3 data (non-audio) streams on the audio tracks.



\* Dolby and the double-D symbol are trademarks of Dolby Laboratories Inc.

## Compact Design and Low Power Consumption

This Series features a compact 4RU-size\* design and weighs only 50 lb 11 oz (23 kg) – 26 lb 7 oz (12 kg) lighter than the HDW-500 HD Video Recorder. It also has low power consumption of 220 W. This compactness and low power consumption are suited to not only studio use but also installation into OB-vans.

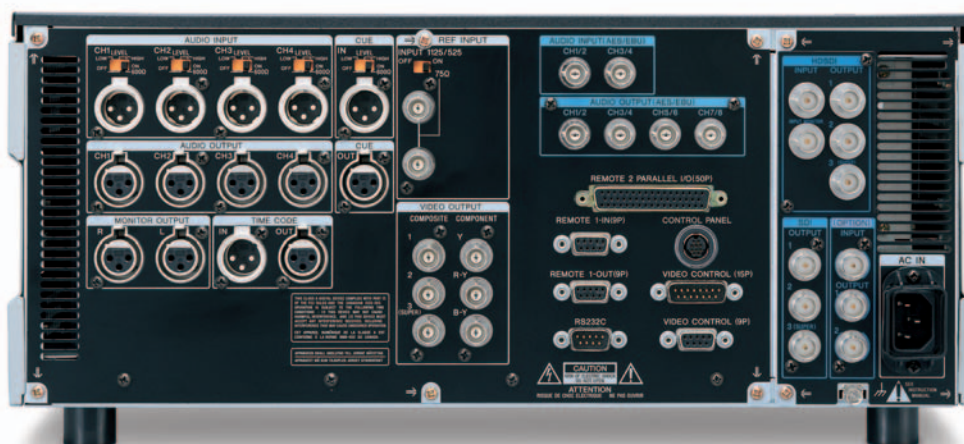
\* 4RU size=16 7/8 x 6 7/8 x 21 1/2 inches (427 x 174 x 540 mm)

## Versatile Interfaces

The HDW-2000 Series features a wide range of interfaces including;

- HD SDI I/O\*
- SDI output (D1 component)
- SDTI I/O\*
- Analog Composite output (NTSC/PAL)
- Digital Audio I/O\*(AES/EBU)
- Analog Audio I/O\*
- Audio Monitor output (2-ch analog)

\* The HDW-M2100/M2100P player provides outputs only.



HDW-M2000

## User-friendly Control Panel

Control panels are compact, yet comprehensive. There is a minimal learning curve since its design and functionality are inherited from universally used BETACAM SP VTRs. In addition, the control panel has a multi-function display that provides comprehensive information for quick access and easy control of a variety of functions. Dedicated control knobs and meter displays are included for each of the four audio channels.

Using the optional control panel HKDW-101, VTRs can be controlled from the same control panel simultaneously.



HKDW-101 Control Panel with BKMW-102 Case

## Easy Maintenance

Most of the circuitry of the HDW-2000 Series is arranged on plug-in boards to allow quick and easy maintenance. The drum assembly has been designed to achieve simple, low-cost maintenance by adopting an upper drum mechanism and an auto adjustment function as used in MPEG IMX VTRs and BETACAM SX recorders. This helps to drastically reduce the time required for periodic drum replacement.







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# Operational Convenience

## Frame Accurate Editing

The HDW-2000 Series recorders enable insert or assemble editing with frame accuracy. Each channel of video and audio signal is independently editable. It is possible to execute precise editing on HDCAM tapes in machine-to-machine or A/B roll configurations.

## High Speed Color Picture Search

Recognizable color pictures are provided in shuttle mode at speeds up to  $\pm 50$  times normal playback.

## Dynamic Tracking™ Playback

A Dynamic Tracking playback capability provides high quality pictures over the range of -1 to +2 times normal playback speed during playback of HDCAM tapes, -1 to +3 times for BETACAM/BETACAM SP/MPEG IMX/Digital BETACAM tapes, -1 to +2 for BETACAM SX tapes.

## Digital Jog Sound

Reproduction of four (eight for MPEG IMX) channels of digital audio is achieved, in the Jog mode. With a responsiveness and sound quality reminiscent of BETACAM SP machines, this feature is helpful in quickly and precisely establishing an editing point while monitoring the digital audio signals which remain in absolute sync with the pictures.

## Audio Crossfade Function

As with all Sony half-inch professional formats, the HDW-2000 Series recorders feature Digital Audio Crossfade to achieve smooth audio transitions at audio insert edit points. Previously recorded audio signals are read in advance using Pre-read heads and then re-recorded onto the same track after being mixed with the input audio signal. The crossfade duration can be selected from a range of values.

## Dynamic Motion Control (DMC) Playback

The HDW-2000 Series also provides a DMC playback capability, memorizing the tape speed trajectory over the DT speed range (-1 to +2 times normal speed).

## Pre-read Editing

The HDW-2000 Series recorders are equipped with advanced playback heads to enable pre-read editing. This function allows application including titling with a single VTR, A/B-roll with two VTRs, as well as audio mix and channel swap.

## 1080/1035 Line Conversion

The HDW-2000 Series provides bi-directional vertical filtering between the two active line standards of 1080 and 1035 and enhanced quality of variable speed Dynamic Tracking playback as standard.

## Shot Marks

The HDW-2000 Series recorders can scan tapes with Shot Marks and automatically detect their positions. After scanning, a list of all the marks is displayed on the video monitor, allowing easy cueing to any mark.



HDW-750 Series Menu



HDW-2000 Series Time Code List

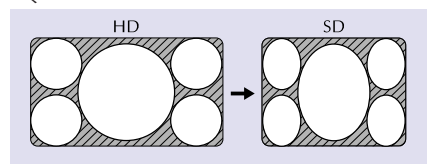


HDW-750

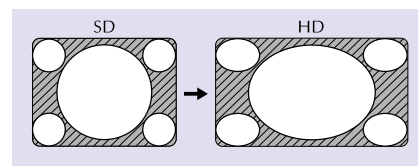
## Selectable Picture Mode

Three modes of operation enable correct presentation, depending on the application required.

### SQUEEZE mode

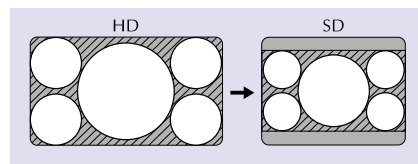


HD to SD, 16:9 HD picture is down-converted and output as a 4:3 SD picture.

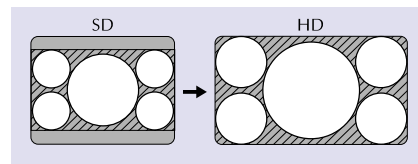


SD to HD, 4:3 SD picture is up-converted, then output as a 16:9 HD picture.

### LETTER BOX mode

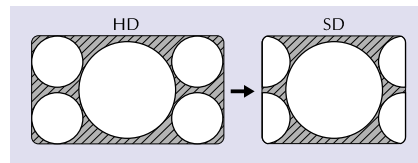


HD to SD, 16:9 HD picture down-converted to SD and output is presented in Letter-box on a 4:3 monitor.

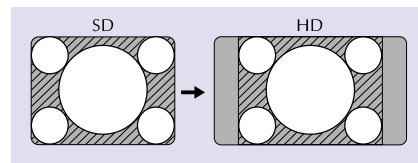


SD to HD, 4:3 SD picture is cropped and presented as a 16:9 picture.

### EDGE CROP mode



HD to SD, edges of a 16:9 HD picture are cropped in the down-converted 4:3 SD picture.



SD to HD, 4:3 SD picture up-converted as a 16:9 HD picture, however the sides are cropped.



## Metadata Handling

In the HDW-2000 Series, special care has been given to metadata handling in order to increase production efficiency, and to provide the utmost convenience in media asset management systems and material distribution systems. In general, metadata consists of user-defined data indicating when, where, or by whom the material was created, Closed Caption data, and a variety of other data describing the material content.

Among such metadata, UMID, as standardized in SMPTE 330M, is a globally unique identifier used for the identification of picture/audio material and data. UMID is automatically

generated within compatible equipment such as VTRs and camcorders during each recording.

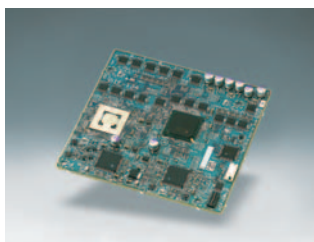
The HDW-2000 Series VTR provides the facility to record UMID on tape when the VTR performs dubbing, editing, and copying through up-/down-conversion. This recorded UMID is used in subsequent processes from editing, archiving and on to distribution, bringing efficiency throughout the entire program production chain.

The HDW-2000 Series VTRs enables up to 255 bytes x 3 packets of metadata per field to be recorded, which can be transferred to other devices via HD-SDI, or SDTI.

## Optional Accessories



HKDW-101,  
Control Panel



HKDW-102,  
SDTI Interface Board



BKMW-102,  
Remote Control Unit



BKMW-103,  
Control Panel Extension Kit



RMM-131,  
Rack Mount Kit



RCC-5G,  
9-pin Remote Cable



HKDV-900,  
HD Digital Video Controller\*



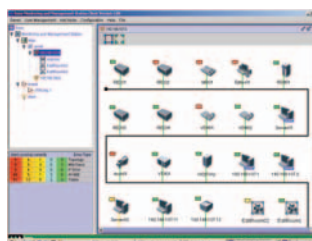
BVR-50,  
Video Controller



BCT-124HDL/64HDL/22HD,  
HDCAM Tape Cassette



BCT-HD12CL,  
Cleaning Cassette



BKNW-1000 Series, ISR Proxy™  
Remote Monitoring and Maintenance  
Software

MLB-1M-100 Memory Label  
(for Tele-File system)

\*To connect the HKDV-900 with the HDW-2000 Series VTRs, the optional video controller cable, RCC-1505H/1510H/1530H is required.

## HDW-2000 Series Specifications

	HDW-2000	HDW-M2000/M2000P	HDW-M2100/M2100P
<b>General</b>	Power requirements	100 to 240 V, 50/60 Hz	
	Power consumption	220 W	
	Operating temperature	41 to 104 °F (+5 to +40 °C)	
	Storage temperature	-4 to +140 °F (-20 to +60 °C)	
	Humidity	25 to 90%	
	Weight	50 lb 11 oz (23 kg)	
	Dimensions (W x H x D)	16 7/8 x 6 7/8 x 21 1/2 inches (427 x 174 x 544 mm)	
	Tape speed	96.7 mm/s (59.94i, 29.97PsF), 80.6 mm/s (50i, 25PsF), 77.4 mm/s (24PsF, 23.98PsF)	
		96.7 mm/s	
		64.5 mm/s (525/59.94), 53.8 mm (625/50)	
		59.6 mm/s	
		118.6 mm/s (525/59.94), 101.5 mm/s (625/50)	
	HDCAM Record/playback time	124 minutes (59.94i, 29.97PsF, with BCT-124HDL cassette) 149 minutes (50i, 25PsF, with BCT-124HDL cassette) 40 minutes (59.94i, 29.97PsF, with BCT-40HD cassette) 48 minutes (50i, 25PsF, with BCT-40HD cassette)	
	HDCAM playback time	155 minutes (24PsF, 23.98PsF, with BCT-124HDL cassette) 50 minutes (24PsF, 23.98PsF, with BCT-40HD cassette)	
	Fast forward/rewind time	Approx. 3 minutes (with BCT-124HDL cassette)	
	Search speed range	Shuttle mode	
		HDCAM Still to ±50 times normal speed playback (59.94i, 29.97PsF), Still to ±58 times normal speed playback (50i, 25PsF), Still to ±60 times normal speed playback (24PsF, 23.98PsF)	
		Digital BETACAM	Still to ±50 times normal speed playback
		MPEG IMX	Still to ±78 times normal speed playback
		BETACAM SX	Still to ±78 times normal speed playback
		BETACAM/BETACAM SP	Still to ±35 times normal speed playback (525/59.94) Still to ±42 times normal speed playback (625/50)
		Variable mode	
		HDCAM	-1 to +2 times normal speed playback
		Digital BETACAM	-1 to +3 times normal speed playback
		MPEG IMX	-1 to +3 times normal speed playback
		BETACAM SX	-1 to +2 times normal speed playback
		BETACAM/BETACAM SP	-1 to +3 times normal speed playback
		Log mode Still to ±1 times normal speed playback	
	Servo lock time	0.6 s or less (59.94i, 29.97PsF, from standby on), 0.7 s or less (50i, 25PsF, 24PsF, 23.98PsF, from standby on)	
	Load/unload time	6 s or less (both L and S cassettes)	
<b>Input/output</b>	HD-SDI input	BNC x 1 (SMPTE 292M), Serial Digital (1.485 Gb/s)	—
	SDTI input (with optional HKDW-102 installed)	BNC x 1 (SMPTE305M), 270 Mb/s	—
	Reference video input	BNC x 2 (with a loop-through), Tri-level sync, 0.6 Vp-p, 75 Ω, sync negative or Black Burst or Composite, 0.3 Vp-p, 75 Ω, sync negative	—
	Digital audio input (CH 1/2, CH 3/4)	BNC x 2, AES/EBU	—
	Analog audio input (CH 1/2/3/4/Cue)	XLR-3-pin type, female, x 5 Low off: -60 dBu, high impedance, balanced High off: +4 dBu, high impedance, balanced High on: -4 dBm, 600 Ω termination, balanced	—
	Time code input	XLR-3-pin type, female, x 1 (0.5 to 18 Vp-p, 10 kΩ, balanced)	—
	HD-SDI output	BNC x 3 (SMPTE 292M including one character out), Serial Digital (1.485 Gb/s)	—
	SDTI output (with optional HKDW-102 installed)	BNC x 2 (SMPTE 305M), 270 Mb/s	—
	SDI output	BNC x 3 (SMPTE 259M including one character out), Serial Digital (270 Mb/s)	—
	Analog composite output	BNC x 3 (RS-170A, including one character out, one WFM out) Y: 1.0 Vp-p, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω	—
	Analog component output	BNC x 3, for 1 set, 1.0 Vp-p, 75 Ω, sync negative	—
	Digital audio output	BNC x 4, AES/EBU	—
	Analog audio output (CH 1/2/3/4)	(CH 1/2, CH 3/4, CH 5/6, CH 7/8) XLR-3-pin type, x 5, male, +4 dBm (600 Ω load), low impedance, balanced	—
	Time code output	XLR-3-pin type, male, x 1 (2.2 Vp-p, low impedance, balanced)	—
	Monitor output L/R	XLR-3-pin type, male, x 2 (+4 dBm at 600 Ω load, low impedance, balanced)	—
	Headphones	JM-60 Stereo phone jack (∞ to -12 dBu at 8 Ω load, unbalanced)	—
	Remote1 In	D-sub 9-pin, Sony 9-pin remote interface	—
	Remote1 Out	D-sub 9-pin, Sony 9-pin remote interface	—
	RS-232C	D-sub 9-pin	—
	Remote2 Parallel I/O	D-sub 50-pin	—
<b>Processor adjustment range</b>	Video control	D-sub 9-pin, D-sub 15-pin	—
	Control panel	D-sub 15-pin	—
	Others	"Memory Stick"™ slot, PCMCIA slot	
	Video level	±3 dB/∞ to +3 dB, selectable	
	Chroma level	±3 dB/∞ to +3 dB, selectable	
	Set up/black level	±3 IRE	
	Chroma phase/hue	±30°	
	System sync phase	±15 μs	
<b>Digital video performance</b>	System SC phase	±200 ns	
	Y/C delay	—	
	Sampling frequency	Y: 74.25 MHz, R-Y/B-Y: 37.125 MHz	
	Quantization	10 bit/sample (compression: 8 bit/sample)	
	Compression	Coefficient recording system	
	Channel coding	S-I-NRZI PR-IV	
	Error correction	Reed-Solomon code	
	Bandwidth	Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB	
<b>Analog component output performance</b>	S/N ratio	56 dB or more	
	K Factor (2T Pulse)	1% or less	
	Bandwidth	Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB	
	S/N ratio	53 dB or more	
<b>Analog composite output performance</b>	Differential gain	2% or less	
	Differential phase	2% or less	
	Y/C delay	20 ns or less	
	K Factor (2T Pulse)	1% or less	
	Output SCH phase	Based upon RS-170A/CCIR R.624-3	
	Sampling frequency	48 kHz (Synchronized with video)	
	Quantization	20 bit/sample	
	Wow & flutter	Below measurable level	
<b>Digital audio performance</b>	Headrooms	20 dB (or 18 dB selectable)	
	Emphasis (ON/OFF selectable in REC mode)	T1=50 μs, T2=15 μs (on/off selectable in recording mode)	
	A/D quantization	20 bit/sample	
	D/A quantization	20 bit/sample	
	Frequency response	20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)	
	Dynamic range	More than 95 dB (at 1 kHz, emphasis ON)	
	Distortion	Less than 0.05% (at 1 kHz, emphasis ON, reference level)	
	Crosstalk	Less than -80 dB (at 1 kHz, between any two channels)	
<b>Cue track</b>	Sampling frequency	100 Hz to 12 kHz ±3 dB	
	S/N ratio	More than 45 dB (at 3% distortion level)	
	Distortion	Less than 2% (T.H.D. at 1 kHz, reference level)	
	Wow & flutter	Less than 0.2%	
<b>Supplied accessories</b>	Erase ratio	More than 60 dB	
		Operation manual (1), Installation manual (1)	

## HDW-2000 Series Specifications

		HDW-D2000	HDW-S2000/S2000P
General	Power requirements	100 to 240 V, 50/60 Hz	
	Power consumption	220 W	
	Operating temperature	41 to 104 °F (+5 to +40 °C)	
	Storage temperature	-4 to +140 °F (-20 to +60 °C)	
	Humidity	25 to 90%	
	Weight	50 lb 11 oz (23 kg)	
	Dimensions (W x H x D)	16 7/8 x 6 7/8 x 21 1/2 inches (427 x 174 x 544 mm)	
	Tape speed	HDCAM	96.7 mm/s (59.94i, 29.97PsF), 80.6 mm/s (50i, 25PsF), 77.4 mm/s (24PsF, 23.98PsF)
		Digital BETACAM	96.7 mm/s
		MPEG IMX	64.5 mm/s (525/59.94), 53.8 mm (625/50)
		BETACAM SX	—
		BETACAM/BETACAM SP	118.6 mm/s (525/59.94), 101.5 mm/s (625/50)
	HDCAM Record/playback time	124 minutes (59.94i, 29.97PsF, with BCT-124HDL cassette) 149 minutes (50i, 25PsF, with BCT-124HDL cassette) 40 minutes (59.94i, 29.97PsF, with BCT-40HD cassette) 48 minutes (50i, 25PsF, with BCT-40HD cassette)	
	HDCAM playback time	155 minutes (24PsF, 23.98PsF, with BCT-124HDL cassette) 50 minutes (24PsF, 23.98PsF, with BCT-40HD cassette)	
	Fast forward/rewind time	Approx. 3 minutes (with BCT-124HDL cassette)	
	Search speed range	Shuttle mode	—
		HDCAM	Still to ±50 times normal speed playback (59.94i, 29.97PsF), Still to ±58 times normal speed playback (50i, 25PsF), Still to ±60 times normal speed playback (24PsF, 23.98PsF)
		Digital BETACAM	Still to ±50 times normal speed playback
		MPEG IMX	Still to ±78 times normal speed playback
		BETACAM SX	—
		BETACAM/BETACAM SP	Still to ±35 times normal speed playback (525/59.94) Still to ±42 times normal speed playback (625/50)
		Variable mode	—
		HDCAM	-1 to +2 times normal speed playback
		Digital BETACAM	-1 to +3 times normal speed playback
		MPEG IMX	-1 to +3 times normal speed playback
		BETACAM SX	-1 to +2 times normal speed playback
		BETACAM/BETACAM SP	-1 to +3 times normal speed playback
		Log mode	Still to ±1 times normal speed playback
	Servo lock time	0.6 s or less (59.94i, 29.97PsF, from standby on), 0.7 s or less (50i, 25PsF, 24PsF, 23.98PsF, from standby on)	
	Load/unload time	6 s or less (both L and S cassettes)	
Input/output	HD-SDI input	BNC x 1 (SMPTE 292M), Serial Digital (1.485 Gb/s)	
	SDTI input (with optional HKDW-102 installed)	BNC x 1 (SMPTE305M), 270 Mb/s	
	Reference video input	BNC x 2 (with a loop-through), Tri-level sync, 0.6 Vp-p, 75 Ω, sync negative or Black Burst or Composite, 0.3 Vp-p, 75 Ω, sync negative	
	Digital audio input (CH 1/2, CH 3/4)	BNC x 2, AES/EBU	
	Analog audio input (CH 1/2/3/4/Cue)	XLR-3-pin type, female, x 5 Low off: -60 dBu, high impedance, balanced High off: +4 dBu, high impedance, balanced High on: -4 dBm, 600 Ω termination, balanced	
	Time code input	XLR-3-pin type, female, x 1 (0.5 to 18 Vp-p, 10 kΩ, balanced)	
	HD-SDI output	BNC x 3 (SMPTE 292M including one character out), Serial Digital (1.485 Gb/s)	
	SDTI output (with optional HKDW-102 installed)	BNC x 2 (SMPTE 305M), 270 Mb/s	
	SDI output	BNC x 3 (SMPTE 259M including one character out), Serial Digital (270 Mb/s)	
	Analog composite output	BNC x 3 (RS-170A, including one character out, one WFM out) Y: 1.0 Vp-p, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω	
	Analog component output	BNC x 3, for 1 set, 1.0 Vp-p, 75 Ω, sync negative	
	Digital audio output	BNC x 4, AES/EBU	BNC x 2, AES/EBU
		(CH 1/2, CH 3/4, CH 5/6, CH 7/8)	(CH 1/2, CH 3/4)
	Analog audio output (CH 1/2/3/4)	XLR-3-pin type, x 5, male, +4 dBm (600 Ω load), low impedance, balanced	
	Time code output	XLR-3-pin type, male, x 1 (2.2 Vp-p, low impedance, balanced)	
	Monitor output L/R	XLR-3-pin type, male, x 2 (+4 dBm at 600 Ω load, low impedance, balanced)	
	Headphones	JM-60 Stereo phone jack (∞ to -12 dBu at 8 Ω load, unbalanced)	
	Remote1 In	D-sub 9-pin, Sony 9-pin remote interface	
	Remote1 Out	D-sub 9-pin, Sony 9-pin remote interface	
	RS-232C	D-sub 9-pin	
	Remote2 Parallel I/O	D-sub 50-pin	
	Video control	D-sub 9-pin, D-sub 15-pin	
	Control panel	D-sub 15-pin	
	Others	"Memory Stick"™ slot	
Processor adjustment range	Video level	±3 dB/∞ to +3 dB, selectable	
	Chroma level	±3 dB/∞ to +3 dB, selectable	
	Set up/black level	±3 IRE	
	Chroma phase/hue	±30°	
	System sync phase	±15 μs	
Digital video performance	System SC phase	±200 ns	
	Y/C delay	—	±100 ns
	Sampling frequency	Y: 74.25 MHz, R-Y/B-Y: 37.125 MHz	
	Quantization	10 bit/sample (compression: 8 bit/sample)	
	Compression	Coefficient recording system	
Analog component output performance	Channel coding	S-I-NRZI PR-IV	
	Error correction	Reed-Solomon code	
	Bandwidth	Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB	
	S/N ratio	56 dB or more	
	K Factor (2T Pulse)	1% or less	
Analog composite output performance	Bandwidth	Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB	
	S/N ratio	53 dB or more	
	Differential gain	2% or less	
	Differential phase	2% or less	
	Y/C delay	20 ns or less	
Digital audio performance	K Factor (2T Pulse)	1% or less	
	Output SCH phase	Based upon RS-170A/CCIR R.624-3	
	Sampling frequency	48 kHz (Synchronized with video)	
	Quantization	20 bit/sample	
	Wow & flutter	Below measurable level	
Analog audio output performance	Headrooms	20 dB (or 18 dB selectable)	
	Emphasis (ON/OFF selectable in REC mode)	T1=50 μs, T2=15 μs (on/off selectable in recording mode)	
	A/D quantization	20 bit/sample	
	D/A quantization	20 bit/sample	
	Frequency response	20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)	
Cue track	Dynamic range	More than 95 dB (at 1 kHz, emphasis ON)	
	Distortion	Less than 0.05% (at 1 kHz, emphasis ON, reference level)	
	Crosstalk	Less than -80 dB (at 1 kHz, between any two channels)	
	Sampling frequency	100 Hz to 12 kHz ±3 dB	
	S/N ratio	More than 45 dB (at 3% distortion level)	
Supplied accessories	Distortion	Less than 2% (T.H.D. at 1 kHz, reference level)	
	Wow & flutter	Less than 0.2%	
	Erase ratio	More than 60 dB	
		Operation manual (1), Installation manual (1)	



## HDW-2000 Series Specifications

### Digital BETACAM playback (HDW-M2000/M2000P, HDW-M2100/M2100P, HDW-D2000)

Video performance	Bandwidth	Y	0 to 5.75 MHz +0.5 dB/-0.5 dB
		R-Y/B-Y	0 to 2.75 MHz +0.5 dB/-0.5 dB
	S/N ratio		62 dB or more
Digital audio (CH 1 to CH 4)	K factor		1% or more
	Frequency response (0 dB at 1 kHz)		20 Hz to 20 kHz +0.5 dB/-1.0 dB
	Dynamic range		95 dB (at 1 kHz, emphasis ON)
Analog audio (cue track)	Distortion (T.H.D. at 1 kHz, reference level)		0.05% rms (emphasis ON)
	Wow & flutter		Below measurable level
	Frequency response (0 dB at 1 kHz)		100 Hz to 12 kHz +3 dB/-3 dB
	S/N ratio (at 3% distortion level)		45 dB (at 1 kHz)
	Distortion (T.H.D. at 1 kHz, reference level)		2% or less
	Wow & flutter		HDW-M2000/M2100/D2000: Less than 0.5% rms HDW-M2000P/M2100P/D2000: Less than 0.2% (DIN 45508 weighted)

### MPEG IMX playback(HDW-M2000/M2000P, HDW-M2100/M2100P, HDW-D2000)

Video performance	Bandwidth	Y	0 to 5.75 MHz +0.5 dB/-2.0 dB
		R-Y/B-Y	0 to 2.75 MHz +0.5 dB/-2.0 dB
	S/N ratio		56 dB or more
Audio performance	K factor (2T pulse)		1% or less
	Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)
	Dynamic range		90 dB or more (at 1 kHz, emphasis ON, 16 bits/48 kHz)
	Distortion		0.05% or less (at 1 kHz, emphasis ON, reference level (+4 dBm))

### BETACAM SX playback (HDW-M2000/M2000P, HDW-M2100/M2100P, HDW-S2000/S2000P)

Video performance	Bandwidth	Y	HDW-M2000/M2100/S2000: 0 to 4.5 MHz +0.5 dB/-3.0 dB HDW-M2000P/M2100P/S2000P: 0 to 5.5 MHz +0.5 dB/-3.0 dB
		R-Y/B-Y	0 to 2.0 MHz +0.5 dB/-3.0 dB
	S/N ratio		56 dB or more
Audio performance	K factor (2T pulse)		1% or less
	Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)
	Dynamic range		90 dB or more (at 1 kHz, emphasis ON)
	Distortion		0.05% or less (at 1 kHz, emphasis ON, reference level (+4 dBm))

### Analog BETACAM playback (HDW-M2000, HDW-M2100, HDW-S2000)

Video performance	Bandwidth	Y	Metal tape	Oxide tape
		R-Y/B-Y	30 Hz to 4.5 MHz +0.5 dB/-4.0 dB	30 Hz to 4.1 MHz +0.5 dB/-6.0 dB
	S/N ratio	Y	30 Hz to 1.5 MHz +0.5 dB/-3.0 dB	30 Hz to 1.5 MHz +0.5 dB/-3.0 dB
	K-Factor (2T Pulse)		51 dB or more	48 dB or more
		R-Y/B-Y	48 dB or more	45 dB or more
	LF non-linearity	Y	2% or less	3% or less
Audio performance		R-Y/B-Y		3% or less
	Y/C delay			4% or less
				20 ns or less
LNG	Frequency response		50 Hz to 15 kHz +1.5 dB/-3.0 dB	50 Hz to 15 kHz +1.5 dB/-3.0 dB
	S/N ratio		72 dB or more	50 dB or more (Dolby NR off)
	T.H.D.		1% or less	2% or less
AFM*	Wow & Flutter			0.1% rms or less
	Frequency response		20 Hz to 20 kHz +0.5 dB/-2.0 dB	
	S/N ratio		85 dB or more	
	T.H.D.		0.5% or less	

\* The HDW-S2000 does not support AFM playback.

### Analog BETACAM playback (HDW-M2000P, HDW-M2100P, HDW-S2000P)

Video performance	Bandwidth	Y	Metal tape	Oxide tape
		R-Y/B-Y	25 Hz to 5.5 MHz +0.5 dB/-4.0 dB	25 Hz to 4.0 MHz +0.5 dB/-6.0 dB
	S/N ratio	Y	25 Hz to 2.0 MHz +0.5 dB/-3.0 dB	25 Hz to 1.5 MHz +0.5 dB/-3.0 dB
	K-Factor (2T Pulse)		48 dB or more	46 dB or more
		R-Y/B-Y	48 dB or more	45 dB or more
	LF non-linearity	Y	2% or less	3% or less
Audio performance		R-Y/B-Y		3% or less
	Y/C delay			4% or less
				20 ns or less
LNG	Frequency response		50 Hz to 15 kHz +1.5 dB/-3.0 dB	50 Hz to 15 kHz ±3.0 dB
	S/N ratio		68 dB or more	62 dB or more (Dolby NR off)
	T.H.D.		1% or less	2% or less
AFM*	Wow & Flutter			0.1% rms or less
	Frequency response		20 Hz to 20 kHz +0.5 dB/-2.0 dB	
	S/N ratio		More than 72 dB (CCIR 468-3 weighted)	
	T.H.D.		Less than 0.5%	

\* The HDW-S2000P does not support AFM playback.

# SONY®

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