

# SONY



**CINEALTA™**  
**HDCAM™**

**HDW-2000 Series**  
**HDW-1800 Series**  
**HDW-S280**  
**J-H1 & J-H3**

Digital Recorders and Players

[www.sonybiz.net/hdcam](http://www.sonybiz.net/hdcam)







# HDCAM

■ **A WORLDWIDE STANDARD  
FOR DIGITAL PRODUCTION**

High Definition equals better-looking television pictures – for the benefit of programme makers, broadcasters, advertisers and viewers.



### Guarantee a Premium for your Pictures

As consumers demand a higher quality viewing experience, Sony HDCAM ensures that your High Definition programmes stand out from the crowd. Offering true 1080-line resolution and crystal clear digital sound, HDCAM offers breathtaking clarity and is the perfect complement for any project where a prestige look is required. A natural partner for documentaries, natural history and live production as well as mainstream entertainment, HDCAM is firmly established as the preferred format for quality-conscious media professionals everywhere.

HDCAM builds upon more than 25 years of Sony heritage in 1/2-inch tape technology - the overwhelming choice of thousands of users who have standardised on Sony 1/2-inch formats for their operations. HDW-2000 Series HDCAM VTRs and players offer the same intuitive control layout, ergonomics and workflow that are familiar to Digital Betacam and MPEG IMX users. Selected models are playback-compatible with your Betacam SP, Betacam SX, MPEG IMX and Digital Betacam tape libraries, so there's no need to forfeit the value of your Standard Definition assets as you migrate smoothly to High Definition. And Sony have added two new HDCAM VTRs to the line-up – the HDW-1800 and HDW-D1800. These two new models offer an even more affordable entry to the world of HDCAM and join the HDW-2000 Series to ensure that the Sony HDCAM line-up is stronger and more versatile than ever.

### Operational Flexibility and Superb Value

HDCAM broadens your creative and commercial options with a choice of shooting modes to suit the demands of any project. Switch between interlace and progressive at a choice of frame rates to suit your creative preferences and distribution requirements. Equally, the benefits of HDCAM are not limited to productions destined for transmission and distribution in HD today. It's easy to down-convert HDCAM pictures to Standard Definition for post production and distribution – as proven by European prime-time television schedules that are already packed with HDCAM-originated programming.

Keeping costs down while providing an exceptional quality original recording for future distribution opportunities, HDCAM ensures your content commands a premium today and tomorrow. With HDCAM there's no need to compromise your personal vision – and with HDCAM VTRs starting at Digital Betacam prices, it's accessible to anyone who's passionate about making great-looking programmes.

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# ■ HDW-2000 Series Digital Video Recorders and Player



## CLASS-LEADING PERFORMANCE BUILT ON PROVEN TECHNOLOGY

### Stunning High Definition Pictures

The HDW-2000 Series records High Definition component digital pictures using state-of-the-art HDCAM video compression. A video data rate of 140 Mb/s ensures superb picture quality. A 1/2-inch tape transport derived from Betacam and Digital Betacam technology provides a robust and reliable design.

### A Smooth Path to High Definition

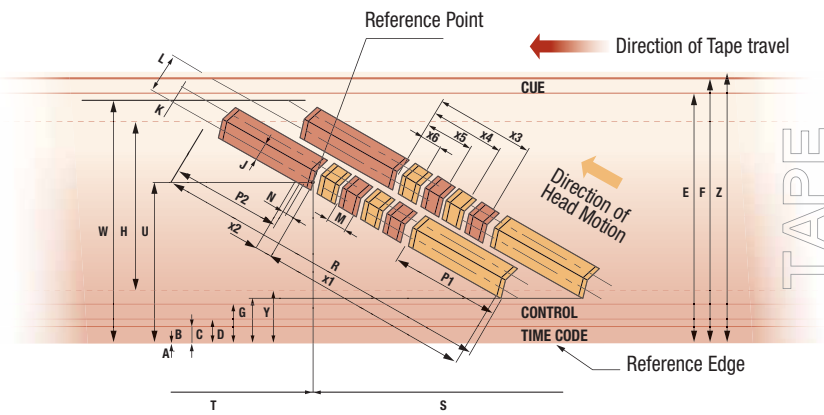
The HDW-2000 Series guarantees the smoothest path to the world of HD. With a choice of four models within the line-up, it's easy to choose the best combination of cost and performance for your facility. The low-cost HDW-2000 records and replays HDCAM. The top of the range HDW-M2000P adds compatible replay of Betacam, Betacam SP, Betacam SX, MPEG IMX and Digital Betacam tapes and, with over 280 million Sony 1/2-inch cassettes sold to date, offers unprecedented replay capability.



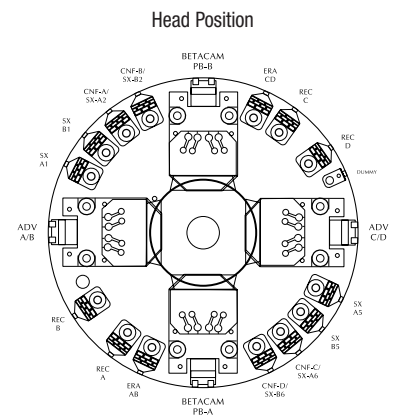
- BETACAM
- BETACAM SP
- BETACAM SX
- MPEG IMX
- Digital BETACAM
- HDCAM



### HDCAM Track Layout



### Drum Head Allocation



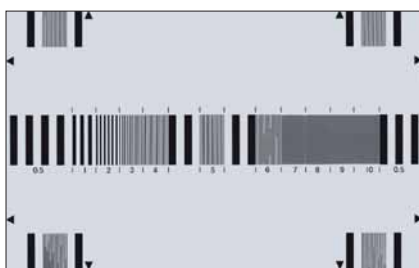
### HDW-2000 Series Line-up

HDW-2000 Series Line-up		Recording Format	Playback Format
<b>HDW-2000</b>	HD Digital Video Cassette Recorder	HDCAM	HDCAM
<b>HDW-M2000P</b>	HD Digital Video Cassette Recorder	HDCAM	HDCAM, Digital Betacam, MPEG IMX, Betacam SX, Betacam SP, Betacam
<b>HDW-D2000</b>	HD Digital Video Cassette Recorder	HDCAM	HDCAM, Digital Betacam, MPEG IMX
<b>HDW-M2100P</b>	HD Digital Video Cassette Player	—	HDCAM, Digital Betacam, MPEG IMX, Betacam SX, Betacam SP, Betacam

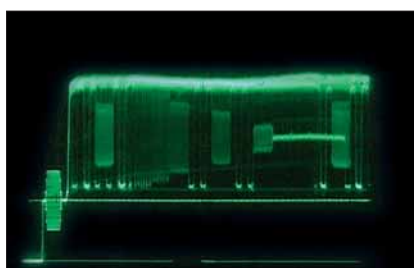
### Built-in Up\* and Down-converters

In addition to compatible replay of Standard Definition cassettes, the HDW-2000 Series features built-in up and down-converters as standard. Existing Standard Definition recordings can be up-converted to HD, while HDCAM material can be down-converted to SD for post production, transmission, or delivery via DVD. The "Super-sampled" images down-converted from HDCAM are visibly superior to those shot in Standard Definition, with higher horizontal and vertical MTF and reduced scanning aliasing.

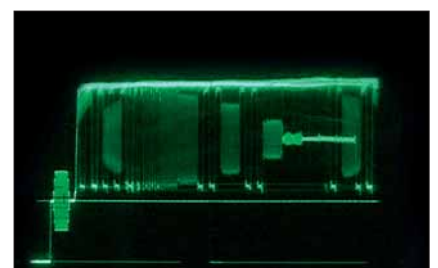
\* The HDW-2000 replays HDCAM tapes only. HD to SD down-conversion is provided, but SD to HD up-conversion is not.



Multi-burst Chart



Conventional 480/576-line Digital VTR



"Super-sampled" HDCAM Down-converted signals

# ■ HDW-2000 Series Digital Video Recorders



HDW-M2000P Rear Panel

## Switchable Between Interlace and Progressive Operation including 24PsF

HDCAM VTRs and players are ideal for facilities producing and distributing programmes internationally. Each model can be switched between 1080/50i, 1080/59.94i, 1080/25PsF and 1080/29.97PsF frame rates\*1. Compatible replay of 576/50i and 480/59.94i is also provided by each deck\*1.

To meet the increasing need for 24P programme creation, 1080/23.98PsF and 1080/24PsF recording and playback is now available on all HDW-2000 Series recorders. Conversion of 23.98PsF/24PsF recordings to a 25PsF output is also provided with time code conversion performed by the VTR\*2.

Finally, a 720/59.94P signal down-converted from 1080/59.94i or 1080/29.97PsF can be output from the VTR or player\*2.

\*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 analogue Betacam tape on the HDW-M2000/M2100 (NTSC model), and playback of a 480-line analogue Betacam tape on the HDW-M2000P/M2100P (PAL model) is for monitoring purposes only.

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

## Long Recording Time on a Single Cassette

The combination of HDCAM compression and high-density recording onto 1/2-inch tape yields a maximum recording time onto a small cassette of 40 minutes at 1080/59.94i, 48 minutes at 1080/50i and 50 minutes at 1080/24PsF.

Up to 124 minutes at 1080/59.94i, 149 minutes at 1080/50i and 155 minutes at 1080/24PsF can be recorded onto a large cassette – ideal for feature films, dramas and football games running to extra time and penalties.

## 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. Dolby-E and Dolby AC-3 (non audio) data streams can be input to the VTR and recorded onto the audio tracks.

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

## Compact Design and Low Power Consumption

The HDW-2000 Series is based upon a compact 4RU-size\* design and weighs only 23 kg (50 lb 11 oz). It also has low power consumption of 220 W. This makes the VTRs and player ideal for studio use and also in OB vehicles, where space is often limited.

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

## Easy Integration into your Facility

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

- HD SDI I/O\*
- SDI output (D1 component)
- SDTI I/O\* (optional - requires HKDW-102 SDTI Interface Board)
- Analogue Component output
- Analogue Composite output (NTSC/PAL)
- Digital Audio I/O\*(AES/EBU)
- Analogue Audio I/O\*
- Audio Monitor output (2-ch analogue)

\*The HDW-M2100P player provides outputs only.





HKDW-101 Control Panel with BKMW-102 Case

### User-friendly Control Panel

Operators with experience of Betacam, Betacam SX, MPEG IMX or Digital Betacam will be instantly familiar with the operational controls of HDCAM VTRs and players. The layout of the tape transport and editing controls has been refined over generations of Sony 1/2-inch VTRs. The control panel has a multi-function display for quick access and easy control of the major operational functions. Dedicated rotary controls and meter displays are included for each of the four audio channels. An optional HKDW-101 control panel can be used in addition to the supplied control panel to operate the VTR remotely.

### 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. This significantly reduces the time required for periodic drum replacement.



# HDW-2000 Series Digital Video Recorders

## FAMILIAR OPERATION

### Frame Accurate Editing

Insert and assemble editing with frame accuracy is provided with each channel of video and audio being independently editable.

### High Speed Colour Picture Search

Recognisable colour pictures in shuttle mode, at speeds up to  $\pm 50$  times normal playback, guarantee quick access to the required material on tape.

### Dynamic Tracking™ Playback

Dynamic Tracking heads provide high quality slow motion pictures from -1 to +2 times normal playback speed from HDCAM and Betacam SX tapes. The slow motion range from Betacam, Betacam SP, MPEG IMX and Digital Betacam cassettes is -1 to +3.

### Digital Jog Sound

The HDW-2000 Series replays four channels of digital audio in Jog mode (eight when replaying MPEG IMX tapes). Jog response is both fast and accurate for exact location of edit points. The monitored audio also remains precisely in sync with video.

### Audio Crossfade

Digital Audio Crossfade provides 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 features DMC playback, memorising the tape speed trajectory over the DT speed range (-1 to +2 times normal speed).

### Pre-read Editing

Pre-read editing became an instant hit when it first appeared on Digital VTRs over 15 years ago. HDW-2000 Series recorders are equipped with advanced playback heads to enable pre-read editing. Captions can be added using a single VTR, A/B-roll editing can be performed with two VTRs and audio crossfades can be added for smooth audio transitions.

### 1080/1035 Line Conversion

Bi-directional vertical filtering between the two active line standards (1080 and 1035) and enhanced quality of variable speed Dynamic Tracking playback is included as standard.

### Shot Marks

HDW-2000 Series VTRs can scan tapes with Shot Marks and automatically detect their positions. After scanning, a list of Shot Marks is displayed on the video monitor, allowing rapid cueing to the required material.

### Selectable Aspect Ratio

Squeeze, Letterbox and Edge Crop adjustments are provided for control of picture aspect ratio when converting from SD to HD and vice versa.



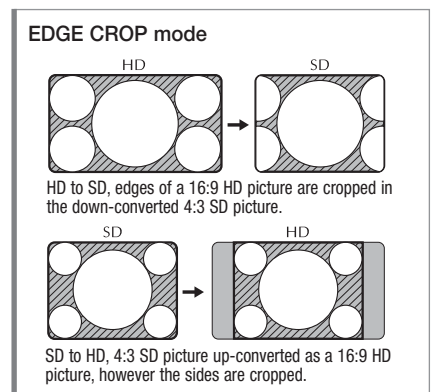
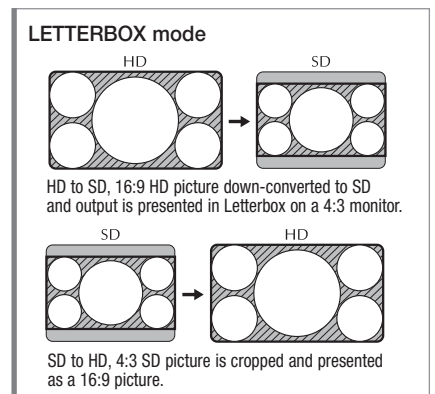
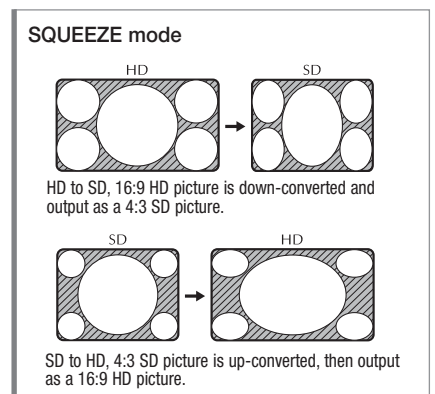
HDCAM Camcorder Menu



HDW-2000 Series Time Code List



HDCAM Camcorder





## Metadata Handling

Metadata is user-defined data indicating when, where, or by whom material was created. The Unique Material Identifier (UMID) has been standardised by the Society of Motion Picture and Television Engineers (SMPTE)\* and is a globally unique identifier used for the identification of picture/audio material and data.

HDW-2000 Series VTRs provide the facility to generate and record UMID data on tape during dubbing, editing and up and down-conversion. Recorded UMIDs can subsequently be used in editing, archiving and distribution, to increase production efficiency throughout the programme production chain.

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

\* The UMID standard is SMPTE-330M

## Unrivalled Heritage in Advanced Metal Tape Technology

Sony HDCAM tape has been developed to offer optimum record and playback performance across the full range of HDCAM recorders and players.

Building on an unrivalled heritage for Metal Tape design, including two Emmy® Awards (Metal Broadcasting Tape Technology in 1990 and Digital Betacam Metal Tape Technology in 1995), HDCAM tapes provide high density recording and a duration of up to 155\* minutes.

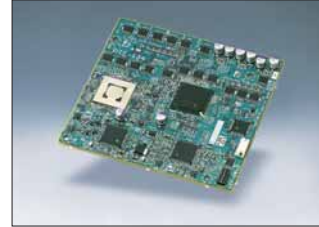
\* When recording at 24PsF or 23.98PsF onto a large cassette.

## OPTIONAL ACCESSORIES

FOR HDW-2000 SERIES DIGITAL VIDEO RECORDERS



**HKDW-101**  
Control Panel



**HKDW-102**  
SDTI Interface Board



**BKMW-102**  
Remote Control Unit



**BKMW-103**  
Control Panel Extension Kit  
(Cable length = 10m)



**RMM-131**  
Rack Mount Kit



**RCC-5G**  
9-pin Remote Cable



**RM-280**  
Editing Controller



**BCT-6HD/12HD/22HD/32HD/  
40HD/34HDL/64HDL/94HDL/  
124HDL**  
HDCAM Tape Cassette



**BCT-HD12CL**  
Cleaning Cassette



**BZNW-7000 Series MMStation™**  
Remote Monitoring and Maintenance Software

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

# ■ HDW-1800 Series Digital Video Recorders



## AN EVEN MORE AFFORDABLE ENTRY TO THE WORLD OF HDCAM

The HDW-1800 and HDW-D1800 offer a combination of operational features and cost designed to make HDCAM appeal to an even wider audience. Packing the same HDCAM picture and sound quality as the HDW-2000 Series, the feature set of the two new VTRs has been optimised to offer a lower cost entry to the world of HDCAM.

Both models offer HDCAM recording and playback at 1080/50i, 1080/59.94i, 1080/23.98PsF, 1080/24PsF, 1080/25PsF and 1080/29.97PsF with compatible MPEG IMX and Digital Betacam replay also built into the HDW-D1800.

An optional i.LINK input board can be installed into each model allowing HDV material to be input directly from an HVR series HDV camcorder or VTR. An optional 1080 to 720 format converter can also be fitted to convert 1080/50i recordings to 720/50P for output from the VTR.

A simplified control panel is provided, with a built-in LCD monitor for on-the-spot picture confirmation and access to operational set-up menus. Frame accurate assemble, insert and pre-read editing is via 9-pin RS-422A control on the rear panel.

MPEG IMX

Digital BETACAM

HDCAM





# FEATURES

## Stunning High Definition Pictures

The HDW-1800 Series records High Definition component digital pictures using state-of-the-art HDCAM video compression. A video data rate of 140 Mb/s ensures superb picture quality. A 1/2-inch tape transport derived from Betacam and Digital Betacam technology provides a robust and reliable design.

## Switchable Between Interlace and Progressive Operation including 24PsF

HDW-1800 series VTRs are ideal for facilities producing and distributing programmes internationally. Each model can be switched between 1080/50i, 1080/59.94i, 1080/25PsF and 1080/29.97PsF frame rates\*1. Compatible replay of MPEG IMX and Digital Betacam at 576/50i and 480/59.94i is also provided by the HDW-D1800\*1. To meet the increasing need for 24P programme creation, 1080/23.98PsF and 1080/24PsF recording and playback is provided by both models.

\*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.

## Up and Down-conversion Capabilities with Selectable Picture Modes

The HDW-D1800 and HDW-1800 recorders can output 525/59.94i and 625/50i signals in SD-SDI or analogue composite from HDCAM playback. The HDW-D1800 can also output 1080i signals in HD-SDI from SD legacy playback. Squeeze, letterbox and edge cropping can be applied to the up or down-converted outputs.

## A Smooth Path to High Definition

The HDW-D1800 provides compatible replay of MPEG IMX and Digital Betacam tapes, and with over 120,000 MPEG IMX and Digital Betacam camcorders and VTRs in use worldwide, offers unprecedented replay capability.

## 720P Conversion and 2-3 Pull-down

When fitted with an optional HKDW-104 board, the HDW-D1800 and HDW-1800 can convert 1080i material from tape to 720P for output. 2-3 pulldown is also added, enabling 23.98PsF and 24PsF\* material to be output as 720/59.94i

\* For 24PsF material, 2-3 pull-down output is available only when it is played back at the system frequency of 23.98 Hz. (In this case, its playback speed is reduced by 0.1%.)

### Converted 720P Output

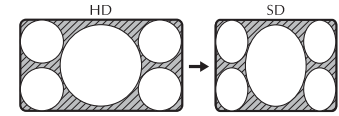
1080/59.94i, 1080/29.97PsF, 1080/23.98PsF, 525*	720/59.94P
1080/50i, 1080/25PsF, 625*	720/50P

\* Conversion from SD material is available on the HDW-D1800 only.

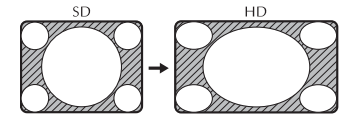
## HDV 1080i Stream Recording

**HDV** The new HDW-D1800 and HDW-1800 recorders are equipped with a powerful HDV 1080i stream recording capability. With the addition of the HKDW-105 board, the HDW-D1800 and HDW-1800 recorders can accept an HDV 1080i compatible stream via i.LINK. This is ideal for users who want to shoot in HDV format and post in HDCAM.

### SQUEEZE mode

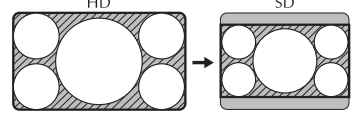


HD to SD, 16:9 HD picture is down-converted and output as a 4:3 SD picture.

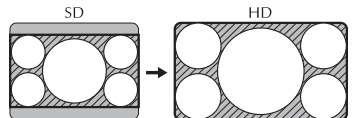


SD to HD, 4:3 SD picture is up-converted, then output as a 16:9 HD picture.

### LETTERBOX mode

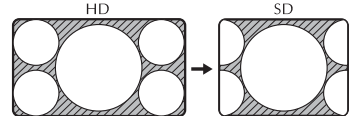


HD to SD, 16:9 HD picture down-converted to SD and output is presented in Letterbox on a 4:3 monitor.

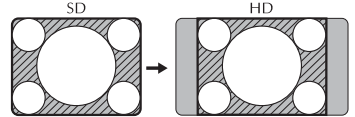


SD to HD, 4:3 SD picture is cropped and presented as a 16:9 picture.

### 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.

# HDW-1800 Series Digital Video Recorders



HDW-D1800 (top) and HDW-1800 Rear Panels



## Search Functions – Jog and Shuttle Mode

The HDW-D1800 and HDW-1800 recorders deliver recognisable colour pictures in shuttle mode at speeds of up to 50 times normal playback. Jog operation is also possible, at -1 to +2 times normal speed. High quality jog audio provides a responsiveness familiar to Digital Betacam users.

## 4.3-inch Colour LCD Screen

The control panels are simple and easy to use. They are equipped with a 4.3-inch (viewable area, measured diagonally) 16:9 colour LCD screen, allowing users to view playback material and VTR setup menus. It is also possible to monitor output signals via 2-3 pull-down when converted to 720P.

## Frame Accurate Editing

Insert and assemble editing with frame accuracy is provided on the HDW-D1800 and HDW-1800. Each video and audio channel can be edited independently.

## Digital Audio Crossfade

Digital Audio Crossfade ensures 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 signal. The crossfade duration can be selected from a range of values.



Video Monitor View



System Status View



## Dynamic Motion Control (DMC) Playback

The HDW-D1800 and HDW-1800 recorders also provide DMC playback capability, which memorises the tape speed trajectory over the DT (Dynamic Tracking) speed range.

## Pre-read Editing

Pre-read editing became an instant hit when it first appeared on Digital VTRs over 15 years ago. HDW-1800 Series recorders are equipped with advanced playback heads to enable pre-read editing. Captions can be added using a single VTR, A/B-roll editing can be performed with two VTRs and audio crossfades can be added for smooth audio transitions.

## Easy Integration into your Facility

The HDW-D1800 and HDW-1800 are equipped with the following interfaces:

- HD-SDI input and output
- SD-SDI output
- Analogue composite output
- Digital audio input and output
- Analogue audio input and output
- Timecode input and output
- Reference input
- RS-422 9-pin remote interface
- Analogue audio monitor output
- Video control interface
- Remote parallel 50-pin interface
- RS-232C remote interface

## Easy Setup Using “Memory Stick” Media

Users can store and recall VTR setup parameters onto optional Memory Stick™ media, enabling quick and consistent setup of multiple VTRs.

## Metadata Recording

The HDW-D1800 and HDW-1800 can record metadata including UMID (Unique Material Identifier) and shot marks, which are used for quick cue-up to scenes of interest. This metadata capability improves overall efficiency across the production process.

## Unrivalled Heritage in Advanced Metal Tape Technology

Sony HDCAM tape has been developed to offer optimum record and playback performance across the full range of HDCAM recorders and players.

Building on an unrivalled heritage for Metal Tape design, including two Emmy® Awards (Metal Broadcasting Tape Technology in 1990 and Digital Betacam Metal Tape Technology in 1995), HDCAM tapes provide high density recording and a duration of up to 155\* minutes.

\* When recording at 24PsF or 23.98PsF onto a large cassette.

The HDW-1800 and HDW-D1800 incorporate many of the operational features of the HDW-2000 Series. The following table shows the main operational differences.

	HDW-1800	HDW-2000	HDW-D1800	HDW-D2000
HDCAM record and replay	✓	✓	✓	✓
MPEG IMX and Digital Betacam replay			✓	✓
LCD display on front panel	✓		✓	
Editing controls on front panel		✓		✓
Editing via RS-422A (9-pin)	✓		✓	
SDTI-CP (option)		✓		✓
SD component output		✓		✓
4 channels of analogue input/output	2 channels	✓	2 channels	✓
Cue channel input/output		✓		✓
i.LINK input (option)	✓		✓	
HD-SDI input monitor connector		✓		✓
1080/50i to 720/50P output converter (option)	✓		✓	
15-pin connector for video control		✓		✓
Control panel EXT operation		✓		✓
Tele-File Reader/writer		✓		✓
3:2 pulldown (option)	✓		✓	
Dual reference input for 3:2 pull-down	✓		✓	

## OPTIONAL ACCESSORIES

FOR HDW-1800 SERIES DIGITAL VIDEO RECORDERS



**RMM-131**  
Rack Mount Kit



**RCC-5G**  
9-pin Remote Cable



**RM-280**  
Editing Controller\*1



**HKDV-900**  
HD Digital Video Controller\*2



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



**BCT-HD12CL**  
Cleaning Cassette



**HKDW-104**  
Pull-down/720P Board



**HKDW-105**  
i.LINK (HDV) Input Board

\*1 Supplied with a 9-pin to 4-pin remote cable (2 metres) for connection to the HDW-D1800/HDW-1800. For longer cable runs, a 10-metre cable is available as an option (1-832-104-11.)

\*2 To connect the HKDV-900 with the HDW-D1800/1800 VTR, the optional video controller cable, RCC-1505H/1510H/1530H is required.

# ■ HDW-S280 Portable Digital Video Recorder



## HDCAM OPERATION IN THE REMOTEST OF LOCATIONS

HDCAM is firmly established as the format of choice for high quality programming - from drama, commercials and natural history to documentaries, sport and mainstream entertainment. Since the launch of HDCAM, Sony has developed a line-up of camcorders and VTRs which are now in use by the most discerning professionals around the world.

To strengthen this line-up further, Sony added a compact recorder to the HDCAM range. The HDW-S280 is the first HDCAM VTR to offer CineAlta recording in a compact half-rack 3U chassis. Packed with features, the HDW-S280 is switchable between interlace and progressive mode with selectable frame rates, including 50i, 25PsF and 24PsF. Compatible replay of Betacam SX, Betacam SP and Betacam tapes and built-in up and down-conversion is also included as standard.

Despite its small size, the front panel of the HDW-S280 houses a 3.5-inch\* 16:9 colour LCD display for on-the-spot picture monitoring and configuration of VTR operational menus. AC, DC or battery operation completes an impressive list of features.

The HDW-S280 recorder is ideal in operations where space is at a premium and it has already been put to great use by production companies, outside broadcasters and aerial shooting specialists around the world.

\*Viewable area, measured diagonally





# MAIN FEATURES

## Superb High Definition Pictures

The HDW-S280 records High Definition component digital pictures onto small HDCAM cassettes using state-of-the-art HDCAM video compression. A video data rate of 140 Mb/s ensures superb picture quality. A 1/2-inch tape transport derived from Betacam and Digital Betacam technology provides a robust and reliable design.

## Powerful Legacy Playback

Betacam SP and Betacam SX camcorders are in widespread use around the world for programmes such as ENG, documentaries and mainstream entertainment. The HDW-S280 can replay Betacam, Betacam SP and Betacam SX cassettes, providing a smooth migration to the world of High Definition.

## Switchable Between Interlace and Progressive Operation including 24PsF

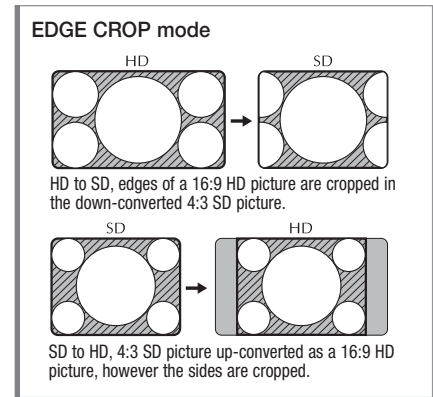
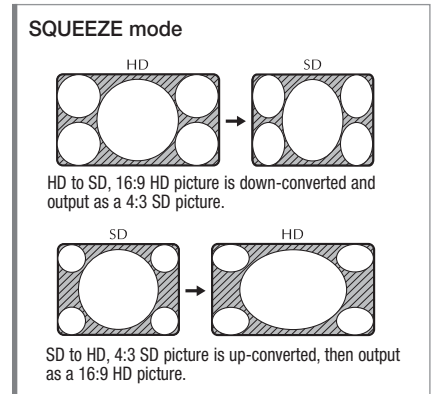
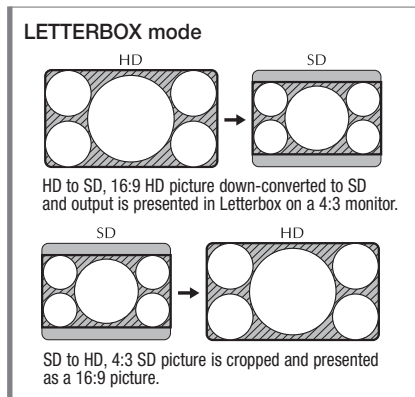
The HDW-S280 is ideal for facilities producing and distributing programmes internationally. This compact model can operate in 1080/50i, 1080/59.94i, 1080/25PsF, 1080/29.97PsF and CineAlta 1080/23.98PsF\* and 1080/24PsF\* modes\*. This versatile choice of rates makes the HDW-S280 ideal for the full range of mainstream and prestige productions

\* The HDW-S280 does not offer a 3-2 pull-down capability. 1080/24PsF and 1080/23.98PsF recordings cannot, therefore, be converted to 1080/59.94i and 1080/50i output by the HDW-S280.

## Built-in Up and Down-converters with Selectable Picture Modes

The HDW-S280 can output 480/59.94i and 576/50i signals via SD-SDI or analogue composite when replaying HDCAM material\*. This is ideal where Standard Definition post production or distribution is required. The HDW-S280 can also output 1080i signals via HD-SDI when replaying SD legacy tapes. Squeeze, Letterbox and Edge Crop adjustments are provided for control of picture aspect ratio when converting from SD to HD and vice versa.

\* 1080/24PsF and 1080/23.98PsF playback cannot be converted to 480/59.94i and 576/50i output.



# OPERATIONAL FEATURES

## Compact and Portable Design

The HDW-S280 recorder has been designed for use wherever space is limited. Outside broadcast trucks, cars and helicopters are just some of the locations where you will find HDW-S280 recorders in use. Measuring only 3U high and half-rack width, with a weight of just 6.0 kg (13 lb 4 oz), the HDW-S280 is the smallest VTR in the HDCAM line-up. A carrying handle and a tilt stand further enhance its suitability for use on location.

## User-friendly Control Panel Design

Technical performance counts for little if a VTR is not easy to operate. Although the control panel of the HDW-S280 is extremely compact, it is very easy to use, providing logical access to each operational control. A Jog/Shuttle dial is provided for quick and precise picture searching. A 3.5-inch\* 16:9 colour LCD display, allows viewing of material and VTR setup without the use of an external video monitor – a feature especially useful for field operations. At the push of a button, the LCD display can be switched between video monitoring with superimposed time code and audio level meters, or system status/menu control mode. Dedicated audio control knobs are also located on the front panel.

\* Viewable area measured diagonally.



Front Panel (Video Monitor View)



System Status View

# ■ HDW-S280 Digital Video Recorder



Rear Panel

## AC/DC or Battery-powered Operation

The HDW-S280 recorder can operate on AC, DC and battery\* power, greatly increasing its flexibility for field productions. The recorder also achieves low power consumption, enabling up to 80 minutes of operating time using the optional BP-GL95 battery.

\* To use with a battery, the optional BKP-L551 battery adaptor is required.



HDW-S280 with BP-GL95 battery

## Backspace and Assemble Editing

The HDW-S280 provides two types of editing capability. Automatic backspace editing with instant-start allows sequential recording, without picture interference at transition points. Assemble editing – including two-machine editing – is also supported\*.

\* Frame accuracy is  $\pm 1$  frame.



Jog and Shuttle

## Sequential Recording Function

The record duration onto a small cassette is up to 50 minutes at 24PsF, 48 minutes at 50i and 40 minutes at 59.94i. Should a longer record time be required, two decks can be connected to record sequentially without a break in the recording. Two minutes from the end of the first tape, the second deck starts recording and the tape in the first deck can then be changed. An unlimited record time can be achieved.



Easy Setup Using Memory Stick™ Media

## Search Functions – Jog and Shuttle Modes

The HDW-S280 recorder delivers recognisable colour pictures in shuttle mode at speeds of up to  $\pm 10$  times normal playback. Jog operation is also supported, at up to  $\pm 1$  time normal playback speed.

## Easy Integration into your Facility

Although compact in design, the HDW-S280 supports the following interfaces:

- HD-SDI input and output
- SD SDI output
- Analogue composite output
- Analogue audio input and output
- Analogue audio monitor output
- Reference input
- Time code input and output
- RS-422 9-pin remote interface

## Easy Setup Using Memory Stick™ Media

Operators can store and recall VTR setup parameters onto optional Memory Stick media, enabling quick and consistent setup of multiple VTRs.

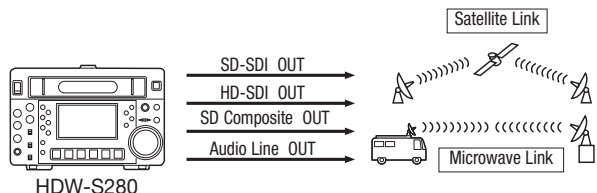
## Metadata Recording

The HDW-S280 can record metadata including UMID (Unique Material Identifier) and shot marks, which are used for quick cue-up to scenes of interest. This metadata capability improves overall efficiency across the production process.

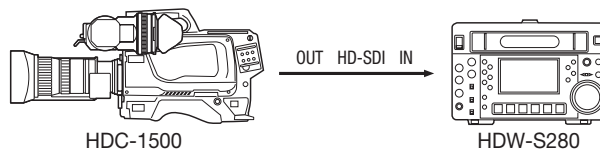


# SYSTEM CONFIGURATIONS

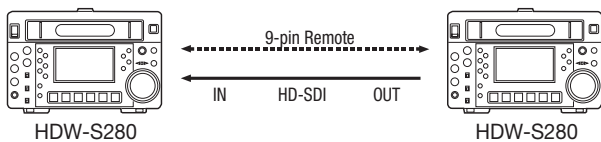
## TRANSMISSION



## ACQUISITION

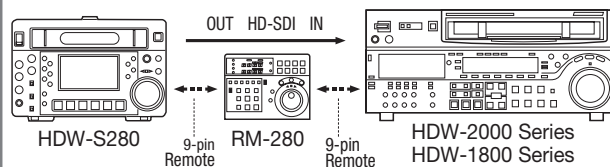


## TWO-MACHINE EDITING

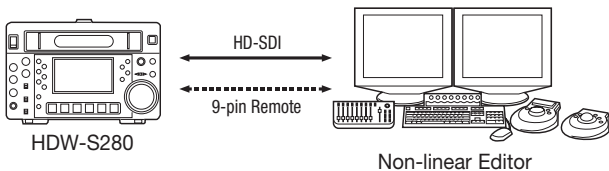


\* Assemble editing only. Frame accuracy is  $\pm 1$  frame.

## EDITING WITH RM-280 EDITING CONTROLLER



## NON-LINEAR EDITING



## Unrivalled Heritage in Advanced Metal Tape Technology

Sony HDCAM tape has been developed to offer optimum record and playback performance across the full range of HDCAM recorders and players.

Building on an unrivalled heritage for Metal Tape design, including two Emmy® Awards (Metal Broadcasting Tape Technology in 1990 and Digital Betacam Metal Tape Technology in 1995), HDCAM tapes provide high density recording and a duration of up to 155\* minutes.

\* When recording at 24PsF or 23.98PsF onto a large cassette.

# OPTIONAL ACCESSORIES



**BCT-6HD/12HD/22HD/32HD/40HD**  
HDCAM Tape Cassette



**BCT-HD12CL**  
Cleaning Cassette



**RCC-5G**  
9-pin Remote Cable



**RM-280**  
Editing Controller



**BKP-L551**  
Battery Adaptor



**BP-GL95/GL65**  
Lithium-ion Battery Pack



**BP-L60/80S**  
Lithium-ion Battery Pack



**BC-M150**  
Battery Charger



**BC-L70**  
Battery Charger



**BC-L500**  
Battery Charger

## ■ J-H1/J-H3 Compact Digital Video Players



### HDCAM PLAYBACK ON YOUR DESK

With HDCAM camcorders and studio VTRs now in widespread use around the world, it was inevitable that producers, editors and others involved in programme production would demand cost-effective HDCAM players for viewing, logging and feeding of HDCAM material into non-linear edit systems. The J-H Series compact players have been designed to meet this requirement. Sharing the same design philosophy and physical dimensions of the J Series Standard Definition compact players, both the J-H1 and J-H3 are affordable, compact and lightweight. While the J-H1 provides HDCAM playback at 1080/59.94i, 1080/50i, 1080/25PsF and 1080/29.97PsF, the J-H3 is equipped with a number of additional features to support 24P production and is the ideal partner to the CineAlta line-up.

### FEATURES

#### Compact Design

Sharing the same chassis design as the J Series compact players for Standard Definition, the J-H1 and J-H3 retain a compact and lightweight design. Equivalent in size to a typical desktop PC, they can be located on the desks of producers, journalists and editors. The J-H1 and J-H3 players measure 307 x 100 x 397 mm (12 1/8 x 4 x 15 3/4 inches) and weigh just 7.5 kg (16 lb 9 oz). They can be used horizontally or placed upright with the supplied vertical stand, for operation where space is limited.

#### Replay of Both Small and Large Cassettes

Despite their very compact design, the J-H1 and J-H3 can play back both large and small size cassettes.

#### HDCAM Replay at Multiple Frame Rates

The J-H1 and J-H3 can replay HDCAM cassettes recorded in 1080/50i, 1080/59.94i, 1080/25PsF and 1080/29.97PsF. The J-H3 adds 1080/23.98PsF and 1080/24PsF replay, making it ideal for the full range of mainstream and prestige TV programming, commercials and feature film applications.





## Flexible Audio Outputs

Both the J-H1 and J-H3 provide two channels of analogue audio output, available from either the XLR or phono connectors located on the rear panel. A headphone socket is also provided on the front panel. The audio channels to be output from the analogue outputs and headphone socket can be selected from Ch 1/2, Ch 3/4 and the Cue track. Audio is automatically muted for off-speed playback and non-data playback.

## Additional J-H3 Features – Extending Applications in Post Production

The J-H3 offers additional features specifically designed to improve its suitability for post production. These include:

- Reference input (HD/SD switchable)
- RS-422A
- Time code output
- Pull down function to convert 1080/23.98PsF to 1080/59.94i and 525/59.94i

\* i.LINK is a trademark of Sony used only to designate that a product contains an IEEE1394 connection. The i.LINK connection may vary depending on the software applications, operating system and specific device. It is possible that some products with an

## Comprehensive Interfacing for Signal Output and Monitoring

### HD and SDI Outputs

For Connection to High Grade Monitors

The J-H1 and J-H3 are equipped with an analogue Y/Pb/Pr component output (BNC x 3) for connection to an HD picture monitor. The J-H3 also offers HD-SDI and SD-SDI outputs for high quality monitoring and feeding to SD and HD non-linear editors. AES/EBU audio and non-audio data are embedded in the digital outputs.

### Built-in Down-converter

For Connection to Standard Definition Monitors

Both the J-H1 and J-H3 have a built-in down-converter, offering NTSC or PAL composite video output from the BNC and RCA output connectors. HDCAM-originated content can be down-converted for viewing on a Standard Definition monitor or for subsequent post production in the SD domain.

i.LINK connection may not communicate with others. Please refer to the documentation that comes with an i.LINK-equipped device for information on compatibility, operating conditions and proper connection.

## RGB Computer Display Interface

For Connection to Computer Displays

The J-H1 and J-H3 are equipped with an RGB computer display interface to output HDCAM-originated content at XGA resolution. The pixel count of an XGA display is 1024 x 768, so the HDCAM image is "letterboxed" to 1024 x 577 pixels. Alternatively, the players can be connected to an XGA-capable data projector for review of material or for formal presentations.

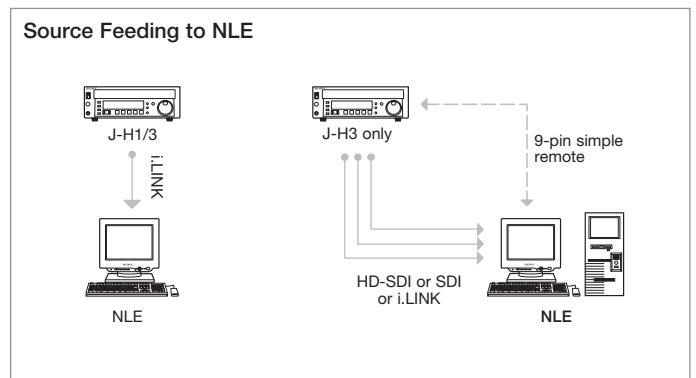
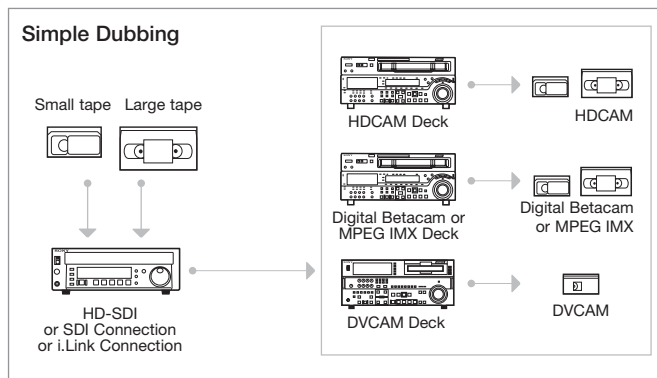
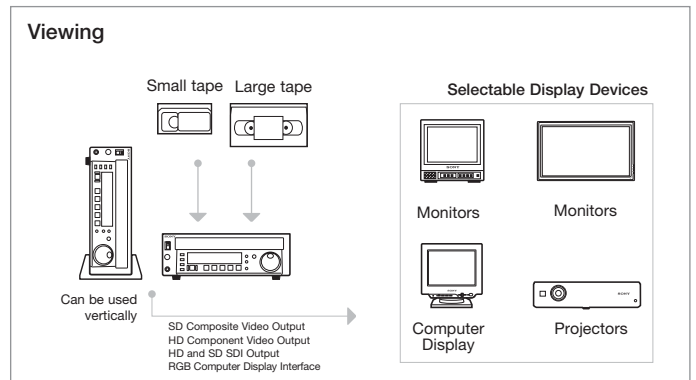
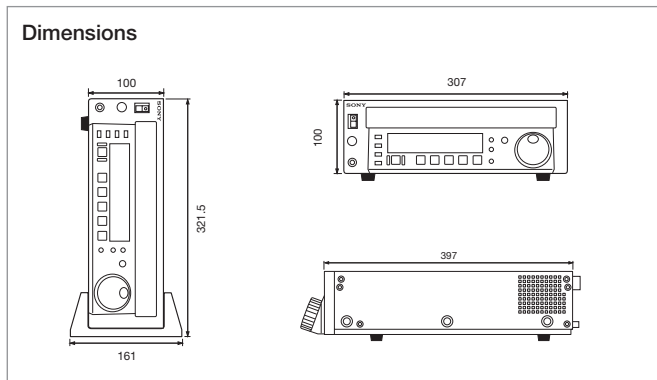
## i.LINK\* Interface

"Single-Cable" Transmission of Video, Audio and Time Code

An optional HKJ-101 i.LINK interface board can be installed into the J-H1 and J-H3. This can feed down-converted HDCAM material as 25 Mb/s DV data, with audio and time code, via a single i.LINK interface cable.

This DV-output can be connected to a DVCAM deck for dubbing of HDCAM material to DVCAM tape\*\*. It also allows a direct connection to DV-based non-linear editors for low-cost off-line editing.

\*\* Assemble or Insert editing functions cannot be used.



# Specifications

## HDW-2000 Series and HDW-1800 Series

	HDW-2000	HDW-M2000P	HDW-M2100P	HDW-D1800
<b>GENERAL</b>				
Power requirements		100 to 240 V, 50/60 Hz		
Power consumption		220 W		150 W
Operating temperature		+5 to +40 °C (41 to 104 °F)		
Storage temperature		-20 to +60 °C (-4 to +140 °F)		
Humidity		25 to 90%		20 to 90%
Mass		23 kg (50 lb 11 oz)		22 kg (48 lb 8 oz)
Dimensions (W x H x D)		427 x 174 x 544 mm (16 7/8 x 6 7/8 x 21 1/2 inches)		
Tape speed	HDCAM	96.7 mm/s (59.94; 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	59.6 mm/s		
	Betacam/Betacam SP	118.6 mm/s (525/59.94), 101.5 mm/s (625/50)		
HDCAM record/playback time (HDW-M2100P is replay only)		124 minutes (59.94; 29.97PsF, with BCT-124HDL cassette) 149 minutes (50i, 25PsF, with BCT-124HDL cassette) 155 minutes (24PsF, 23.98PsF, with BCT-124HDL cassette) 40 minutes (59.94; 29.97PsF, with BCT-40HD cassette) 48 minutes (50i, 25PsF, with BCT-40HD cassette) 50 minutes (24PsF, 23.98PsF, with BCT-40HD cassette)		
Fast forward/rewind time	SHUTTLE MODE	HDCAM	Still to $\pm 50$ times normal speed playback (59.94; 29.97PsF), Still to $\pm 58$ times normal speed playback (50i, 25PsF), Still to $\pm 60$ times normal speed playback (24PsF, 23.98PsF)	
		Digital Betacam	Still to $\pm 50$ times normal speed playback	
		MPEG IMX	Still to $\pm 78$ times normal speed playback	
		Betacam SX	Still to $\pm 78$ times normal speed playback	
		Betacam/Betacam SP	Still to $\pm 35$ times normal speed playback (525/59.94) Still to $\pm 42$ 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	
JOG MODE		Still to $\pm 1$ times normal speed playback		
Servo lock time		0.6 s or less (59.94; 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 $\Omega$ , sync negative or Black Burst or Composite, 0.3 Vp-p, 75 $\Omega$ , sync negative		
Digital audio input (CH 1/2, CH 3/4)		BNC x 2, AES/EBU		
Analogue 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 $\Omega$ termination, balanced		BNC x 2, XLR-3-pin type, Low off: -60 dBu, high High off: +4 dBu, high High on: -4 dBm, 600 $\Omega$
Time code input		XLR-3-pin type, female, x 1 (0.5 to 18 Vp-p, 10 k $\Omega$ , balanced)		
i.LINK(HDV 1080i) input (option: HKDW-105)				IEEE1394, 6-pin x 1
HD-SDI output		BNC x 3 (SMPTE 292M including one character out), Serial Digital (1.485 Gb/s)		
SD-SDI output		BNC x 3 (SMPTE 259M including one character out), Serial Digital (270 Mb/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)		
Analogue 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 $\Omega$ BNC x 3, for one set, 1.0 Vp-p, 75 $\Omega$ , sync negative		
Analogue component output		BNC x 4, AES/EBU		
Digital audio output	BNC x 2, AES/EBU (CH 1/2, CH 3/4)	(CH 1/2, CH 3/4, CH 5/6, CH 7/8)		
Analogue audio output (CH 1/2/3/4)		XLR-3-pin type, x 5, male, +4 dBm (600 $\Omega$ 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 $\Omega$ load, low impedance, balanced)		
Headphones		JM-60 Stereo phone jack ( $\infty$ to -12 dBu at 8 $\Omega$ 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, PCMCIA slot		
<b>PROCESSOR ADJUSTMENT RANGE</b>				
Video level		$\pm 3$ dB/ $\infty$ to +3 dB, selectable		
Chroma level		$\pm 3$ dB/ $\infty$ to +3 dB, selectable		
Set up/black level		$\pm 30$ IRE		
Chroma phase/hue		$\pm 30^\circ$		
System sync phase		$\pm 15$ $\mu$ s		
System SC phase		$\pm 200$ ns		
Y/C delay		$\pm 100$ ns		
<b>DIGITAL VIDEO PERFORMANCE</b>				
Sampling frequency		Y: 74.25 MHz, R-Y/B-Y: 37.125 MHz		
Quantisation		10 bit/sample (compression: 8 bit/sample)		
Compression		Coefficient recording system		
Channel coding		S-1 (NRZ) PR-IV		
Error correction		Reed-Solomon code		
<b>ANALOGUE COMPONENT OUTPUT PERFORMANCE</b>				
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		
<b>ANALOGUE COMPOSITE OUTPUT PERFORMANCE</b>				
Bandwidth		0 to 5.75 MHz +0.5 dB/-3.0 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		
K Factor (2T Pulse)		1% or less		
Output SCH phase		Based upon RS-170A/CCIR R.624-3		
<b>DIGITAL AUDIO PERFORMANCE</b>				
Sampling frequency		48 kHz (Synchronised with video)		
Quantisation		20 bit/sample		
Wow & flutter		Below measurable level		
Headrooms		20 dB (or 18 dB selectable)		
Emphasis (ON/OFF selectable in REC mode)		T1=50 $\mu$ s, T2=15 $\mu$ s (on/off selectable in recording mode)		
<b>ANALOGUE AUDIO OUTPUT PERFORMANCE</b>				
A/D quantisation		20 bit/sample		
D/A quantisation		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 $\pm 3$ 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%		
Erase ratio		More than 60 dB		
<b>SUPPLIED ACCESSORIES</b>				
		Operation manual (1), Installation manual (1)		





## HDW-S280

GENERAL			
Power requirements		100 to 240 V, 50/60 Hz	
Power consumption		80 W (AC operation), 60 W (DC operation)	
Operating temperature		+5 to +40 °C (41 to 104 °F)	
Storage temperature		-20 to +60 °C (-4 to +140 °F)	
Humidity		25 to 80%	
Mass		6 kg (13 lb 4 oz)	
Dimensions (W x H x D)		210 x 132 x 425 mm (8 3/8 x 5 1/4 x 16 7/8 inches)	
Tape speed	HDCAM	96.7 mm/s (59.94i, 29.97PsF), 80.6 mm/s (50i, 25PsF), 77.4 mm/s (24PsF, 23.98PsF)	
	Betacam SX	59.6 mm/s	
	Betacam/Betacam SP	118.6 mm/s (59.94i), 101.5 mm (50i)	
HDCAM Record/playback time		40 minutes (59.94i, 29.97PsF, with BCT-40HD cassette) 48 minutes (50i, 25PsF, with BCT-40HD cassette) 50 minutes (24PsF, 23.98PsF, with BCT-40HD cassette)	
Fast forward/rewind time		Approx. 4 minutes (fast-forward), 3 minutes (rewind)	
Search speed range	Shuttle mode	Still to ±10 times normal speed playback	
	Jog mode	Still to ±1 time normal speed playback	
Servo lock time		1.0 s or less	
Load/unload time		7 s or less	
INPUT/OUTPUT			
HD-SDI input		BNC x 1 (SMPTE 292M), Serial Digital (1.485 Gb/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	
Analogue audio input (CH 1/2)		XLR-3-pin type, female x 2, +4/0/-3/-20/-60 dBu selectable, high impedance, balanced	
Timecode input		BNC x1 (0.5 to 18 Vp-p, 10 kΩ, balanced)	
HD-SDI output		BNC x 2 (SMPTE 292M), Serial Digital (1.485 Gb/s)	
SD-SDI output		BNC x 2 (SMPTE 259M including one character out), Serial Digital (270 Mb/s)	
Analogue composite output		BNC x 2 (RS-170A, including one character out) Y: 1.0 Vp-p, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω	
Analogue audio output (CH 1/2)		XLR-3-pin type, male x 2, +4 dBm (600 Ω load), low impedance, balanced	
Timecode output		BNC x1 (1.0 Vp-p, unbalanced)	
Audio monitor output L/R		XLR-3-pin type, male x 2, +4 dBm (600 Ω load), low impedance, balanced	
Headphones		JM-60 Stereo phone jack (-∞ to -12 dBu at 8 Ω load, unbalanced)	
Remote (RS-422)		D-sub 9-pin, Sony 9-pin remote interface	
Video control		D-sub 9-pin	
DC output		Round shape 4-pin, female x 1, for RM-280 or BVR-3 controller	
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		±210 mV	
Chroma phase/hue		±30°	
System sync phase		±15 μs	
System SC phase		±200 ns	
Y/C delay		±100 ns	
DIGITAL VIDEO PERFORMANCE			
Sampling frequency		Y: 74.25 MHz, R-Y/B-Y: 37.125 MHz	
Quantisation		10 bit/sample (compression: 8 bit/sample)	
Compression		Coefficient recording system	
Channel coding		S-1-NRZI PR-IV	
Error correction		Reed-Solomon code	
ANALOGUE 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	
K Factor (2T Pulse)		1% or less	
Output SCH phase		Based upon RS-170A/CCIR R.624-3	
DIGITAL AUDIO PERFORMANCE			
Sampling frequency		48 kHz (Synchronised with video)	
Quantisation		20 bit/sample	
Wow & flutter		Below measurable level	
Headrooms		20/18/16/12 dB selectable	
Emphasis (ON/OFF selectable in REC mode)		T1=50 μs, T2=15 μs (on/off selectable in recording mode)	
ANALOGUE AUDIO OUTPUT PERFORMANCE			
A/D quantisation		20 bit/sample	
D/A quantisation		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 90 dB (at 1 kHz, emphasis ON)	
Distortion		Less than 0.08% (at 1 kHz, emphasis ON, reference level)	
Crosstalk		Less than -80 dB (at 1 kHz, between any two channels)	
CUE TRACK			
Frequency response		100 Hz to 10 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%	
Erase ratio		More than 60 dB	
SUPPLIED ACCESSORIES			
		Operation manual (1), Installation manual (1), Connector cap (1)	
BETACAM SX PLAYBACK VIDEO PERFORMANCE			
Bandwidth	Y	NTSC: 0 to 4.5 MHz +0.5 dB/-3.0 dB PAL: 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	
K factor (2T pulse)		1% or less	
AUDIO PERFORMANCE			
Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)	
Dynamic range		88 dB or more (at 1 kHz, emphasis ON)	
Distortion		0.08% or less (at 1 kHz, emphasis ON, reference level (+4 dBm))	
ANALOGUE BETACAM (NTSC) PLAYBACK VIDEO PERFORMANCE		METAL TAPE	OXIDE TAPE
Bandwidth	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
	R-Y/B-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
S/N ratio	Y	51 dB or more	48 dB or more
	R-Y/B-Y	48 dB or more	45 dB or more
K-Factor (2T Pulse)		2% or less	3.5% or less
LF non-linearity	Y	3% or less	3% or less
	R-Y/B-Y	4% or less	4% or less
Y/C delay		20 ns or less	20 ns or less
AUDIO PERFORMANCE			
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	72 dB or more	50 dB or more (Dolby NR off)
	T.H.D.	1.5% or less	2% or less
	Wow & flutter	0.2% or less	0.2% or less
ANALOGUE BETACAM (PAL) PLAYBACK VIDEO PERFORMANCE		METAL TAPE	OXIDE TAPE
Bandwidth	Y	25 Hz to 4.5 MHz +0.5 dB/-4.0 dB	25 Hz to 4.1 MHz +0.5 dB/-6.0 dB
	R-Y/B-Y	25 Hz to 1.5 MHz +0.5 dB/-3.0 dB	25 Hz to 1.5 MHz +0.5 dB/-3.0 dB
S/N ratio	Y	48 dB or more	46 dB or more
	R-Y/B-Y	48 dB or more	45 dB or more
K-Factor (2T Pulse)		2.5% or less	4% or less
LF non-linearity	Y	3% or less	3% or less
	R-Y/B-Y	4% or less	4% or less
Y/C delay		20 ns or less	20 ns or less
AUDIO PERFORMANCE			
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.	1.5% or less	2% or less
	Wow & flutter	0.2% or less	0.2% or less

# J-H1/J-H3

	J-H1	J-H3
<b>GENERAL</b>		
Power requirements		AC 100 V to 240 V 50/60 Hz
Power consumption	50 W	60 W
Operating temperature		+5 °C to +40 °C (+41 °F to +104 °F)
Storage temperature		-20 °C to +60 °C (-4 °F to +140 °F)
Humidity		25 % to 80 % (relative humidity)
Mass		7.5 kg (16 lb 9 oz)
Dimensions (W x H x D)		307 x 100 x 397 mm (12 1/8 x 4 x 15 3/8 inches)
Tape speed	HDCAM	96.7 mm/s (29.97 Hz), 80.7 mm/s (25 Hz)
Playback time		96.7 mm/s (29.97 Hz), 80.7 mm/s (25 Hz) 77.4 mm/s (24 Hz)
Fast forward / Rewind time		124 min (29.97 Hz, with BCT-124HDL) 149 min (25 Hz, with BCT-124HDL)
Search speed	Shuttle mode	Approx. 6 min with BCT-124HD
	Jog mode	Still to ± 21 times normal speed playback
Servo lock time		Still to ± 1 time normal speed playback
Load/unload time		1 sec or less (from standby on)
	7 sec or less	-
<b>INPUT/OUTPUT</b>		
Digital HD video	-	BNC x 1, SMPTE-292M
Digital SD Video	-	BNC x 1, SMPTE-259M
Analogue HD video		BNC (x 3) Y: 0.7 vp-p, Pb/Pr: ±0.7vp-p 75 Ω EIAJ RC-5237 connector, EIAJ CP-4120 standard
Analogue SD video		BNC (x 1), Pin jack (x 1), 1.0 Vp-p, 75 Ω
Computer display		D-sub 15 pin, XGA (1024 x 768 dots), RGB, 0.7 V
i.LINK (Optional)		IEEE1394
Timecode	-	BNC x 1, SMPTE 12M
Audio monitoring		Pin jack (x 2): -10 dBu at 47 kΩ load, unbalanced XLR (male x 2) +4 dBm, 600 Ω load, low impedance, balanced JM-60 stereo phone jack, ±2 to -12 dBu at 8 Ω, unbalanced
Headphone		D-sub 9 pin male (x 1)
RS-232C		
RS-422		
Wireless remote	-	D-sub 9 pin female (x 1), Sony 9-pin remote interface
EXT SYNC		BIRCS BNC x 2
<b>HD ANALOGUE RESPONSE</b>		
Output level		Y: 700 mV (±5 %), Pb/Pr: 700 mV (±5 %), Sync signal: 300 mV (±5 %)
Bandwidth		Y: 0 to 20 MHz + 1.0 dB / -3.0 dB, Pb/Pr: 0 to 7 MHz +1.0 dB / -3.0 dB
S/N ratio		56 dB or more
Output impedance		Y, Pb, Pr: 75 Ω (±5 %)
Y/C Delay		Y, Pb, Pr: ±15 nsec or less
<b>XGA ANALOGUE RESPONSE</b>		
Output level		R: 700 mV (±5 %), G: 700 mV (±5 %), B: 700 mV (±5 %)
Resolution		XGA
Refresh/rate		60 Hz
H-Frequency		48.4 kHz
<b>SD COMPOSITE RESPONSE</b>		
Output level		Y: 59.94i: 714 mV (±5 %), 50i: 700 mV (±5 %) Sync: 59.94i: 286 mV (±5 %), 50i: 300 mV (±5 %) Burst: 59.94i: 286 mV (±5 %), 50i: 300 mV (±5 %)
Bandwidth		0.5 to 5.75 MHz + 0.5 dB/-3.0 dB
S/N ratio		56 dB or more
Y/C delay		20 nsec or less
K Factor (2T Pulse)		1.0 % or less
<b>ANALOGUE AUDIO RESPONSE</b>		
Output level		XLR: +4±0.5 dBm, -20 dBFS, 600 Ω terminated PIN: +10±0.5 dBu, -20 dBFS, 47 kΩ terminated
Frequency response		20 Hz to 20 kHz + 1.0 dB/-1.5 dB
Dynamic range		More than 85 dB (at 1 kHz, emphasis ON)
Distortion		Less than 0.1 % (at 1 kHz/-20 dBFS, emphasis ON)
Wow & flutter		Below measurable level
<b>CUE AUDIO RESPONSE</b>		
Sampling frequency		100 Hz to 10 kHz ±3.0 dB
S/N ratio		More than 43.5 dB (3 % distortion level)
Distortion		Less than 2 % (T.H.D. at 1kHz, reference level)
Wow & flutter		Less than 0.18 %
<b>SUPPLIED ACCESSORIES</b>		
		Operation manual (CD-ROM), Quick operation guide, Vertical stand (x 2), Infra-red remote controller

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