

SONY[®]

MSW-2000 Series

MPEG IMX[™]

MPEG

MPEG IMX **VTRs**

MSW-M2000/M2000P
MSW-A2000/A2000P
MSW-2000
MSW-M2100/M2100P

e-VTR

MSW-M2000E/M2000EP
MSW-M2100E/M2100EP
BKMW-E3000

Create an end-to-end MPEG environment with Sony MSW-2000 Series MPEG IMX Studio Editing VTRs

As the broadcasting industry has entered a digital networked environment, users have become aware of the significant benefits of consistent MPEG compression throughout the entire production process. MPEG-2 – the selected standard for DTV distribution thanks to its quality, cost-effectiveness, and efficiency in transmission – has naturally become a strategic choice for use in a variety of production and postproduction applications.

Sony's response to this is the MSW-2000 Series of MPEG IMX™ VTRs, operating on MPEG-2 4:2:2 P@ML at 30/40/50 Mb/s, I-frame only compression. This family of VTRs offers four studio recorders and two players, each optimized for environments where picture quality and operability are of prime concern.

A distinct advantage of these VTRs is their powerful legacy playback capability of Sony standard-definition 1/2-inch tape formats*. This not only protects vast quantities of archive material, but also allows continued use of those all-important acquisition tools, for a smooth migration into an open MPEG environment.



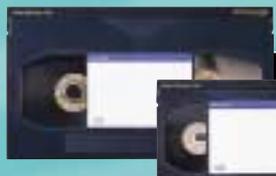
MPEG IMX
Small and Large Cassette



BETACAM SX
Small and Large Cassette



Digital BETACAM
Small and Large Cassette



BETACAM SP
Small and Large Cassette



BETACAM
Small and Large Cassette

MSW-2000 Series MPEG IMX VTRs

MPEG-2 4:2:2P@ML
I-frame only
50, 40, 30 Mb/s selectable

Recorders



MSW-M2000/M2000P
MSW-A2000/A2000P
MSW-2000
MSW-M2000E/M2000EP

Players

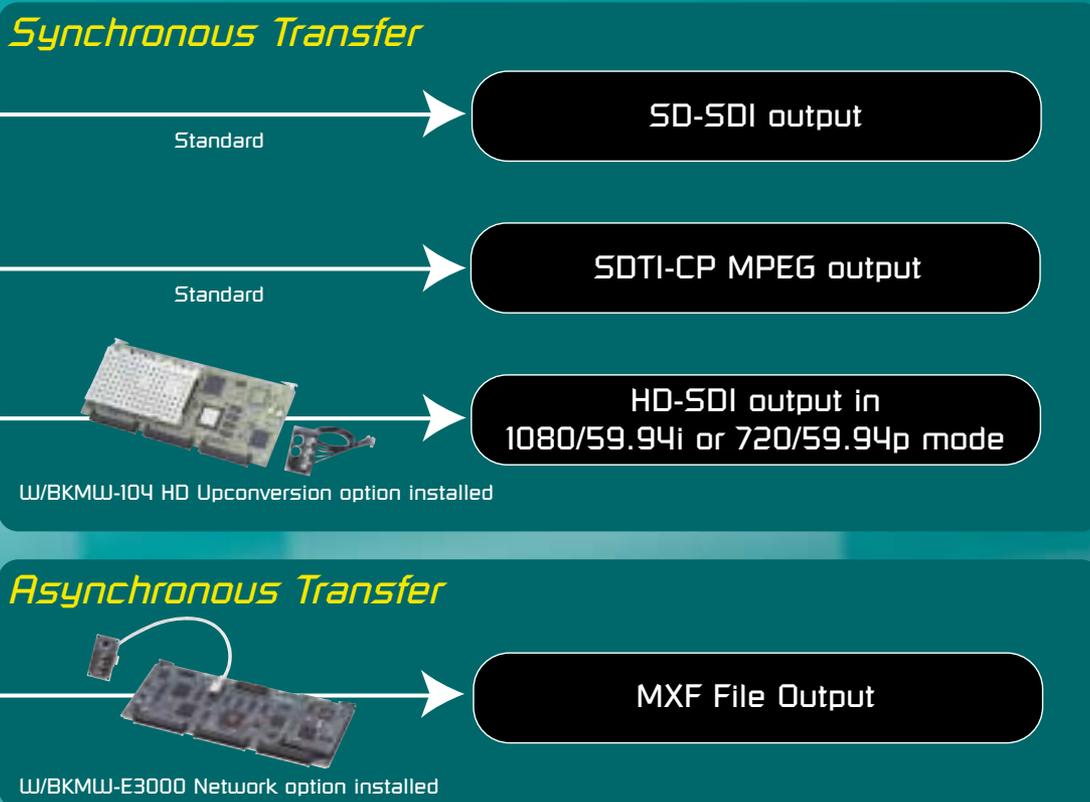


MSW-M2100/M2100P
MSW-M2100E/M2100EP

Equally important, the MSW-2000 Series is built to accommodate a standard Gigabit Ethernet interface for integration into a TCP/IP networked world. With this capability, video assets on tape can be converted to computer data files and flexibly exchanged between other network-capable devices, such as the Sony XDCAM™ Series optical disc recording system, XPRI™ Series nonlinear editing systems, and a variety of compatible third-party server systems.

Far from just another VTR format, the Sony MPEG IMX VTRs combine the benefits of an open MPEG environment with the convenience of both synchronous and asynchronous operations.

**Playback-compatible formats vary by product.*



	REC	PLAY					Network Capability (e-VTR)
	MPEG IMX	MPEG IMX	Digital Betacam	Betacam SX	Betacam SP	Betacam	
MSW-M2000/M2000P	●	●	●	●	●	●	Option
MSW-M2000E/M2000EP	●	●	●	●	●	●	●
MSW-A2000/A2000P	●	●	—	●	●	●	Option
MSW-2000	●	●	—	●	—	—	Option
MSW-M2100/M2100P	—	●	●	●	●	●	Option
MSW-M2100E/M2100EP	—	●	●	●	●	●	●

Main Features

■ MPEG-2 4:2:2P@ML 50 Mb/s, I-frame Compression

MSW-2000 Series VTRs employ 8-bit 4:2:2P@ML component video sampling and MPEG-2 4:2:2 P@ML data compression at 50 Mb/s, I-frame only, thus offering superb picture quality and editing performance.

■ Powerful Legacy Playback Capability

One significant feature of MPEG IMX VTRs is the legacy playback capability to replay all of Sony's digital Digital BETACAM and BETACAM SX to analog BETACAM SP and BETACAM 1/2-inch SD formats. This not only protects legacy analog libraries, but also protects ongoing analog acquisition. This feature makes these VTRs an ideal solution for migrating from analog to a digital, MPEG-based environment.

■ IP-Network Interface

As standard, the MSW-M2000E and MSW-M2100E VTRs are capable of sending and receiving video and audio material as data files through a common network. The four other MSW-2000 models also offer this capability via an optional plug-in board, the BKMW-E3000. These network-capable VTRs, distinguished by the name "e-VTR", offer powerful features to revolutionize current production workflows using typical network infrastructures. (See page 7 for feature details.)

■ MPEG Bit Stream Data Over SDTI-CP

SDTI-CP (Serial Digital Transport Interface-Content Packages) is an industry-standard interface that is defined by SMPTE 326M. With SDTI-CP, an MPEG elementary stream output can be openly interfaced to compatible products without signal deterioration. There are a number of SDTI-CP-equipped nonlinear editors and servers available from leading manufacturers as well as Sony, giving the widest possible choice.

■ High-Speed Data Transfer

As a standard feature, MSW-2000 Series VTRs* enable the MPEG elementary stream

to be transferred at twice-normal playback speed**. This is an effective feature when integrating an MSW-2000 Series VTRs into a production system using the SDTI-CP interface - for example, the Sony XPRIT™ nonlinear editor or Sony MAV-555A server - since material can be digitized at twice-normal playback speed and virtually without signal degradation.

**Only the MSW-2000 model requires an optional part. Please contact your nearest Sony office.*

***Transfer at twice-normal playback speed is available only when playing back an MPEG IMX cassette.*

■ High-Definition Up-Conversion Output

Another interface option, the BKMW-104 up-conversion board, allows 1080/59.94i and 720/59.94P output from the playback (off-tape) signals of standard-definition 1/2-inch formats*, including BETACAM, BETACAM SP, BETACAM SX, and Digital BETACAM as well as MPEG IMX cassettes. This option enables smooth migration to future HDTV operations.

**Playback-compatible formats vary by product.*

■ Compact Body Design

MSW-2000 Series VTRs feature a compact 4U design* and weigh only 23 kg (50 lb 11 oz) – 12 kg (approx. 26 lb) lighter than the DVW-A500 Digital BETACAM VTR.

**427 x 174 x 544 mm (16 7/8 x 6 7/8 x 21 1/2 inches)*

■ Elegant Front-Panel Design

These VTRs offer two major front-panel design innovations, while keeping knobs and buttons in their familiar positions. A clear, multi-function display provides comprehensive information, allowing quick access and easy control of a variety of functions. Additionally, dedicated control knobs are included for each of the eight, independently editable audio channels.

■ High-Quality Digital Audio

MSW-2000 Series VTRs provide eight channels of independently editable, 16-bit audio as standard. They can also be switched to provide four channels of 24-bit digital audio.

■ Long Recording and Playback Times

These VTRs provide long recording and playback times.

■ 184 (525)/220 (625) minutes
using an L cassette

■ 60 (525)/71 (625) minutes
using an S cassette

■ 525/60, 625/50 Switchable Operation

MSW-2000 Series VTRs offer 525/625 switchable operation for all playback-compatible 1/2-inch formats.

**For playback of 625-line BETACAM and BETACAM SP tapes in 525 machines and vice versa, the video outputs are for monitoring purpose only.*

■ Versatile Interfaces

These VTRs are equipped with a wide range of interfaces including SD-SDI, SDTI-CP, analog component/composite, and analog/digital audio. This versatility allows the MSW-2000 Series VTRs to be easily integrated into a variety of systems. By adding the optional BKMW-104 board, HD-SDI output is also available. The optional BKMW-E3000 board further adds an IP-network interface.

**Either the BKMW-104 or BKMW-E3000 can be installed in the VTR.*

Standard

- Analog composite I/O*
- Analog component I/O*
- SD-SDI I/O*
- SDTI-CP I/O*
- Analog audio I/O* (4 ch)
- AES/EBU audio I/O*
(16-bit – 8 ch/24-bit – 4 ch)
- Audio monitor output (2 ch)
- Time code I/O*
- RS-422A (Sony 9-pin Remote)
- RS-232C
- Parallel 50-pin (standard)

**The MSW-M2100/M2100P/M2100E/M2100EP player provides outputs only.*

Option

- HD-SDI output
(requires the optional BKMW-104)
- Ethernet
(requires the optional BKMW-E3000)

Operational Features

■ Frame-Accurate Insert/Assemble Editing (Recorders Only)

MSW-2000 Series recorders enable insert and assemble editing with ± 0 frame accuracy. This allows precise editing on MPEG IMX tape in machine-to-machine or A/B-roll configurations.

■ Pre-read Editing Capability (Recorders Only)

These recorders are equipped with advanced playback heads to enable pre-read editing. This function allows applications that require titling with a single VTR or A/B-roll with two VTRs, as well as audio mixing and channel swapping.

■ Variable Speed Control

- Digital BETACAM tape: -1 to $+3$ times
- MPEG IMX tape: -1 to $+3$ times
- BETACAM SX tape: -1 to $+2$ times
- BETACAM SP tape: -1 to $+3$ times
- BETACAM tape: -1 to $+3$ times

*With noiseless image and digital jog sound.
Figures are relative to normal play speed.*

■ High-Speed Picture Search

- Digital BETACAM tape: ± 50 times
- MPEG IMX tape: ± 78 times
- BETACAM SX tape: ± 78 times
- BETACAM SP tape:
 $\pm 35(525)/\pm 42(625)$ times
- BETACAM tape: $\pm 35(525)/\pm 42(625)$ times

Figures are relative to normal play speed.

■ DMC Capability

Equipped with Dynamic Motion Control, this VTR provides slow-motion playback from its control panel or from external controllers such as Sony BVE Series Editors or the DTR-3000 Slow Motion Controller.

■ Audio Jog Sound

Complete reproduction of eight channels (four channels when playing back Digital BETACAM and BETACAM SX cassettes) of digital audio is maintained, from normal play speed forward to normal play speed in reverse, in Jog mode. 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.

■ Optional Remote Control Panel

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

MPEG IMX Format

General	Tape width Tape material Recording/Playback time Tape speed Track pitch Tracks per frame Longitudinal tracks	12.65 mm (1/2-inch) Metal particle tape Max. 184 (525)/220 (625) min with L-cassette 64.467 (525)/53.776 (625) mm/s 21.7 μ m 8 tracks/frame Time code/Control
Video	Compression Video bit rate Active lines per frame Sampling frequency Quantization Error correction	MPEG-2 4:2:2P@ML, Intra frame coding (ISO/IEC 13818-2000) 50 Mb/s 512 (525)/608 (625) Y: 13.5 MHz, R-Y/B-Y: 6.75 MHz 8 bits/sample Reed-Solomon
Audio	Compression Sampling frequency Quantization Data recording capability Error correction	None 48 kHz Selectable, 16 bits/sample (8 channels) or 24 bits/sample (4 channels) Yes Reed-Solomon



MSW-2000 Series with Ethernet Capability

Other Features

■ Shot-Mark Handling

These VTRs can scan tapes with shot marks and automatically detect their positions. After scanning, a list of all the marks can be displayed on a monitor, allowing easy cueing to any mark.

■ UMID (Metadata) Handling

In the MSW-2000 Series, special care has been given to metadata handling in order to increase production efficiency and to provide 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, 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. MSW-2000 Series VTRs provide the facility to automatically generate and record UMID on tape while dubbing and editing. This recorded UMID is used in subsequent processes from editing and archiving and on to distribution, bringing efficiency throughout the entire program production process.

■ Easy maintenance

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



■ Easy Integration into Flexicart™ and LMS Systems

These MPEG IMX studio VTRs can be used in Flexicart and LMS systems. Integration is quick and easy.



e-VTR Features

The Sony e-VTR is a network-capable MPEG IMX VTR, which enables 1/2-inch tape-based content to be integrated into common Ethernet network environments. The Sony e-VTR lineup consists of the MSW-M2000E recorder and MSW-M2100E player, which offer Ethernet capability as standard, and four other MSW-2000 models, which offer this with an optional e-VTR board (BKMW-E3000).

The e-VTR allows video and audio files to be sent and received across a standard network, enabling flexible material exchange all over the world. Many other network features, including remote monitoring and the use of Proxy Data derived from tape or live sources (e-to-e) are also available with the e-VTR.

The file format used for network transfer is MXF (Material eXchange Format), an approved SMPTE standard (SMPTE 337M) for the interchange of audio-visual material and associated metadata between compatible production equipment.

The e-VTR provides the following features:

■ Network File Transfer of All Sony 1/2-inch SD Assets

The e-VTR can convert material recorded on any playback-compatible 1/2-inch tape format to the MXF (asynchronous) file-based format, for exchange of tape material across an Ethernet network environment. This allows MPEG IMX, Digital Betacam, Betacam SX, Betacam SP, and Betacam materials* to be easily sent and received as data files through the network.

The e-VTR compensates for the different bit rates of the tape format and network bandwidth by intelligently controlling the tape playback and using a buffer memory to output the data according to the available network bandwidth.

MXF files can be transferred while playing back the tape, and also during recording. The file transfer can be performed between two e-VTRs, or between an e-VTR and other MXF-compatible devices such as the Sony XDCAM series of products.

This network capability makes it possible to send footage from the field to the studio immediately after the shoot, or to easily share material among production staff at multiple locations. This removes the delays associated with the physical delivery of tapes, and reduces the use of costly satellite transmissions.

**Playback-compatible formats vary by product.*

■ Easy File Transfer Operation

The e-VTR allows file transfers to be easily accomplished through two types of operation:

PC-based Operation

File transfer can be performed via a simple drag-and-drop operation using the supplied e-VTR Manager software running on a compatible Windows PC. The intuitive GUI allows operators to perform the file transfer while browsing a low data-rate stream of the material on the PC to determine the in/out points of the transfer segment. This method is particularly convenient when e-VTRs are installed at a different or remote location.



VTR Front-Panel Operation

Another convenient way of transferring material is to set the in/out points from the e-VTR's front panel during tape playback, and then send the designated material segments on the fly. This is similar to two-machine editing, and does not require the

use of a PC. Operators can view a full-resolution image on a standard video monitor, which enables them to make a precise decision on which material to transfer.

■ e-Monitor Function

By connecting a PC to the e-VTR network, operators can browse a low data-rate stream of any tape material loaded in any e-VTR residing on the network. By running the supplied e-VTR Manager software on the PC, tape transport controls such as PLAY, REW, and FF are provided. This unique feature allows operators to visually check the material content first, and then send it across the network – saving time and keeping network traffic to a minimum.



e-VTR Features

■ Generation of Low-resolution Proxy Data

Another effective way of viewing material stored in a networked e-VTR is "Proxy Data browsing." Proxy Data is a low-resolution audio/video stream copy of the tape material, available from the e-VTR's Ethernet connector. Using MPEG-4 compression, Proxy Data is provided at a low bit rate of 2.0 Mb/s (1.5 Mb/s for video and 0.5 Mb/s for A-law compressed audio). Proxy Data can be sent across any standard network from an e-VTR to a PC's hard disk drive, and replayed locally on the supplied e-VTR Manager software.

Operators can use the Proxy Data for many different purposes: as material to show for urgent client approval; as 'work material' for off-line editing; or as catalog pictures in an archive management system. Furthermore, the Proxy Data can be used on-air for emergency breaking news, when only low-bandwidth transmission paths are available.

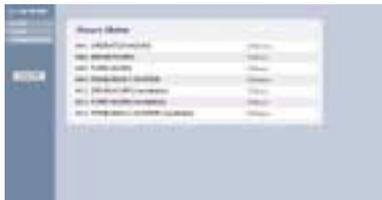
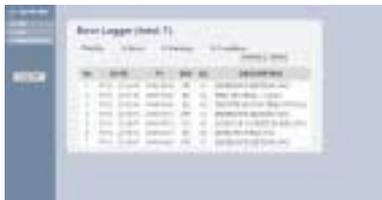
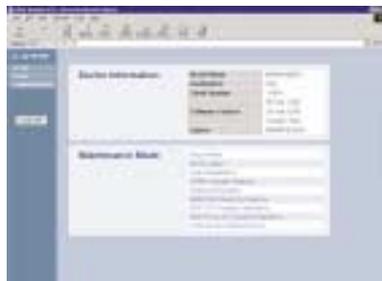
The availability of Proxy Data frees the e-VTR from being constantly accessed by users wishing to browse material. Once the Proxy Data is copied to a PC, it can easily be sent to other production staff or uploaded to a specific contents server for access by multiple operators.

■ Remote Monitoring of e-VTR using a Standard Web Browser

The e-VTR allows a variety of key maintenance information to be displayed on standard web browsers such as Microsoft Internet Explorer and Netscape Navigator. This includes "Hours Meter" information, as well as logs on errors, warnings, and channel condition.

This capability allows operators to remotely monitor the status of multiple e-VTRs from a single PC, for proactive and efficient maintenance operations. The e-VTR also supports the industry-

standard SNMP protocol, allowing further advanced remote monitoring using the Sony MMStation™ Remote Monitoring software.



■ Metadata Transfer

The e-VTR can send metadata together with AV streams by wrapping them into an MXF file. Metadata originally recorded on tape loaded or metadata stored on an external data server can be wrapped into the output of MXF file. The use of an external data server allows operators to transfer much larger-sized metadata along with the AV material over a network.

Supported Protocols and Interfaces

TCP/IP, FTP, HTTP, DHCP, SNMP, 1000Base-T (GbE), 100Base-TX, 10Base-T

System Requirements for the Supplied e-VTR Manager Software

PC	IBM PC/AT-Compatible machine
Operating system	Microsoft Windows 2000, XP (with DirectX 8.1b or higher)
Memory capacity	256-MB RAM minimum
CPU	1-GHz Intel Pentium processor or faster
Display	XGA 1024 x 768 or higher with more than 16-bit high color
Sound	MCI Device & Driver, Microphone, Speaker
Interface	Fast Ethernet or GbE is recommended
Hard disk drive	5 MB or more available

Optional Accessories



BKMW-101
Remote Control Panel



BKMW-102
Remote Control Unit



BKMW-103
Control Panel Expansion Kit



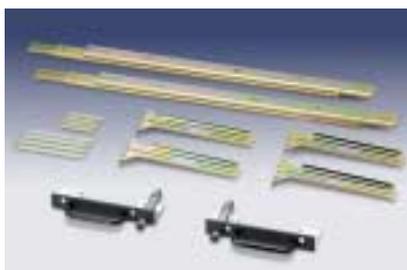
BKMW-104
HD Upconverter Board



BKMW-E3000
Network Interface Board (for e-VTR)



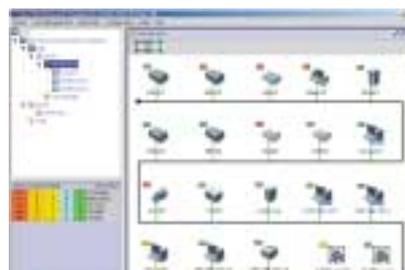
RCC-5G
Remote Cable



RMM-131
Rack Mount Kit



MLB-1M-100
Memory Label for Tele-File System



BZMW-5000/1000 Series
MMStation™/ISR™ Proxy
Remote Monitoring and Maintenance
Software



BCT-6MX/12MX/22MX/32MX/60MX (Small)
BCT-64MXL/94MXL/124MXL/184MXL (Large)
MPEG IMX Videocassettes

Specifications

	MSW-M2000/M2000P, MSW-M2000E/M2000EP, MSW-A2000/A2000P, MSW-2000 MPEG IMX Recorders	MSW-M2100/M2100P, MSW-M2100E/M2100EP MPEG IMX Players
General		
Power requirements	AC 100 V to 240 V, 50/60 Hz	
Power consumption	2A (200 W)/AC 240 V	
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	20% to 90% (relative humidity)	
Mass	23.0 kg (50 lb 11 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	MPEG IMX	64.467(525)/53.776(625) mm/s
	Digital BETACAM	96.7 mm/s (except MSW-A2000/A2000P)
	BETACAM SX	59.515 (625)/59.575 (625) mm/s
	BETACAM/BETACAM SP	118.6 (525)/101.51 (625) mm/s (except MSW-2000)
Playback time (MPEG IMX)	Max. 184 (525)/220 (625) min with BCT-184MXL cassette	
Fast forward/rewind time	Approx. 3.5 min with BCT-184MXL cassette	
Search speed range	MPEG IMX	±78 times normal playback speed
	Digital BETACAM	±50 times normal playback speed (except MSW-A2000/A2000P)
	BETACAM SX	±78 times normal playback speed
	BETACAM/BETACAM SP	±35 (525)/±42 (625) times normal playback speed (except MSW-2000)
Servo lock time	0.5 (525)/0.7 (625) s or less (from standby on)	
Load/unload time	6 sec or less	
Input/Output signals		
Analog composite input	BNC (x2, including one loop through output), 1.0 Vp-p, 75 Ω, sync negative	—
Analog composite output	BNC (x3, including one character out), 1.0 Vp-p, 75 Ω, sync negative	
Analog component input	BNC (x3, for 1 set, Y/R-Y/B-Y): 1.0 Vp-p, 75 Ω, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω	—
Analog component output	BNC (x3, for 1 set, Y/R-Y/B-Y): 1.0 Vp-p, 75 Ω, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω	
SD-SDI input	BNC (x2, including one active through out), SMPTE 259M (ITU-R BT.656-3), 270 Mb/s	—
SD-SDI output	BNC (x3, including one character out), SMPTE 259M (ITU-R BT.656-3), 270 Mb/s	
SDTI-CP input	BNC (x1), SMPTE 326M (SDTI-CP)	—
SDTI-CP output	BNC (x2), SMPTE 326M (SDTI-CP)	
HD-SDI output (option)	BNC (x3)	
Analog audio input	XLR (x4) (4CH: channel selectable)	—
Analog audio output	XLR (x4) (4CH: channel selectable)	
Cue audio output	XLR (x1, only Digital Betacam playback) (MSW-M2000/M2000P/M2100/M2100P)	
Digital audio input (CH 1/2, 3/4, 5/6, 7/8), AES/EBU	BNC (x4), default 48 kHz (32 to 48 kHz with Sample Rate converter), Complies with AES-3id-1995	—
Digital audio output (CH 1/2, 3/4, 5/6, 7/8), AES/EBU	BNC (x4), 48 kHz fixed, Complies with AES-3id-1995	
Remote control	Remote (RS-422A)	D-sub 9-pin (x2), Sony 9-pin remote interface
	RS-232C (ISR*)	D-sub 9-pin (x1), RS-232C interface
	Parallel Remote	D-sub 50-pin (x1)
	Video control (1)	D-sub 50-pin (x1)
	Control Panel	Circular connector 10-pin
Time code input	XLR (x1)	—
Time code output	XLR (x1)	
Ethernet	RJ-45(x1), 1000Base-T/100Base-TX/10Base-T (MSW-M2000E/M2000EP/M2100E/M2100EP, or other models when equipped with the optional BKMW-E3000 board)	
Memory card insertion slot	*Memory Stick™ (x1), PCMCIA (x1)	
Monitor output L/R	XLR (x2) (channel selectable)	
Phones	JM-60 Stereo phone jack	
Processor adjustment range		
Video level	±3 dB/-∞ to 3 dB selectable	
Chroma level	±3 dB/-∞ to 3 dB selectable	
Set up/Black level	±30 IRE/±210 mV	
Chroma phase/hue	±30°	
System sync phase	±15 μs	
System SC phase	±200 ns	
Y/C delay	±100 ns (BETACAM/BETACAM SP playback only)	
Composite input level	±3 dB	—
Digital video performance		
Sampling frequency	Y: 13.5 MHz, R-Y/B-Y: 6.75 MHz	
Quantization	MPEG IMX/BETACAM SX: 8 bits/sample Digital BETACAM: 10 bits/sample (MSW-M2000/M2000P/M2100/M2100P)	
Error correction	Reed-Solomon code	
Digital input to analog component output	D/A quantization: 10 bits/sample Bandwidth: 0 to 5.75 MHz ±0.5 dB S/N ratio: 56 dB or more K-factor (2T pulse): 1% or less	
Analog component input to analog component output (MPEG IMX record/playback)	A/D and D/A quantization: 10 bits/sample Bandwidth: Y: 0 to 5.75 MHz +0.5/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5/-2.0 dB S/N ratio: 56 dB or more K-factor (2T pulse): 1% or less LF non-linearity: 3.0% or less	
Analog composite input to analog composite output (MPEG IMX record/playback)	A/D and D/A quantization: 10 bits/sample Bandwidth: 0 to 5.75 MHz +0.5/-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	
Digital audio performance		
Sampling frequency	48 kHz (synchronized with video)	
Quantization	MPEG IMX: 16 or 24 bits/sample (selectable) Betacam SX: 16 bits/sample Digital Betacam: 20 bits/sample (MSW-M2000/M2000P/M2100/M2100P)	
Analog input to analog output (MPEG IMX record/playback)	A/D and D/A quantization: 24 bits/sample Frequency response (0 dB at 1kHz): 20 Hz to 20 kHz +0.5/-1.0 dB Dynamic range (at 1 kHz, emphasis ON): More than 90 dB (16-bit mode), More than 95 dB (24-bit mode) Distortion (at 1 kHz, emphasis ON, reference level): Less than 0.05% Cross talk (at 1 kHz, between any two channels): Less than -80 dB Wow & flutter: Below measurable level	
Head room	20 dB (18 dB selectable)	
Emphasis (ON/OFF selectable in REC mode)	T1=50 μs, T2=15 μs	
Supplied accessories		
PSW 4x16 rack mount screw (x4), Operation manual (x1), Installation manual (x1)		

*ISR: Interactive Status Reporting

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Features and specifications subject to change without notice.

All non-metric weights and measures are approximate.

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