

SONY®



48-Channel Digital Audio Recorder

**PCM-3348HR**



# PCM-3348HR

## 24-bit Digital Audio Recorder

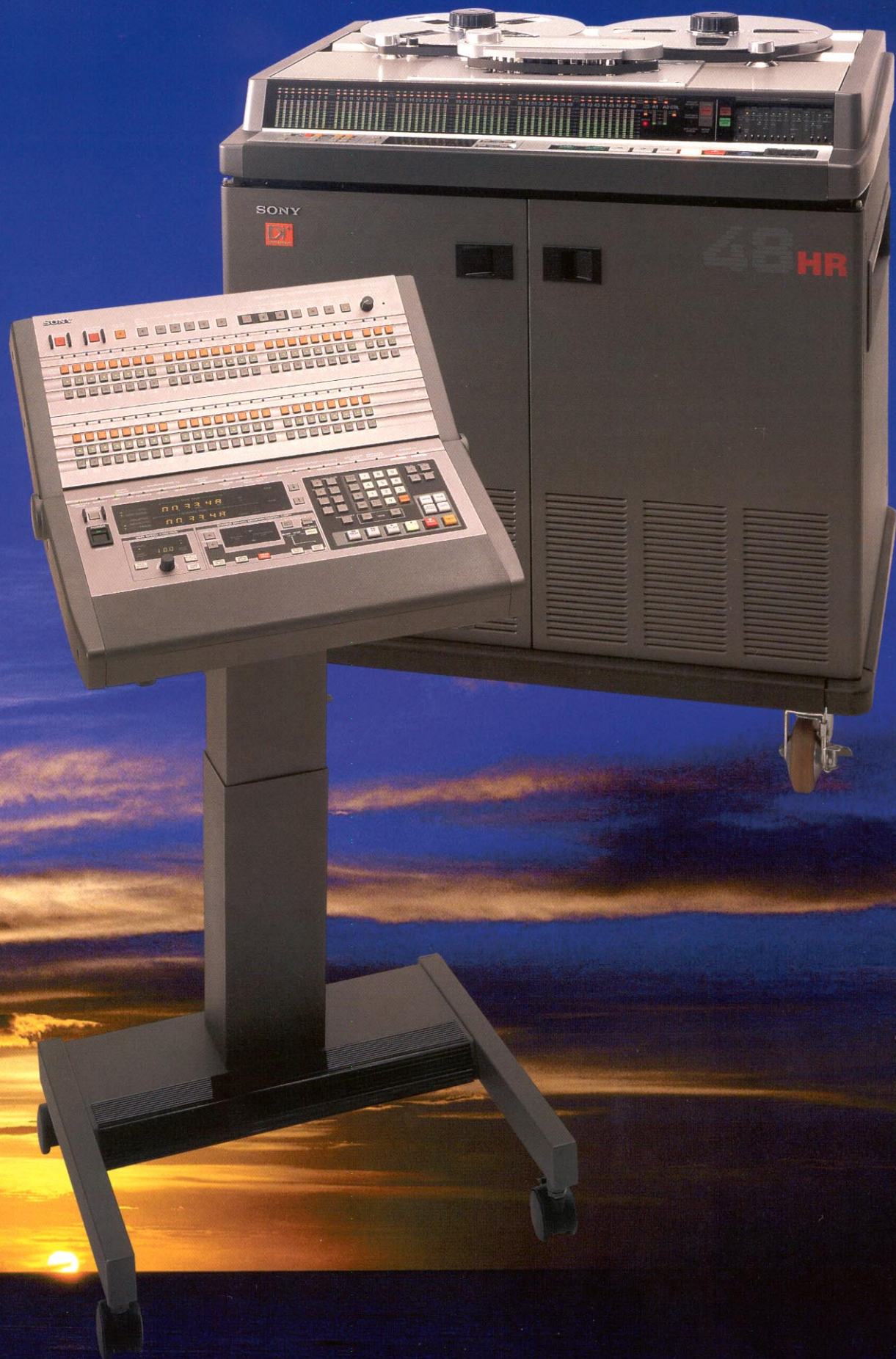
**S**ony mastery of digital audio technology has been clearly demonstrated over many years. Of the developments that it has pioneered, that of the 16-bit DASH (Digital Audio Stationary Head) format has to be one of the most significant. Over the past fifteen years, Sony has introduced a range of 24 and 48-track DASH recorders that have made the format a de-facto standard in multichannel recording.

In particular the Sony PCM-3348, the world's first 16-bit, 48-track recorder when it was introduced in 1988, has achieved a legendary status in many top-class recording studios worldwide. For its supreme sound quality, high performance, excellent reliability and convenient operational features, it is still used as the most powerful and reliable workhorse at the front-line of audio production.

However, the growing demand for higher sound quality and the ability to master at resolutions higher than 16-bit have become essential. As part of its overall strategy to provide the recording industry with an enhanced, but affordable, production platform, Sony has developed a full range of products for recording, producing and mastering at 24 bits. Along with the OXF-R3 Digital Audio Mixing Console and PCM-9000 Master Disc Recorder, Sony takes pride in introducing the PCM-3348HR 48-track DASH PLUS 24-bit recorder.

Developed based on the experience and know-how attained through the success of the PCM-3348, the PCM-3348HR uses the basic framework of its predecessor, maintaining its system configuration, tape transport and operational style, while implementing innovative functions such as a vocal selector function, an enhanced sound memory function and Sony 9-pin serial remote interface capability.

The PCM-3348HR, a product of the latest innovative Sony technology, is set to create a new standard for the next generation of high-quality digital audio multichannel recorders and is proof of the continuing Sony commitment to maintaining outstanding excellence in sound quality.



# MAIN FEATURES

## Ultimate Sound Quality

### 24-bit 48-channel Capability

Supported by its highly reliable tape transport and refined servo control system, the PCM-3348HR provides 24-bit 48-channel recording/playback by increasing the tape speed to 1.5 times that of current 16-bit DASH machines. By employing this technique, it can perform both 16-bit (at 30ips and 48kHz) and 24-bit (at 45ips and 48kHz) recording/playback without changing the type of tape used.

A maximum of 44 minutes of 24-bit 48-channel recording can be achieved on a standard 14-inch reel of 1/2-inch tape at 44.1kHz.

### Master Clock System

Three types of oscillator are available in the Master Clock System of the PCM-3348HR; a crystal oscillator, a Voltage Controlled Crystal Oscillator (VCXO) and a Voltage Controlled Oscillator (VCO). The type of oscillator is selected according to the operational mode of the machine so that clock jitter is kept as low as possible, and sound quality maximized.

### Dither Circuit

With dither circuits incorporated in the A/D conversion circuitry, superb sound quality is assured even when recording the output of the internal high-quality 20-bit converters in 16-bit mode.

## User-Friendly Operation & Configuration

### Compatibility with DASH Recorders: DASH PLUS Format

The PCM-3348HR employs the DASH PLUS format. This is an extension of the DASH format that allows recording and playback of 24-bit signals exclusively but also retains compatibility with the 16-bit DASH format. The PCM-3348HR can therefore both record in 16-bit and playback tapes recorded by current 16-bit DASH recorders by using its 16-bit mode.

### Same Operational Style as the PCM-3348

The operational style of the PCM-3348 is preserved for the PCM-3348HR, allowing users of the PCM-3348 to operate the PCM-3348HR without any special training or preparation in advance.

### DASH Synchronization

Sample-accurate synchronization between 16-bit and 24-bit modes on two machines is made possible by the same recording sector address frequency being applied for CTL recording. This enables

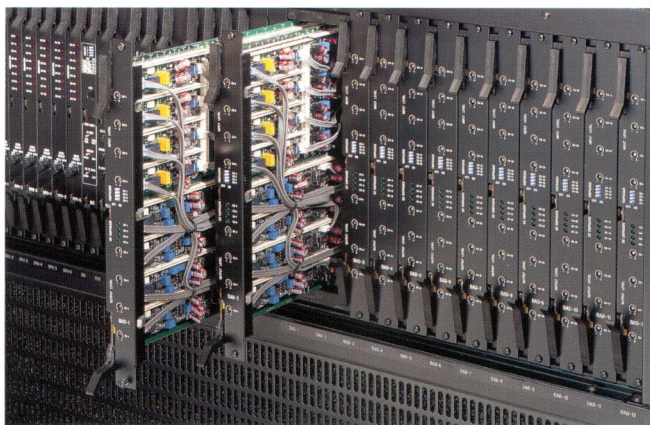
DASH synchronization between a PCM-3348HR and other Sony 16-bit DASH recorders even if the PCM-3348HR operates in 24-bit mode.

Under control of the supplied RM-3348HR Remote Control Unit, a PCM-3348HR can be operated in perfect DASH synchronization with up to two other PCM-3348HRs or Sony 16-bit DASH recorders.

### DABK-3343HR: 20-bit A/D D/A Converter Board Pack

The PCM-3348HR will frequently be used in conjunction with mixing consoles, such as the Sony OXF-R3, which already incorporate high resolution A/D and D/A conversion. For this reason, converter boards for the PCM-3348HR are provided separately as the optional DABK-3343HR A/D D/A Converter Board Pack. The DABK-3343HR consists of twelve A/D D/A converter boards, each board having a four channel capability, and the complete set of boards can be installed into the slots provided inside the front doors of the main unit.

To provide ultimate sound quality for analog input signals, 1-bit 64 times oversampling  $\Delta\Sigma$  type A/D converters and 20-bit decimation filters are used for A/D conversion. For D/A conversion, 24-bit eight times oversampling interpolation filters and 20-bit multibit type D/A converters are employed.

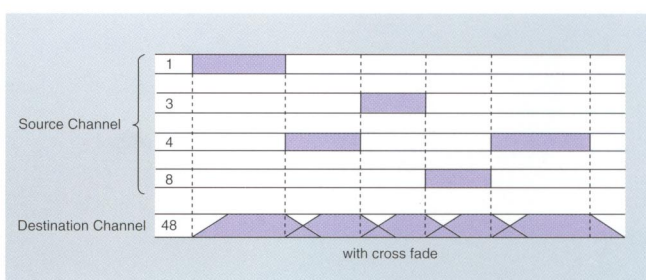


DABK-3343HR

## Enhanced Performance

### Vocal Selector Function

In addition to the realtime digital copy function which is available in two modes (2-channel and multichannel modes), a vocal selector mode is included to enable compilation of separate vocal tracks.



Vocal Selector Function



System Control Block

By selecting this mode, any part of different source channels can be selected into one destination channel, with variable cross fade time, by simple key strokes.

Cross fade time is selectable in 16 steps by the X'FADE TIME knob on the supplied RM-3348HR Remote Control Unit.

### Sound Memory Function

The sound memory function is enhanced both in quality and recording time.

At 48kHz, a maximum of approximately 80 seconds of 24-bit stereo sound memory data can be stored in the sound memory. This sampling time can be extended to around 160 seconds in mono mode.

The sound memory function is available in three modes; manual, auto start and external trigger modes. In auto start mode, the digital audio data of a source channel can be recorded automatically in the sound memory and also played back from the sound memory at a designated CTL address. In external trigger mode, at the input of an external analog signal, the digital audio data of a source channel can be recorded automatically in the sound memory and played back from the sound memory.

Reverse playback of the digital audio data stored in the sound memory is also available and it can be used for creating sound effects.

Accurate trimming of the start and/or end points of the stored data in the sound memory to be copied to a destination channel can be done by the TRIM +/- buttons whatever display resolution is selected in time code frames.

### Continuous Auto Punch IN/OUT

Unlike the PCM-3348, which is capable of storing only one set of auto punch in/out points, a continuous auto punch in/out mode is added enabling up to nine sets of auto punch in/out points to be registered. Sequential execution of the nine sections by using this mode is supported.

In this mode, the tape is played back from the start of the pre-roll point set before the first section of auto punch in/out points and stopped at the end of the post-roll point set after the last section of auto punch in/out points.

### X'FADE OUTPUT Button

A X'FADE OUTPUT button is now provided on the RM-3348HR Remote Control Unit to monitor the sound recorded on the tape allowing cross fade effects to be checked.

## System Expandability

### 9-Pin Serial I/F Control

With a Sony 9-pin RS-422A serial remote interface connector now provided as the REMOTE-2 port at the rear panel, the PCM-3348HR can be conveniently controlled from an external machine, facilitating systematization with audio and video equipment.

### Versatile Digital Audio I/F

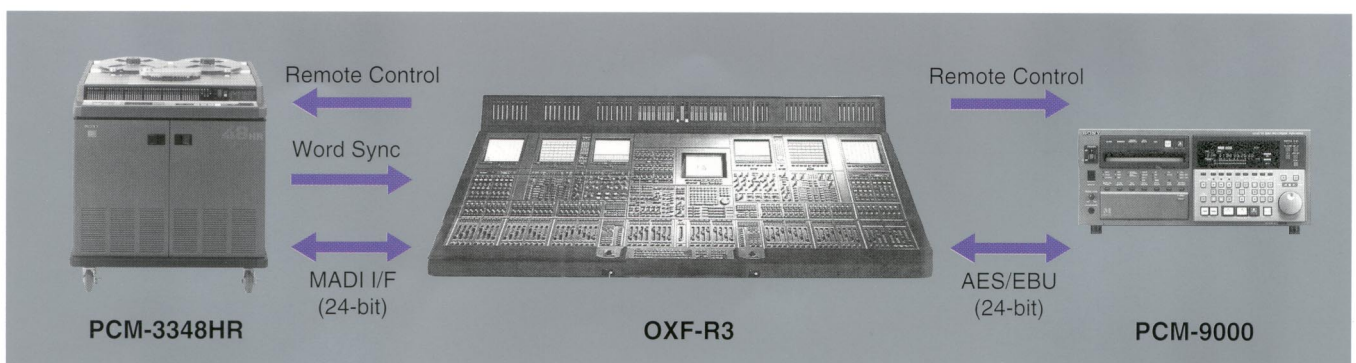
The PCM-3348HR is equipped with four types of digital audio interface all with 24-bit resolution:

- 48-channel MADI I/O
- 48-channel balanced SDIF-2 D I/O
- 8-channel AES/EBU D I/O
- 2-channel unbalanced SDIF-2 D I/O



Rear Panel

For multichannel digital I/O, MADI I/O connectors are provided in addition to the 48-channel balanced SDIF-2 digital I/O connectors. This allows interfacing with an even wider range of digital audio equipment such as MADI interfacing to an OXF-R3 Digital Audio Mixing Console. This further supports the concept of a complete 24-bit recording system using the Sony PCM-9000 Digital Audio Master Disc Recorder for the highest quality audio production. For 2-channel digital I/O, four 2-channel AES/EBU digital I/O boards and one 2-channel unbalanced SDIF-2 board are provided as standard. Any combination of four of these five boards can be installed into the four slots reserved in the rear panel.



24-bit Recording System

## System Application Benefits

### External Synchronization

Accepting a word sync, AES/EBU digital I/O sync or reference video (composite video, composite sync and black burst) signal as an external reference signal, the PCM-3348HR can be synchronized with a variety of audio and video equipment, making it suitable for enhanced audio editing and sound-to-picture applications.

The clock signal generated by the PCM-3348HR's internal master clock (X'tal/VCO/VCXO precision) can also be used as a reference signal to synchronize external digital audio equipment.

### Supplied Remote Control Unit

All the functions of the PCM-3348HR can be remotely controlled from the supplied RM-3348HR Remote Control Unit. Convenient functions, such as the digital copy, sound memory and vocal selector functions, as well as channel setup can be conveniently controlled and set via the RM-3348HR by simple key strokes.

### Flexible Remote Control Capability

As well as remote control from the supplied RM-3348HR Remote Control Unit, the PCM-3348HR can also be remotely controlled by other equipment, such as a synchronizer or a digital mixing console. A synchronizer can be connected via the parallel or serial I/F connector. An audio mixer supporting the Channel Rec Ready function can be connected via the SRIF-4 port, allowing the mixer to control the switchover of the Rec Ready/Safe status of the analog, time code and digital audio channels of the PCM-3348HR.



RM-3348HR

### Built-In Time Code Generator/Reader

The PCM-3348HR is equipped with a built-in time code generator/reader which can handle all time code formats, including SMPTE (drop-frame and non-drop frame), EBU and FILM. It can also regenerate and record time code locked to an incoming external time code read by the built-in time code generator/reader, or regenerate and reproduce time code recorded on the time code track.

Time code sync playback is possible when the PCM-3348HR is synchronized to an external composite video signal. This enables the deck to playback tape with the phase of its time code synchronized to the sync phase of an external reference video signal, ideal in an audio-for-video editing environment.

## Reliable Mechanism

### Stable, High Speed Tape Transport

The mechanical clutch provided between the capstan and the capstan motor, the integrated microprocessor controlled servo system, and the rigid diecast chassis on which the tape transport is placed, give stable and high speed tape movement and fully support the higher tape speed of 1.5 times that required for 16-bit DASH recorders, thereby enabling 24-bit recording/playback.



Head Block Section

### Tape Tail End Slow

To avoid physical damage to the tape, it is automatically slowed down and stopped before the end of the reel in FF or REW mode. A further push on the FF or REW key, and the tape will be wound off completely.

## Flexible Digital Performance

### Selectable Sampling Frequency

The sampling frequency is selectable between 44.056kHz, 44.1kHz or 48kHz, making the PCM-3348HR suitable for use in a wide range of applications from CD mastering to digital video post production. By using an Fs shift mode, sampling frequencies of 1000/1001 times 48kHz and 44.1kHz can also be supported in playback or record.

## Operational Advantages

### Time Code Chase Synchronization

Time code chase synchronization is available with subframe accurate offset in two modes when under control of the supplied RM-3348HR Remote Control Unit.

#### ■ Address Mode

After locking to an incoming time code, the PCM-3348HR will continuously monitor and chase the time code, maintaining complete synchronization with the master time code. The tape can be monitored as its speed varies.

#### ■ Free Mode

After locking to an incoming time code, the PCM-3348HR returns to its normal playback mode and it will not be affected by any changes in the external time code.



RM-3348HR

### Noiseless Punch IN/OUT with Cross Fade

A convenient punch in and out with cross fade operation becomes available when under RM-3348HR remote control, providing a smooth and noiseless transition at each punch in/out point. Cross fade time is adjustable in 16 steps over the range of from approximately 1 to 370 milliseconds and can be selected by turning the XFADE TIME knob on the RM-3348HR.

### Accurate Auto Location

Precise and instant auto location to a designated point is provided. A maximum of 100 points on the tape can be stored as cue points and trimmed as necessary. Both a locate function, which simply rewinds or fast forwards the tape to a designated locate point, and a zero locate function which enables the tape to be located to a point set as "00H00M00S" are provided. In addition, a roll back function is available. This

function rewinds or fast forwards the tape to a point which is a designated locate point minus the pre-roll time.

### PWM Recording

Thanks to the use of PWM (Pulse Width Modulation) for recording and playback of cue tracks, a dynamic range of over 60dB is maintained for cue signals.

### Variable Speed Playback $\pm 12.5\%$

Tape can be played back over a variable range of  $\pm 12.5\%$  normal tape speed. It is also possible to indicate tape speed in semitones over the range from -2.31 to +2.04 on the RM-3348HR Remote Control Unit.

## System Features

### RM-3348HR: Supplied Remote Control Unit

All the functions of the PCM-3348HR can be controlled from the RM-3348HR.

- DASH synchronization
- Digital copy function
- Vocal selector function
- Sound memory function
- Cross fade time set up
- Time code chase
- Time code sync playback
- Auto punch IN/OUT
- Channel monitor setting memory
- Analog in-line monitoring
- Variable speed control
- Cue point store: max. 100 cue points
- Locate and rollback operation
- Pre/post-roll time setting
- Return/repeat playback
- Spot erase function
- Individual channel control
- Rec mute
- Rehearsal/Rec Disable
- 2CH D I/O setup
- Monitor mode control

### DABK-3343HR: Optional Converter Board Pack

Consisting of twelve DAD boards with each board having a four-channel processing capability, the DABK-3343HR performs 20-bit A/D D/A conversion ensuring high sound quality of analog input and output signals.

Dimensions: 340(W) x 31(H) x 272(D) mm each  
(13 1/2 x 1 1/4 x 10 3/4 inches)

Mass: 830g (1 lb 13 oz) each

Supplied accessory: installation guide

### DMU-3048: Optional Digital Meter Unit

By connecting the DMU-3048 to the PCM-3348HR with a supplied meter cable and a remote cable, remote monitoring of channel status of all 48 channels of the PCM-3348HR is provided. Digital audio signal level, over level, tape condition (CRC error, interpolation, hold and mute) and recorder status (Rec and Rec Ready) can be indicated. And peak HOLD/2 seconds HOLD functions and a calibration adjustment are also available.

Dimensions: 700(W) x 152(H) x 200(D) mm  
(27 3/4 x 6 x 7 3/8 inches)

Mass: 10kg (22 lb 1 oz)

Power requirements: AC 100V to 240V, 50/60Hz

Current consumption: 1.2A

# SPECIFICATIONS

## PCM-3348HR

### Format/Performance

Recording format	DASH PLUS/DASH-F Double Density
Digital audio channel	48 channels
Quantization	24-bit/16-bit linear switchable
Error correction	Cross Interleave
Recording time	24 bit: 40 minutes, 16 bit: 60 minutes (Fs=48kHz, with 14-inch reel) 24 bit: 44 minutes, 16 bit: 65 minutes (Fs=44.1 or 44.056kHz, with 14-inch reel)
Tape speed	24 bit: 114.30cm/s, 16 bit: 76.2cm/s (Fs=48kHz) 24 bit: 105.01cm/s, 16 bit: 70.01cm/s (Fs=44.1kHz) 24 bit: 104.91cm/s, 16 bit: 69.94cm/s (Fs=44.056kHz)
Variable tape speed	+12.5%
Fast forward time	4min 20s (with 14-inch reel) 2min 25s (with 10.5-inch reel)
Recommended tape	1/2-inch width, Sony D-1/2-2920 (14-inch reel), D-1/2-1460 (10-inch reel)
Reel size	14/12.5/10 inches
Recording tracks	Digital tracks 1 to 48, analog tracks A1 and A2, time code and CTL
FWD rise time	Less than 0.50s
FF / REW maximum speed	16.0m/s
Slow wind speed	1.52m/s
Shuttle speed	+7.6cm/s to 3.8m/s
Input sensitivity of external speed control	160cm/s/V
Input sensitivity of external phase control	+5%/V of playback speed
Locate accuracy	+3.6s, with timer roller (14-inch reel) 0 to 64ms, with CTL address (14-inch reel) (used when the CTL address on the tape can be read)

### Editing Accuracy

Cross fade time	Fs (kHz)	48,	44.1,	44.056
	Electronic editing (min.)	1.4ms,	1.5ms,	1.5ms
	(max.)	341.3ms,	371.5ms,	371.9ms
Splice editing		5.2ms,	5.6ms,	5.7ms
		(Note: 16 step adjustment between min. and max.)		
Editing accuracy	1 sector (1.00ms at Fs=48kHz, 1.088ms at Fs=44.1kHz, 1.09ms at Fs=44.056kHz)			

### Digital Audio Signal Characteristics

Frequency response	20Hz to 21.7kHz within +0.5/-1dB (Fs=48kHz)
Total harmonic distortion	0.009% TYP (20Hz to 20kHz, at reference level)
Dynamic range	105dB TYP (at 1 kHz, Emphasis OFF, BW 30kHz)
Crosstalk between channel	105dB TYP (20Hz to 20kHz, at reference level)
Emphasis	50µs/15µs, ON/OFF selectable for each channel
Sampling frequency	48, 44.1 or 44.056kHz ±50ppm Fs shift (1000/1001 x 44.1kHz or 48kHz)
Delay time of signal processing	Average delay time in playback: 264 blocks Average delay time in recording: 240 blocks Advance out: 256 words variable in 1 sample steps

### Digital Inputs / Outputs

SDIF-2 balanced IN (48 ch)	RS-422A, D-sub 50P (x2)
SDIF-2 balanced OUT (48 ch)	RS-422A, D-sub 50S (x2)
SDIF-2 unbalanced IN (2 ch)	TTL compatible, 75Ω, BNC (x2)
SDIF-2 unbalanced OUT (2 ch)	TTL compatible, 75Ω, BNC (x2)
AES/EBU IN (8 ch)	XLR-3-31 type (x4)
AES/EBU OUT (8 ch)	XLR-3-32 type (x4)
MADI IN	MADI unbalanced, ECL, 75Ω, BNC (x1)
MADI OUT	MADI unbalanced, ECL, 75Ω, BNC (x1)

### Analog Audio Signal Characteristics

Frequency response	50Hz to 10kHz +2dB/-6dB
Signal to noise ratio	More than 60dB (at 1kHz, +19dBu)
Total harmonic distortion	Less than 3% (at 1kHz, reference input level)
Wow and flutter	Less than 0.1% RMS WTD (LPF 200Hz)

### Analog Inputs / Outputs

Digital audio IN (48 ch)	+4dBu (+24dBu max.), more than 10kΩ, balanced, NK-27-31SL (x6)
Digital audio OUT (48 ch)	+4dBu (+24dBu max.), less than 100Ω, balanced, NK-27-32S (x6)
Analog audio IN (2 ch)	+4dBu (+19dBu max.), more than 10kΩ, balanced, XLR-3-31 type (x2)
Analog audio OUT (2 ch)	+4dBu (+19dBu max.), less than 100Ω, balanced, XLR-3-32 type (x2)

### Other Inputs / Outputs

Time code IN	0.5 to 10Vp-p, more than 10kΩ, balanced, XLR-3-31 type (x1)
Time code OUT	2.4Vp-p ±0.1V, variable within 1.8V to 3.4V, less than 100Ω, balanced, XLR-3-32 type (x1)
Word sync IN / OUT	TTL compatible, 75Ω, unbalanced, with loop-through, BNC (x2, each)
Sector sync IN / OUT	TTL compatible, 75Ω, unbalanced, with loop-through, BNC (x2, each)
Sector address IN / OUT	TTL level, 75Ω, unbalanced, with loop-through, BNC (x1, each)
Reference video	75Ω, unbalanced, with loop-through, BNC (x2, each) Black burst: 0.3Vp-p, Composite sync: 4Vp-p, Square wave: 0.3Vp-p to 5Vp-p
REMOTE-1 IN	SRIF-1 format, D-sub 37-pin (female x1)
External speed control IN	±10V, balanced, XLR-3-31 type (x1)
External phase control IN	±10V, balanced, XLR-3-31 type (x1)
REMOTE-2 IN	RS-422A, D-sub 9-pin (female x1)
REMOTE-3 IN	SRIF-3 format, RS-422A, D-sub 50-pin (female x1)
EXT. TRIGGER IN	Sound memory control, XLR-3-31 type (x1)
REMOTE-4 IN	SRIF-4 format, AUX: D-sub 25-pin (male x1), REC RDY CONTROL: D-sub 50-pin (male x4)

### Cable Length

Digital I/O	SDIF-2 balanced: less than 75m SDIF-2 unbalanced: less than 30m AES/EBU: less than 100m MADI: less than 50m Sync: less than 75m
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Remote meter	Less than 100m
Remotes	Remote-1: less than 20m Remote-2: less than 75m Remote-3: less than 120m Remote-4: less than 20m, AUX, REC RDY CONTROL

### General

Dimensions	916(W) x 997(H) x 740(D) mm (36 1/8 x 39 3/8 x 29 1/4 inches)
Mass	Approx. 220kg (485 lb)
Power requirements	AC 120V, 60Hz (USA and Canada) AC 100V, 50/60Hz (Japan) AC 220V to 240V, 50/60Hz (Europe)
Power/current consumption	1.2 kW (USA, Canada and Japan) 7A (Europe)
Supplied accessories	RM-3348HR with stand (x1) 2-ch unbalanced SDIF-2 board (x1) 2-ch AES/EBU board (x4) RH-10DA 10-inch empty reel (x1) AC power cord for PCM-3348HR (x1) AC power cord for RM-3348HR (x1) Remote cable (10m, x1) Extension board (x1) Operation manual (x1) Installation manual (x1) Quick reference (x1) Analog I/O 27-pin multichannel connector plug (NK-27-32SL type x6, NK-27-31SL type x6) Remote interface connector (x8) CL-1/2-12 Tape Cleaner (x1 box)
Optional accessories	DABK-3343HR Converter Board Pack DMU-3048 Digital Meter Unit D-1/2-1460 Digital Audio Tape (10-inch) D-1/2-2920 Digital Audio Tape (14-inch) RH-14DA Empty Reel (14-inch) CL-1/2-12 Tape Cleaner

## RM-3348HR

Cue memory	Max. 100 points
Setup memory	4 memory locations x 48 channels
Auto punch I/O point memory	9 I/O points
Pre-roll time	Duration: 0 to 1 hour (1ms steps) Default: 8s (Fs=48kHz), 8.707s (Fs=44.1kHz), 8.716s (Fs=44.056kHz)
Post-roll time	Duration: 0 to 1 hour (1ms steps) Default: 3s (Fs=48kHz), 3.265s (Fs=44.1kHz), 3.269s (Fs=44.056kHz)
Repeat operation	Between any 2 cue points
Synchronized operation	Max. 3 DASH PLUS or DASH recorders
Synchronized resolution	1 sector, 1ms (Fs=48kHz)/1.088ms (Fs=44.1kHz)/1.090ms (Fs=44.056kHz)
Editing resolution	+1/-0 sector
TAPE TIMER display	CTL ABSOLUTE 0 to 74h 33min 55s (Fs=48kHz) 0 to 81h 09min 34s (Fs=44.1kHz) 0 to 81h 14min 26s (Fs=44.056kHz) CTL RELATIVE ±9h 59min 59s TC ABSOLUTE 0 to 23h 59min 59s TIMER MODE ±9h 59min 59s
Sound memory	Stereo: 87.3s (Fs=48kHz), 95.1s (Fs=44.1kHz), 95.2s (Fs=44.056kHz) Mono: 174.6s (Fs=48kHz), 190.2s (Fs=44.1kHz), 190.4s (Fs=44.056kHz), +1/-0 sector accuracy
Digital copy	2-channel mode: max. 2 channels simultaneously Multichannel mode: max 48 channels simultaneously
Time code chase	Chase mode: Address mode and Free mode Accuracy: ±1/100 frame Variable offset range: ±23h 59min 59s Offset error detection: 1/100 frame Sync offset time correction: 1/100 frame
I/O connectors	SECTOR ADDRESS, WORD SYNC, SECTOR SYNC: TTL level, 75Ω, BNC (x1, each) TAPE RECORDER: SRIF-3, RS-422A, D-sub 50-pin male (x1) IEEE Std 488: IEEE-488-1978 SOUND MEMORY EXT TRIGGER IN: Phone jack (x1)
Dimensions	Main unit: 490(W) x 220(H) x 472(D) mm (19 3/8 x 8 3/4 x 18 5/8 inches) Stand: 526(W) x 600 to 750(H) x 536(D) mm (20 3/4 x 23 5/8 to 29 5/8 x 21 1/8 inches)
Mass	Main unit: 13.5kg (29 lb 12 oz) Stand: 14.5kg (31 lb 15 oz)
Power requirements	AC 100V to 240V, 50/60Hz
Current consumption	0.7A
	* 0dBu = 0.775V.r.m.s

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