SONIFEX

Reference Monitors
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SONIFEX

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Reference Monitors

Reference Monitor Range of Rack-Mount Audio Monitors

The Reference Monitor Range is a new series of rack-mount audio monitors, combining the latest DSP technology with outstanding audio enclosure design to produce monitors of the highest standards with exceptional sound quality, a comprehensive feature set and good looks in the rack.

Uniquely an embedded 5 band parametric EQ allows you to configure the monitor for your environment or to suit your listening tastes.

The three monitors in the range are:

RM-2S4 Reference Monitor, 2 LED meters, 4 stereo channel audio inputs.

RM-2S10 Reference Monitor, 2 LED meters, 10 stereo channel audio inputs.

RM-4C8 Reference Monitor, 4 LED meters, 8 channel inputs, dual selectors.

Detail In The Design
In the design of the product, every care has been taken to ensure the best and most accurate reproduction of the audio sources.

In a 1U rack, the propogation of high power sound waves in such a small enclosure could have a tendency to produce rattles or move components, but the Reference Monitors have been designed to ensure that their audio performance is not compromised.

Anti-Vibration
A welded and sealed stainless-steel case with milled aluminium fascia provides exceptional rigidity and has been used to ensure that there are no extraneous metallic rattles. The lid is sealed with extensive thin foam cut-outs to provide damping to the lid and multi-point screw fixings are used to ensure lid rigidity.

The XLR and USB port connectors on the rear panel are sealed with foam, and silicon sealant is used on components which could move, or vibrate, under high SPL conditions.

Accurate Sound System
The speaker system comprises a three-way arrangement with two mid/high frequency speakers providing excellent stereo imaging and a separately driven, forward facing, dual magnet, mono bass driver.

Custom-moulded, profiled, HF enclosures are used to minimise standing waves and eliminate response peaks, and acoustic damping in the HF enclosures is used to reduce colouration, effectively creating a separate, sealed, infinite-baffle enclosure for each driver.

❚❚ The Reference Monitors are a breakthrough in design - if you want to find out what the deal is, just listen to them, you'll notice how good they are. ❚❚

Reference Monitors

Each of the drivers is magnetically shielded so that the monitors are perfectly safe to use near CRTs and TFT displays and each speaker uses a separate, highly efficient class-D switching amplifier.

Even cable lengths to and from the speaker enclosures have been kept short to reduce any potential microphonic induction.

DSP Based Design

The use of a modern electronic architecture allows a much better audio performance to be realised. The DSP-based, 3rd-order active crossover provides perfect separation between mid-range and bass sounds.

Reference Monitor Block Diagram

A DSP-based electronic equalisation is used to flatten the frequency response and also enables the 5 band parametric EQ. Additionally, the fast-attack DSP loudspeaker limiter protects the drivers from overload damage.

Audio Modifiers

Six illuminated soft-touch pushbuttons allow front panel muting and dimming of the loudspeakers, stereo-to-mono conversion, phase inversion and Middle+Side encoding/decoding with all front panel settings stored in non-volatile memory which is recalled at power-up. A universal power supply ensures global voltage operation without adjustment.
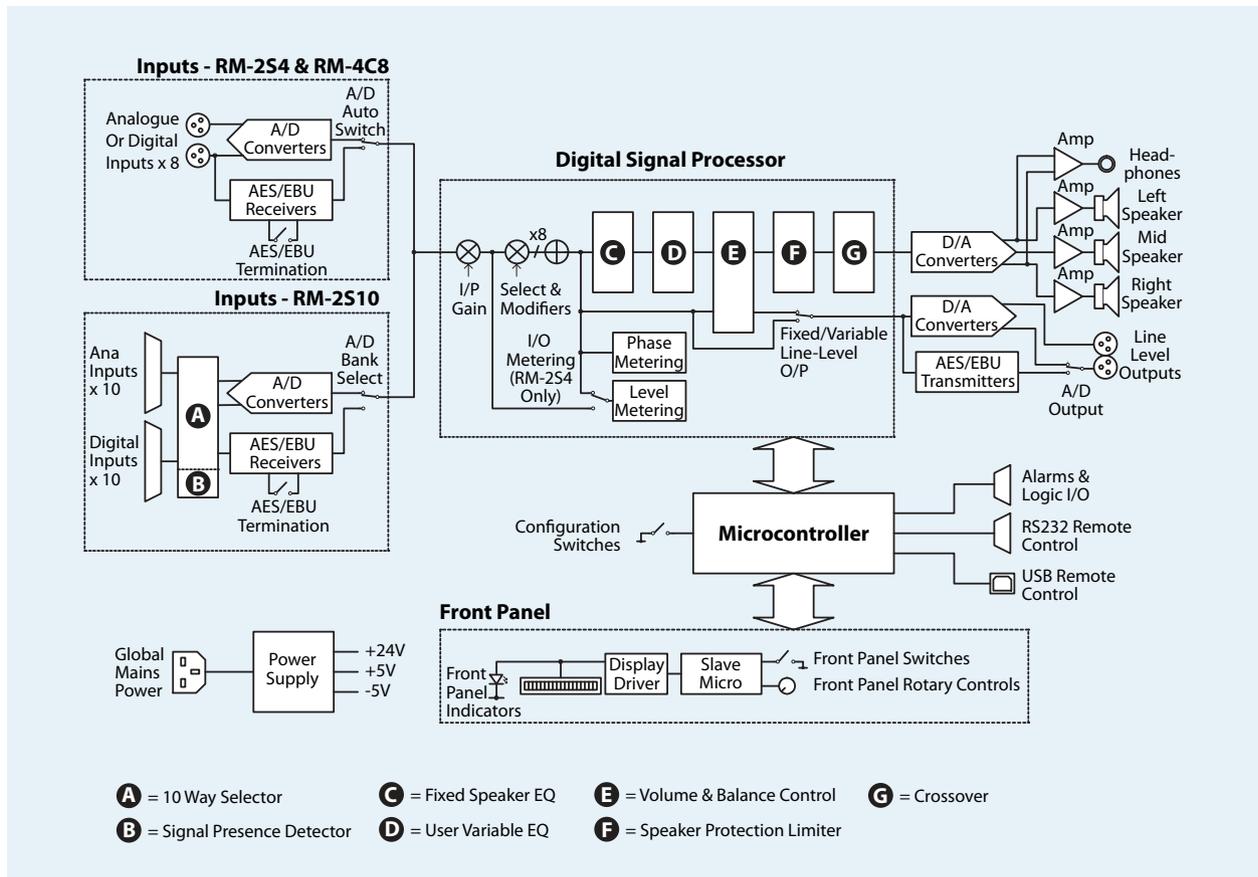
Optional HD Expansion Cards
RM-HD1 HD-SDI expansion card &
RM-HDE1 HD-SDI & Dolby® E expansion card

The HD-SDI video input expansion cards allow multiple AES groups embedded within an HD-SDI or SD-SDI signal to be de-embedded and monitored, either as linear PCM with Dolby® E or Dolby® Digital encoding (RM-HDE1), or as non-encoded linear PCM (RM-HD1).

The HD-SDI input is equalised, internally reclocked and re-transmitted to provide a reclocked output to pass to external equipment via an output BNC connector, allowing the reference monitor to be inserted into an HD-SDI chain.

Reference Monitors

RM-2S4   Reference Monitor, 2 LED Meters & 4 Stereo Channel Inputs
RM-2S10   Reference Monitor, 2 LED Meters & 10 Stereo Channel Inputs

RM-2S4 Front & Rear Views

5 Band Parametric Equalisation

Each product in the Reference Monitor range contains an embedded 5 band parametric equaliser.

On testing the units, they are set up to give a flat response across the quoted frequency range, but the parametric EQ allows you to alter the response either to account for poor acoustics in the room that the monitor is mounted in, or to suit your particular listening tastes.

Using the free of charge SCi remote control software, preset EQ settings can be selected, or different EQ settings can be created and stored.

Two separate audio monitors for monitoring stereo channels:

- RM-2S4 with 4 analogue or digital stereo channels
- RM-2S10 with 10 analogue and 10 digital stereo channels

The RM-2S4 and RM-2S10 are 1U rack-mount units offering quality loudspeaker monitoring and accurate, high-resolution metering of up to four (RM-2S4) or twenty (RM-2S10 both analogue and digital) stereo audio sources and more with the addition of optional expansion cards. Sources may be in any mixture of analogue and AES/EBU digital formats, with sample rates up to 192kHz accepted.

Audio inputs on the RM-2S4 can be analogue or digital because they are autoswitching using the left Neutrik™ XLR for AES/EBU, or both Neutrik™ XLRs for analogue inputs and they can be used in any combination. The RM-2S10 has 10 separate analogue and digital inputs.

Analogue inputs can be balanced or unbalanced in any combination. The digital inputs have switchable AES/EBU termination for (close-range) bridging operation and there is extra global input gain available for both analogue and digital low-level sources.

Sources (and additional banks of sources, if fitted) are selected via a front panel ▶

RM-2S4 Front Panel

RM-2S4 Rear Panel

Reference Monitors

RM-2S10 Front & Rear Views

rotary encoder, with clear LED indication of the current selection. On the RM-2S10, the Source LEDs also act as signal present indicators. A pair of line-level audio outputs, configurable as analogue or AES/EBU digital, follow the selected source at either a fixed level or one mirroring the loudspeaker volume.

The level of the chosen source is displayed on a pair of bright, multicoloured 53-segment bargraph meters, with a choice of seven accurately modelled scales/responses to suit different applications and local preferences. Clear scale labels are provided for you to chose the scale displayed and the meter brightness can be adjusted from the front panel. A separate phase meter indicates channel correlation or phase error conditions. On the rear panel, open-collector alarm outputs provide hardware indication of sustained underlevel, overlevel, phase errors and digital source lock.

Six illuminated pushbuttons provide access to a range of audio 'modifiers' – instant dimming of the volume, individual muting of each audio channel, stereo-to-mono conversion, phase inversion and Middle+Side transcoding. On the rear panel, logic-level inputs allow direct remote access to the DIM and MUTE functions.

The three-way loudspeaker system is fed via a DSP-based active crossover and a trio of highly efficient Class-D amplifiers. Careful attention to driver selection, materials and case design, plus active DSP equalisation, has ensured a flat response and outstanding reproduction from such a shallow unit. A protective limiter prevents damage to the loudspeakers under overload conditions and the front-panel headphone socket automatically mutes the internal loudspeakers when a plug is inserted.

A Balance control allows you to alter the stereo imaging of the left and right channels.

A further five-band parametric equaliser can be accessed for room-equalisation purposes via Sonifex SCi Windows-based remote control software. Source selection, status monitoring and unit ID functions, plus firmware updates to add extra functionality, are all accessible remotely via both USB and RS232 connections in conjunction with Sonifex SCi software. The open control protocol also allows operation with terminal programs or customised applications.

Optional additions to the RM-2S4 and RM-2S10 include HD video input expansion cards, allowing multiple AES groups embedded within an HD-SDI or SD-SDI signal to be de-embedded and monitored.

Both RM-2S4 and RM-2S10 units operate from global mains voltages (85-264V AC, 47-63Hz) without adjustment.

RM-2S10 Front Panel

RM-2S10 Rear Panel

Reference Monitors

The 5 band parametric EQ allows you to alter the monitor's response to suit the room it's in, or to suit your particular taste in listening.

Technical Specification For RM-2S4 & RM-2S10

Inputs

Audio Inputs (RM-2S4):	4 x stereo analogue or AES/EBU digital (autoselecting)
Audio Inputs (RM-2S10):	10 x stereo analogue, plus 10 x stereo AES/EBU digital
Max level (0dB input gain):	+18dBu (analogue)/0dBFS (digital)
CMRR:	>60dB typical
Input Impedance:	20kohms (analogue) 110 ohms (digital with termination switchable)
AES/EBU Sample Rate:	32 to 192kHz, converted internally to 48kHz
Input Gain:	0, +6, +12 or +18dB digital gain (switchable)
Selection:	Front panel rotary control with indicator LEDs

Line Level Outputs

Audio Outputs:	1 x stereo analogue or AES/EBU digital (switchable)
Gain re Selected Input:	Unity or variable, following volume control (switchable)
Maximum Output Level:	+18dBu (analogue)/0dBFS (digital)
Output Impedance:	<50 ohms (analogue)/110 ohms (digital)
AES/EBU Sample Rate:	48kHz
Distortion:	<0.02% (1kHz, +8dBu output)
Noise:	-84dB RMS, unity gain ref +8dBu output
Frequency Response:	20Hz-20kHz +0/-0.5dB
Crosstalk 1kHz input: 10kHz input:	Analogue I/O, ref 0dBu <-90dB <-85dB

Audio Modifiers

Modifier Selection:	Illuminated front panel pushbuttons
DIM:	Reduces speaker audio level by 10dB
CUT L & CUT R:	Mutes left/right speaker audio
MONO:	Combines left and right audio inputs
PHASE INVERT:	Inverts phase of right audio input
M+S:	Converts stereo input to Middle (sum) and Side (difference) signals

User-Variable Equalisation

Type:	Parametric
Bands:	Five
Centre Frequency:	200Hz to 18kHz
Bandwidth:	0.25 to 2 octaves
Boost/Cut:	±12dB
Programming:	Via USB/serial control port

Amplifier/Loudspeakers

Configuration:	Three-way with stereo mid/high-frequency drivers & mono low-frequency driver
Power Output:	2 x 5W (HF) + 20W (LF) with protective limiter
Crossover:	500Hz (3rd order Butterworth)
Distortion (HF Outputs):	< 0.05% (1kHz, 3W output)
Distortion (LF Output):	< 0.05% (100Hz, 6W output)
Noise:	More than 80dB below full output
Volume:	Mute to full volume via front panel rotary control
Balance Trim:	±6dB via front panel rotary control.
Peak Acoustic Level:	102dB SPL @ 2ft

Level Metering

Number:	2 x 53-segment tri-colour LED bargraphs
Characteristics:	Selectable by switch from: 1. Dual BBC PPM + standard VU 2. BBC PPM 3. EBU PPM 4. Nordic PPM 5. AES/EBU digital PPM 6. DIN PPM 7. Standard VU 8. Extended VU
Ballistics:	According to selected characteristic
Line-Up Level:	According to selected characteristic

Phase Metering

Type:	5-segment, indication at 0, 45, 90, 135 and 180 degrees

Remote Control

USB:	Slave device, 19200 baud
Serial:	RS232, 19200 baud, 3-wire connection
Alarm Outputs:	1. Audio underlevel/fail (latching) 2. Audio overlevel (latching) 3. Sustained phase error (latching) 4. AES/EBU input unlock (non-latching) Open-collector outputs rated at 30V, 50mA maximum Output low/conducting in normal condition (no alarm)
Control Inputs:	1. Mute audio 2. Dim audio 3. Alarm reset Pull-to-ground to activate inputs

Status Indicators

LIMIT:	Indicates loudspeaker protection limiter is active.
CLIP:	Indicates internal digital clipping due to overlevel.
LOCK:	Indicates lock achieved on selected digital input(s).
OPT:	For future use.

Connectors

Audio Inputs (RM-2S4):	8 x XLR 3-pin female (balanced, may be unbalanced)
Audio Inputs (RM-2S10):	3 x D-type 25-pin female (balanced, may be unbalanced)
Audio Outputs:	2 x XLR 3-pin male (balanced, may be unbalanced)
Headphones:	1/4" (6.35mm) A-gauge 3-pole stereo jack socket
USB:	Type B socket
Serial:	D-sub 9-pin female
Remote I/O:	D-sub 15-pin male
Mains Input:	Filtered 3-pin IEC male, continuously rated 85 - 264VAC, 47 - 63Hz, fused, 60W peak, 30W average
Fuse Rating:	Anti-surge fuse 2A 20 x 5mm

Equipment Type

RM-2S4:	Reference Monitor, 2 LED meters, 4 stereo channel inputs
RM-2S10:	Reference Monitor, 2 LED meters, 10 stereo channel inputs

Physical Specification

Dimensions (Raw):	48cm (W) x 30.5cm (D) x 4.4cm (H) (1U) 19" (W) x 12" (D) x 1.73" (H) (1U)
Dimensions (Boxed):	55cm (W) x 43cm (D) x18cm (H) 21.7" (W) x 16.9" (D) x 7.1" (H)
Weight:	Nett: 4.5kg Gross: 5.9kg Nett: 10lb Gross: 13lb

Options

RM-HD1:	HD-SDI expansion card
RM-HDE1:	HD-SDI & Dolby® E expansion card

REFERENCE MONITORS - RM-4C8

Reference Monitors

RM-4C8   Reference Monitor, 4 LED Meters, 8 Channel Inputs & Dual Source Selectors

RM-4C8 Front & Rear Views

With 4 x bright high-resolution 26 segment meter displays and separate left and right source selectors, the RM-4C8 is ideal for monitoring audio channels in an SDI group, or groups of de-embedded AES/EBU channels.

The RM-4C8 offers the same functionality as the RM-2S4 but with an additional source selector so that any of the 4 channels in the selected group, or bank, can be monitored independently on left and right speakers.

Also, 4 meters are provided so that every channel in the selected group, or bank, can be visually monitored and 4 expansion port groups of 4 channels are allowed, so that all audio channels in an HD-SDI signal can be monitored, using the optional RM-HD(E)1 cards.

The audio inputs on the RM-4C8 are auto-sensing, for digital AES/EBU using the left input XLR, or both XLRs for analogue inputs. The inputs can be used in any combination of analogue or digital.

With full remote control via GPI, RS232 or USB, a 5 band parametric equaliser, 6 front panel modifier buttons and the ability to take the optional HD-SDI expansion cards, the RM-4C8 is a flexible and versatile monitoring solution.

The same high level of care has been taken in the design of the RM-4C8 as in the RM-2S4 to ensure that it will be the best sounding 1U rack-mount audio monitor that you listen to.

RM-4C8 Front Panel

RM-4C8 Rear Panel

Reference Monitors

Technical Specification For RM-4C8

Inputs

Audio Inputs	8 analogue or AES/ EBU digital channels (autoselecting)
Max level (0dB input gain):	+18dBu (analogue)/0dBFS (digital)
CMRR:	>60dB typical
Input Impedance:	20kohms (analogue) 110 ohms (digital with termination switchable)
AES/EBU Sample Rate:	32 to 192kHz, converted internally to 48kHz
Input Gain:	0, +6, +12 or +18dB digital gain (switchable)
Selection:	2 x Front panel rotary control with indicator LEDs

Line Level Outputs

Audio Outputs:	1 x stereo analogue or AES/EBU digital (switchable)
Gain re Selected Input:	Unity or variable, following volume control (switchable)
Maximum Output Level:	+18dBu (analogue)/0dBFS (digital)
Output Impedance:	<50 ohms (analogue)/110 ohms (digital)
AES/EBU Sample Rate:	48kHz
Distortion:	<0.02% (1kHz, +8dBu output)
Noise:	-84dB RMS, unity gain ref +8dBu output
Frequency Response:	20Hz-20kHz +0/-0.5dB
Crosstalk 1kHz input: 10kHz input:	Analogue I/O, ref 0dBu <-90dB <-85dB

Audio Modifiers

Modifier Selection:	Illuminated front panel pushbuttons
DIM:	Reduces speaker audio level by 10dB
CUT L & CUT R:	Mutes left/right speaker audio
MONO:	Combines left and right audio inputs
PHASE INVERT:	Inverts phase of right audio input
M+S:	Converts stereo input to Middle (sum) and Side (difference) signals

User-Variable Equalisation

Type:	Parametric
Bands:	Five
Centre Frequency:	200Hz to 18kHz
Bandwidth:	0.25 to 2 octaves
Boost/Cut:	±12dB
Programming:	Via USB/serial control port

Amplifier/Loudspeakers

Configuration:	Three-way with stereo mid/ high-frequency drivers & mono low-frequency driver
Power Output:	2 x 5W (HF) + 20W (LF) with protective limiter
Crossover:	500Hz (3rd order Butterworth)
Distortion (HF Outputs):	< 0.05% (1kHz, 3W output)
Distortion (LF Output):	< 0.05% (100Hz, 6W output)
Noise:	More than 80dB below full output
Volume:	Mute to full volume via front panel rotary control
Balance Trim:	±6dB via front panel rotary control
Peak Acoustic Level:	102dB SPL @ 2ft

Level Metering

Number:	4 x 26-segment tri-colour LED bargraphs
Characteristics:	Selectable by switch from: 1. Dual BBC PPM + standard VU 2. BBC PPM 3. EBU PPM 4. Nordic PPM 5. AES/EBU digital PPM 6. DIN PPM 7. Standard VU 8. Extended VU
Ballistics:	According to selected characteristic
Line-Up Level:	According to selected characteristic

Phase Metering

Type:	5-segment, indication at 0, 45, 90, 135 and 180 degrees

Remote Control

USB:	Slave device, 19200 baud
Serial:	RS232, 19200 baud, 3-wire connection
Alarm Outputs:	1. Audio underlevel/fail (latching) 2. Audio overlevel (latching) 3. Sustained phase error (latching) 4. AES/EBU input unlock (non-latching) Open-collector outputs rated at 30V, 50mA maximum Output low/conducting in normal condition (no alarm)
Control Inputs:	1. Mute audio 2. Dim audio 3. Alarm reset Pull-to-ground to activate inputs

Status Indicators

LIMIT:	Indicates loudspeaker protection limiter is active.
CLIP:	Indicates internal digital clipping due to overlevel.
LOCK:	Indicates lock achieved on selected digital input(s).
OPT:	For future use.

Connectors

Audio Inputs:	8 x XLR 3-pin female (balanced, may be unbalanced)
Audio Outputs:	2 x XLR 3-pin male (balanced, may be unbalanced)
Headphones:	1/4" (6.35mm) A-gauge 3-pole stereo jack socket
USB:	Type B socket
Serial:	D-sub 9-pin female
Remote I/O:	D-sub 15-pin male
Mains Input:	Filtered 3-pin IEC male, continuously rated 85 - 264VAC, 47 - 63Hz, fused, 60W peak, 30W average
Fuse Rating:	Anti-surge fuse 2A 20 x 5mm

Equipment Type

RM-4C8:	Reference Monitor, 4 LED meters, 8 channel inputs & dual source selectors

Physical Specification

Dimensions (Raw):	48cm (W) x 30.5cm (D) x 4.4cm (H) (1U) 19" (W) x 12" (D) x 1.73" (H) (1U)
Dimensions (Boxed):	55cm (W) x 43cm (D) x18cm (H) 21.7" (W) x 16.9" (D) x 7.1" (H)
Weight:	Nett: 4.5kg Gross: 5.9kg Nett: 10lb Gross: 13lb

Options

|	
RM-HD1:	HD-SDI expansion card
RM-HDE1:	HD-SDI & Dolby® E expansion card

Reference Monitors

RM-HD1   Reference Monitor HD-SDI Expansion Card &
RM-HDE1   Reference Monitor HD-SDI & Dolby® E Expansion Card

These expansion boards allow the monitoring of embedded audio channels within an SD/HD-SDI video signal. The embedded audio can be either non-encoded linear PCM (RM-HD1), Dolby® E or Dolby® Digital (RM-HDE1) depending on which card is used.

The RM-HDE1 card is for use with the RM-4C8 whilst the RM-HD1 card can be used with the RM-2S4, RM-2S10 and RM-4C8.

The expansion board can extract two AES/EBU groups (4 stereo pairs) from the video signal and pass them to the main Reference Monitor unit for monitoring. The input is autosensing for either SD or HD input formats and the extraction of embedded audio complies with SMPTE-272 (SD) and SMPTE-299 (HD).

The SDI input is equalized, internally reclocked and re-transmitted to provide a reclocked output to pass to external equipment such as another reference monitor.
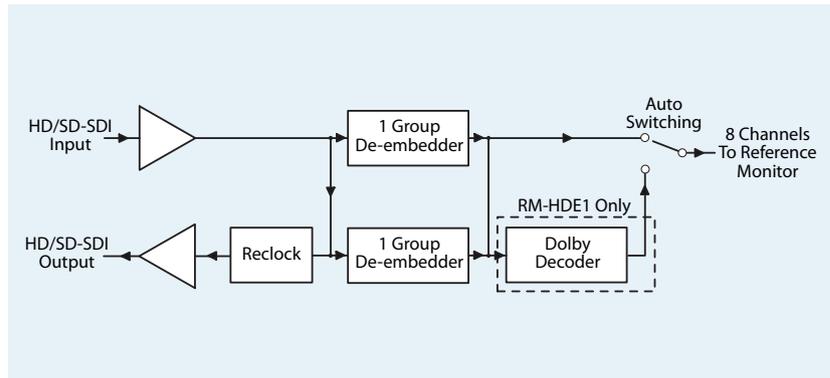
RM-HD(E)1 Block Diagram

	Reference Monitor		
	RM-2S4	**RM-2S10**	**RM-2C4**
Expansion Card			
RM-HD1	✓	✓	✓
RM-HDE1	✗	✗	✓

RM-HD1 Expansion Card

RM-HDE1 Expansion Card

Technical Specification RM-HD1 & RM-HDE1

SDI Input

SDI Video:	SMPTE 259M – SD @ 270 Mbps or SMPTE 292M – HD @ 1.5 Gbps
Input Impedance:	75Ω

SDI Output

SDI Video:	Reclocked input
Output Impedance:	75Ω
Output Level:	0.8 Vp-p
Return Loss:	> 15 dB (1.5 GHz)

Jitter:	< 0.2UI
Embedded Audio Standard:	SMPTE 272M or SMPTE 299M 24 bit 48 kHz synchronous/asynchronous*
	*Audio must be synchronous in SD. If asynchronous audio is presented in an HD input then only one group can be presented at any one time.

Connectors

HD-SDI Input:	1 x BNC 75Ω SDI input
HD-SDI Output:	1 x BNC 75Ω SDI output (reclocked loop through)

Equipment Type

RM-HD1:	HD-SDI expansion card
RM-HDE1:	HD-SDI & Dolby® E expansion card

Physical Specification

Dimensions (Raw):	15cm (W) x 11.5cm (D) x 3.1cm (H) 5.9" (W) x 4.5" (D*) x 1.2" (H) (1U)
Dimensions (Boxed):	25cm (W) x 20cm (D) x 10cm (H) 9.8" (W) x 7.9" (D*) x 3.9" (H) (1U)
Weight (RM-HD1):	Nett: 0.13kg Gross: 0.4kg Nett: 0.3lb Gross: 0.9lb
Weight (RM-HDE1):	Nett: 0.15kg Gross: 0.4kg Nett: 0.3lb Gross: 0.9lb

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