

## 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.

#### 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 propagation 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.

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.

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.

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.

*“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.”*

#### 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-HD1E), 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 response, 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, either with (RM-HD1E) or without (RM-HD1) Dolby® E or Dolby® Digital encoding.

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

## Reference Monitors

### 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:   | Analogue I/O, ref 0dBu <-90dB                            |
| 10kHz input:            | <-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:<br>1. Dual BBC PPM + standard VU<br>2. BBC PPM<br>3. EBU PPM<br>4. Nordic PPM<br>5. AES/EBU digital PPM<br>6. DIN PPM<br>7. Standard VU<br>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)<br>2. Audio overlevel (latching)<br>3. Sustained phase error (latching)<br>4. AES/EBU input unlock (non-latching)<br>Open-collector outputs rated at 30V, 50mA maximum<br>Output low/conducting in normal condition (no alarm) |
| Control Inputs: | 1. Mute audio<br>2. Dim audio<br>3. Alarm reset<br>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) |

*“ 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. ”*

|                |  |
|----------------|--|
| 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 |

#### 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)<br>19" (W) x 12" (D) x 1.73" (H) (1U) |
| Dimensions (Boxed): | 55cm (W) x 43cm (D) x 18cm (H)<br>21.7" (W) x 16.9" (D) x 7.1" (H)           |
| Weight:             | Nett: 4.5kg    Gross: 5.9kg<br>Nett: 10lb    Gross: 13lb                     |

#### Options

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

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-HD1(E) 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

## Reference Monitors

### Technical Specification For RM-4C8

#### Inputs

|                             |  |
|-----------------------------|--|
| Audio Inputs (RM-254):      | 8 analogue or AES/ EBU digital channels (autoselecting)              |
| Max level (0dB input gain): | +18dBu (analogue)/0dBFS (digital)                                    |
| CMRR:                       | >60dB typical  |
| Input Impedance:            | 20kohms (analogue)<br>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:   | Analogue I/O, ref 0dBu <-90dB                            |
| 10kHz input:            | <-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:<br>1. Dual BBC PPM + standard VU<br>2. BBC PPM<br>3. EBU PPM<br>4. Nordic PPM<br>5. AES/EBU digital PPM<br>6. DIN PPM<br>7. Standard VU<br>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 |
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#### Remote Control

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

#### 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)<br>19" (W) x 12" (D) x 1.73" (H) (1U) |
| Dimensions (Boxed): | 55cm (W) x 43cm (D) x 18cm (H)<br>21.7" (W) x 16.9" (D) x 7.1" (H)           |
| Weight:             | Nett: 4.5kg    Gross: 5.9kg<br>Nett: 10lb    Gross: 13lb                     |

#### Options

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