Redbox RB-DMX4
4 x 4 Channel Digital Audio
Mixer/Router
User Handbook

SONIFEX *Redbox*

SONIFEX - ONLY THE BEST -

This handbook is for use with the following product:
Redbox RB-DMX4 4 x 4 Channel Digital Audio Mixer/Router

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Warranty

Warranty and Liability
Important: the purchaser is advised to read this clause

a. The Company agrees to repair or (at its discretion) replace Goods which are found to be defective (fair wear and tear excepted) and which are returned to the Company within 12 months of the date of despatch provided that each of the following are satisfied:

   i. notification of any defect is given to the Company immediately upon its becoming apparent to the Purchaser;

   ii. the Goods have only been operated under normal operating conditions and have only been subject to normal use (and in particular the Goods must have been correctly connected and must not have been subject to high voltage or to ionising radiation and must not have been used contrary to the Company's technical recommendations);

   iii. the Goods are returned to the Company's premises at the Purchaser's expense;

   iv. any Goods or parts of Goods replaced shall become the property of the Company;

   v. no work whatsoever (other than normal and proper maintenance) has been carried out to the Goods or any part of the Goods without the Company's prior written consent;

   vi. the defect has not arisen from a design made, furnished or specified by the Purchaser;

   vii. the Goods have been assembled or incorporated into other goods only in accordance with any instructions issued by the Company;

   viii. the defect has not arisen from a design modified by the Purchaser;

   ix. the defect has not arisen from an item manufactured by a person other than the Company.

In respect of any item manufactured by a person other than the Company, the Purchaser shall only be entitled to the benefit of any warranty or guarantee provided by such manufacturer to the Company.

b. In respect of computer software supplied by the Company the Company does not warrant that the use of the software will be uninterrupted or error free.

WARRANTY

c. The Company accepts liability:
    i.   for death or personal injury to the extent that it results from the negligence of the Company, its employees (whilst in the course of their employment) or its agents (in the course of the agency);
    ii. for any breach by the Company of any statutory undertaking as to title, quiet possession and freedom from encumbrance.

d. Subject to conditions (a) and (c) from the time of despatch of the Goods from the Company's premises the Purchaser shall be responsible for any defect in the Goods or loss, damage, nuisance or interference whatsoever consequential economic or otherwise or wastage of material resulting from or caused by or to the Goods. In particular the Company shall not be liable for any loss of profits or other economic losses. The Company accordingly excludes all liability for the same.

e. At the request and expense of the Purchaser the Company will test the Goods to ascertain performance levels and provide a report of the results of that test. The report will be accurate at the time of the test, to the best of the belief and knowledge of the Company, and the Company accepts no liability in respect of its accuracy beyond that set out in Condition (a).

f. Subject to Condition (e) no representation, condition, warranty or other term, express or implied (by statute or otherwise) is given by the Company that the Goods are of any particular quality or standard or will enable the Purchaser to attain any particular performance or result, or will be suitable for any particular purpose or use under specific conditions or will provide any particular capacity, notwithstanding that the requirement for such performance, result or capacity or that such particular purpose or conditions may have been known (or ought to have been known) to the Company, its employees or agents.

g. i.   To the extent that the Company is held legally liable to the Purchaser for any single breach of contract, tort, representation or other act or default, the Company's liability for the same shall not exceed the Price of the Goods.
    ii. The restriction of liability in Condition (g)(i) shall not apply to any liability accepted by the Seller in Condition (c).
    iii. Where the Goods are sold under a consumer transaction (as defined by the Consumer Transactions (Restrictions on Statements) Order 1976) the statutory rights of the Purchaser are not affected by these Conditions of Sale.

Unpacking the RB-DMX4

The RB-DMX4 is shipped with the following equipment. Please check your packaging to ensure that you have all of the items below. If anything is missing, please contact the supplier of your equipment immediately.

Item	Quantity RB-DMX4
RB-DMX4	1
IEC Mains lead fitted with moulded mains plug	1
Handbook and warranty card	1

Fig A: Packing List

Each RB-DMX4 is shipped in protective packaging and should be inspected for damage before use. Where an item is found to have transit damage, notify the carrier immediately with all the relevant details of the shipment. Packing materials should be kept for inspection and also for if the product needs to be returned.

Returning the Warranty Card

In order to register the date of purchase so that we can keep you informed of any design improvements or modifications, it is important to complete the warranty registration document that is enclosed and return it to Sonifex Ltd in the UK.

For your own records you should write down the serial number (which can be found on the rear of the RB-DMX4.

Serial Number	……………………………………

SAFETY INFORMATION

Safety Information

Safety of Mains Operated Equipment

CE This equipment has been designed to meet the safety regulations currently advised in the country of purchase and it conforms to the safety regulations specified by use of the CE Mark.

Warning : There are no user serviceable parts inside the equipment. If you should ever need to look inside the unit, always disconnect the mains supply before removing the equipment covers.

Voltage Setting Checks

Ensure that the machine operating voltage is correct for your mains power supply by checking the box in which your Redbox was supplied. The voltage is shown on the box label. The available voltage settings are 115V, or 230V. Please note that all Redboxes are either switchable between 115V and 230V, or have a universal power supply.

Fuse Rating

The RB-DMX4 is supplied with a single fuse in the live conducting path of the mains power input. For reasons of safety it is important that the correct rating and type of fuse is used. Incorrectly rated fuses could present a possible fire hazard, under equipment fault conditions. The fuse rating for the RB-DMX4 is:

230 or 115 V operation - 2A   5 x 20mm SB

The active fuse is fitted on the outside rear panel of the unit.

Power Cable and Connection

An IEC power connector is supplied with the RB-DMX4 which has a moulded plug attached – this is a legal requirement. If no moulded plug has been supplied with your RB-DMX4, please contact your supplier, because an IEC connector is always supplied from the Sonifex factory.

If for any reason, you need to use the RB-DMX4 with a different power cable, you should use the following wiring guidelines.

Wire Colour	Connection
Green, or green and yellow	Earth (E)
Blue, or Black	Neutral (N)
Brown, or Red	Live (L)

Fig B: Power Connections

Connect the equipment in accordance with the connection details and before applying power to the unit, check that the machine has the correct operating voltage for your mains power supply.

Important Note : The terminal marked on the rear panel must be earthed.

Ordering the Correct Mains Lead

When ordering a Redbox from Sonifex, it is helpful if you can specify your required operating voltage and mains lead. After the product code add:

UK, for 230V, UK 3 pin to IEC lead	
EC, for 230V, European Schuko 2 pin to IEC lead	
US, for 115V, 3 pin to IEC lead	
AU for 230V, Australasian 3 pin to IEC lead	

Fig C: Mains Lead Table

E.g. order RB-DMX4 UK for a UK IEC lead to be supplied.

Installation Information

Atmosphere
The units should be installed in an area that is not subject to excessive temperature variation (<0°C, >50°C), moisture, dust or vibration.

Electromagnetic Radiation
The cover is connected to earth by means of the fixing screws. It is essential to maintain this earth ground connection to ensure a safe operating environment and provide electromagnetic shielding.

Fitting Redboxes
Redboxes can be fixed to the underside of a mixing desk, or other surfaces using 4.2mm holes in the sides and fixed with 2 x M4 screws or 2 x No. 6 countersink wood screws.

They can also be rack-mounted, with either the front, or rear of the Redbox positioned at the front of the rack:

Rear Mounting The RB-DMX4: The **RB-RK3** 1U rear panel rack kit can be used for large Redboxes such as the RB-DMX4.

Fig D: RB-RK3 Large Redbox Rear Rack-mount Kit

Note: When fitting the rear-mounting rack-kits, a notch has been left on the inside of the right-hand rack-piece for the mains cable to pass through. Make sure that the mains cable has been put through the notch before attaching the right hand rack-piece.

Installing the Optional Video Sync Boards
There are 2 optional video sync boards which can be used to synchronise the outputs of the RB-DMX4 to a 48kHz sample rate from an analogue or digital video signal:

RB-SYA - The Analogue video sync board will accept a composite signal of NTSC (525), PAL (625) & SECAM (625) signals covered by SMPTE-170-M (NTSC) and ITU-R BT.470-6 (PAL & SECAM).

RB-SYD - The Digital video sync board will accept 270Mbps SD-SDI and HD-SDI signals covered by SMPTE-259-M-C (SD) and SMPTE-292M (HD).

Opening the RB-DMX4
Warning: The power must be switched off at the supply or the power lead must be disconnected before attempting to open the unit. Removal of the cover can expose dangerous voltages.

1. Remove the 4 screws in the corners of the rear panel.

2. Remove the 4 screws on the top and bottom panels which hold the rear panel in place (2 on the top and 2 on the bottom).

3. Remove the screw in the centre of the front panel.

4. Slide the rear panel and main PCB backwards out of the metal chassis giving you internal access.

5. Remove the rubber grommet/bung on the rear panel which covers the hole for the video sync connector.

6. Remove the 2 screws from the bottom of the sync card pillars and, making sure to keep the plastic washers in place at the bottom of the pillars, fit the 20 way pin header into the 20 way connector on the RB-DMX4 motherboard.

7. Underneath the board, insert the 2 screws to fix the board in place.

To put the unit back together, slide the PCB back into the chassis and refit the screws in reverse order.

The video synchronisation is chosen using the front panel DIPSwitches (see page 5).

Follow these instructions to fit either of the sync boards.
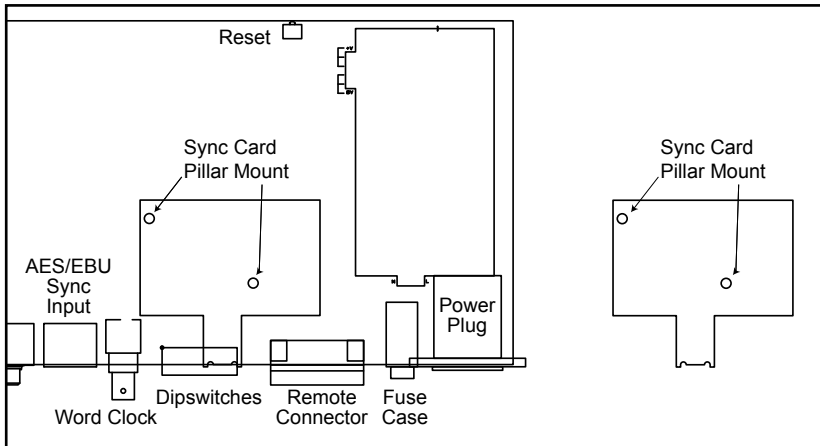
Fig E: RB-DMX4 Optional Video Sync Installation

WEEE & RoHS Directives - Sonifex Statement

The Waste Electrical and Electronic Equipment (WEEE) Directive was agreed on 13 February 2003, along with the related Directive 2002/95/EC on Restrictions of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).

The **Waste Electrical and Electronic Equipment Directive (WEEE)** aims to minimise the impacts of electrical and electronic equipment on the environment during their life times and when they become waste. It applies to a huge spectrum of products. It encourages and sets criteria for the collection, treatment, recycling and recovery of waste electrical and electronic equipment. All products manufactured by Sonifex Ltd have the WEEE directive label placed on the case. It gives a contact for individuals who are unsure about the correct procedure when the product has reached its "end of use".

Sonifex Ltd will be happy to give you information about local organisations that can reprocess the products, or alternatively all products that have reached "end of use" can be returned to Sonifex and will be reprocessed correctly free of charge.

Sonifex Ltd has phased out the use of certain hazardous substances identified in the European Union's **Restriction of Hazardous Substances (RoHS)** directive. The RoHS directive limits the use of certain hazardous substances currently used in EEE manufacture, including lead, mercury, cadmium, hexavalent chromium, and halide-containing compounds PBB (polybrominated biphenyl) and PBDE (polybrominated diphenyl ether). Elimination of these substances will result in more environmentally friendly recycling of electronic equipment. For the products which Sonifex manufacture, the main area where products were affected was in the use of lead for manufacturing and assembling electronics circuit boards.

Sonifex Ltd practices lead-free (LF) manufacturing processes. LF solder is used on the surface-mount PCB manufacturing processes and for hand soldering. The printed circuit boards (PCBs) used are either gold plated, or immersion tin plated, both of which use no lead. Historically the PCBs were hot air solder levelled (HASL) PCBs which used tin/lead based solder.

The manufacturing processes include the assembly of purchased components from various sources. Product is offered as RoHS compliant, or LF, only after sufficient evidence is received from the component manufacturers that their components are RoHS compliant. Sonifex Ltd relies solely on the distributor, or manufacturer, of the components for identification of RoHS compliance. Thus whilst every effort is made to ensure compliance, Sonifex Ltd makes no warranty, or certification, or declaration of compliance concerning said components.

Sonifex Ltd defines "Lead Free" as pertaining to any product, which has been manufactured by Sonifex Ltd using components which have been declared by the manufacturers as "Lead Free". All statements by Sonifex Ltd of RoHS compliance are based on component manufacturer documentation.

RB-DMX4 4 x 4 Channel Digital Audio Mixer/Router

Introduction

Fig 1-1: RB-DMX4 Front Panel

The RB-DMX4 is a digital mixer capable of mixing or routing 4 mono input channels into 4 mono outputs, or 2 stereo inputs into 2 stereo outputs. The inputs are sample rate converted to allow sources of different sample rates to be mixed. The flexible Mix Matrix allows for a wide variety of mixing options and creativity, using 4 blocks of 4 way DIPswitches to select which inputs are mixed or routed to which outputs.

The RB-DMX4 has 4 x digital mono audio inputs, each one selectable in pairs via front panel INPUTS 1 & 2 and INPUTS 3 & 4 push buttons, from either AES/EBU balanced XLRs, S/PDIF unbalanced phonos or TOSlink unbalanced optical inputs. Sample rate converters on each input mean that sources of different sample rates can be used with the output sample rate being defined independently. The colour of the INPUTS 1 & 2 and INPUTS 3 & 4 push-buttons indicate whether the input source is synchronised (no colour) or not (flashing green and red).

Each input has a trim pot, which can be used to attenuate the input signal. This allows for a perfect mix of channels at different audio levels. Audio presence LEDS around each input button give an indication of input audio level. There is one LED for each channel. There are also 4 presence LEDS around the MONITOR button which give an indication of output level. Additional gain can be added by accessing the OUTPUT GAIN mode.

There are 2 stereo outputs which are available as simultaneous AES/EBU balanced XLRs, S/PDIF unbalanced phonos or TOSlink unbalanced optical outputs. The output sample rates are selectable via rear panel DIPswitches from one of 32kHz, 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz or 192kHz.

The unit has TTL wordclock BNC and AES/EBU XLR synchronising inputs as standard and optionally, the RB-SYA and RB-SYD synchronisation boards can be fitted to synchronise the unit to analogue or digital video signals. A rear panel DIPswitch block is used to decide whether the unit is synchronised to Input 1 & 2, Input 3 & 4, the AES/EBU sync input, the wordclock sync input or an optional video sync board. The DIPswitch block also selects the synchronisation mode of the unit and the MONITOR button flashes whenever the unit is not synchronised to an incoming sync signal. Selectable sync modes are as follows:

Master Mode
In this mode the digital output sample rate is simply set by, and locked to, the internal on-board clock generator. No sync signal is used or required.

Auto Sync Mode
In this mode the digital output sample rate follows the selected sync input. When the sync signal is not present the output sample rate will be set by, and locked to, the internal on-board clock generator at the selected output frequency.

Auto Lock Mode

The digital output sample rate follows the sync input. If the sync signal is removed then the output sample rate will be set by, and locked to, the internal on-board clock generator at the closest frequency available to the previous sync input.

Slave Mode

In this mode the digital output sample rate follows the sync input. When the sync signal is not present the digital output is turned off.

There is a monitor socket on the front panel with a gain pot to allow you to monitor the output of each channel. The monitored channel can be selected via a push button on the front panel which, when held, can also supply up to 12dB of gain. If the level that is being monitored is close to full scale, a 12dB attenuation can be added to the monitor channel via a DIPswitch on the rear panel.

The unit can be placed in mono or stereo mode via rear panel DIPswitch. Stereo mode allows you to monitor the two input pairs as stereo channels as well as controlling the input gain as a pair, giving tied audio levels.

The RB-DMX4 has been designed to have a passive signal path through the main input, so if power to the unit fails, signal inputs 1 & 2 are routed to outputs 1 & 2 and signal inputs 3 & 4 are routed to outputs 3 & 4. This is essential for applications such as installation at transmitter sites, where a power failure to the unit should not prevent the audio input signal from being output to the transmitter. Please note that this is not true for the TOSLink outputs which are muted.

The RB-DMX4 can be controlled using Sonifex free software, SCi. Contact Sonifex for further information if you have a particular requirement that isn't catered for by the RB-DMX4 as standard.
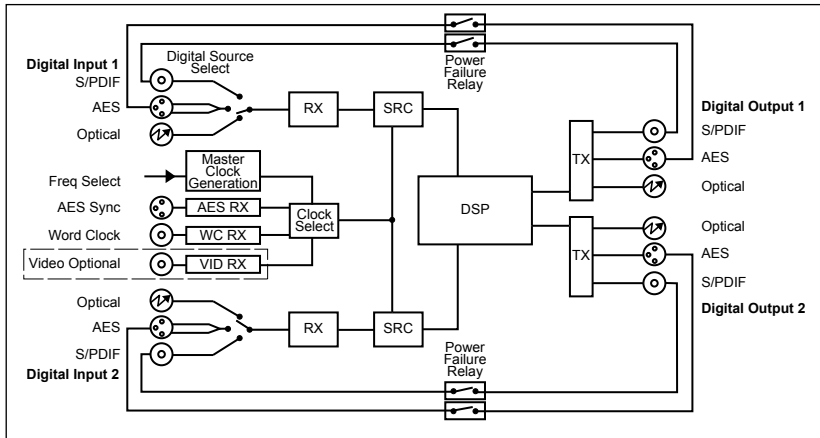
Fig 1-2: RB-DMX4 System Block Diagram

Front Panel Controls and Indicators

The LED on the front panel is normally red to indicate power to the unit.

OUTPUT MIX DIPSwitches   SERIAL LED   INPUT GAIN Pots   Headphone Jack

Reset Button   INPUTS 1 & 2 Source Select, Indicators & Input Presence   INPUTS 3 & 4 Source Select, Indicators & Input Presence   MONITOR SELECT Button & Output Presence   Level Control Knob
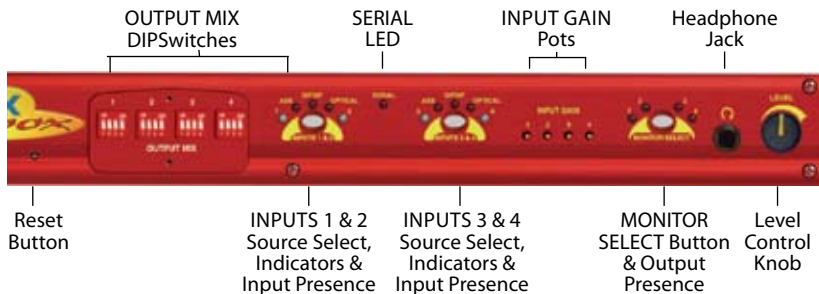
Fig 2-1: RB-DMX4 Front Panel Controls and Indicators

Fig 2-2: RB-DMX4 Front Panel DIPSwitches

Output Mix Matrix Selection Using The Front Panel DIPSwitches

The OUTPUT MIX front panel DIPSwitches are concealed behind the screw panel located on the front of the unit and they decide which input channels are mixed to which output channels. There are 4 banks of DIPSwitches, each representing an output channel.

To mix an input to that channel, simply lift the DIPSwitch for the desired input channel. In total, 4 mono channels can be mixed together on each mono output channel.

This allows many mixing configurations and maximum flexibility. Adding to that, mixing can be achieved between all the different input types at all sample rates. See page 7 for applications for the product using different matrix settings.

Fig 2-3: RB-DMX4 INPUT 1 & 2 Select Button

INPUT 1 & 2 Source Select Button, Indicators & Input Presence LEDS

This button allows you to select which of the digital input sources you would like to use. The three LEDs above the button illustrate which source is selected. The button also indicates whether the input is locked - it flashes green and red if the input is unlocked and is unlit when locked.

The bicolour LEDs, marked '1' and '2', show input presence and give an indication of the input level using the AES digital standard with the following colours:

-INF < -52dBFS = OFF

-52dBFS < -3dBFS = GREEN

-3dBFS <0dBFS = ORANGE

INPUT 3 & 4 Source Select Button, Indicators & Input Presence LEDS

The operation of this button is identical to the INPUT 1 & 2 button but acts on inputs 3 & 4.

Fig 2-4: RB-DMX4 INPUT Gain Pots

INPUT GAIN Pots

These pots allow the gain of each individual channel to be trimmed so that the perfect mix can be achieved. Simply turn anti-clockwise to attenuate the level or clockwise to restore it. Fully clockwise is unity gain. Fully anti-clockwise is muted.

In Stereo Mode, pots 1 and 3 control the gain for channels 1 & 2 and 3 & 4 respectively. See page 7 for further information.

MONITOR Button & Output Presence LEDs

Normally, this button displays the external synchronisation status and the four LEDS around it display output presence. If the selected synchronisation source is unlocked, the button will flash green and red. A button press allows you to choose which channel is output through the headphone socket and to set-up the output gain.

Fig 2-5: RB-DMX4 MONITOR Button

For monitor selection, the button illuminates red, as does the LED of the selected channel. For output gain, the LEDS around the button illuminate in green sequentially indicating the level of gain applied.

MONITOR Button Modes

The MONITOR button has three modes of operation with different functions: Display Mode, Monitor Output Select Mode and Output Gain Mode:

Display Mode

Display Mode is the default mode of the button. In display mode, the four surrounding bicolour LEDs act as presence LEDs for the output channels. Marked '1' to '4', the LEDs give an indication of the output level using the AES digital standard with the following colours:

-INF < -52dBFS = OFF
-52dBFS < -3dBFS = GREEN
-3dBFS <0dBFS = ORANGE
0dBFS/ CLIP = RED (AGC Operational)

Note re Clipping: The AGC is working on a channel if its output presence LED is red. The mixing in this unit is achieved by the summation of 24 bit audio values. The total of this summation could, if uncorrected, breach the upper limit of a 24 bit number, which would lead to clipping. The unit detects these occurrences and adds an instantaneous attenuation to bring the signal in range again. This attenuation factor will decrease on a slow decay until 0dBFS is achieved, or until another breach occurs. The slow decay eliminates any breathing or pumping effects in the audio.

If the unit is set to be synchronized externally but is not synchronized, the button flashes green and red continuously. If it is synchronised, or the unit is set to MASTER sync mode, the button is unlit.

Monitor Output Select Mode

To enter Monitor Output Select Mode, simply press and release the MONITOR button. The button turns red and the surrounding LEDS now display which output is selected for monitoring, in red. This mode will last for two seconds, which is refreshed every time the button is pressed and released. If the unit is in Stereo Mode, LEDs 1 & 2 illuminate together, as do 3 & 4. See page 7 for configure the unit in Stereo Mode.

Output Gain Mode

To enter Output Gain Mode, first enter Monitor Output Select Mode and select the channel which you would like to apply gain to. Within two seconds, press and hold the MONITOR button until the button changes from red to green. On release of the button, the surrounding LEDS will now switch to display the current output gain for this channel. Press and release the button to choose the output gain levels from one of:

LED 1 Green: 0dB
LED 2 Green: +3dB
LED 3 Orange: +6dB
LED 4 Red: +12dB

After choosing your required setting, press and hold the button until it changes colour from solid green. This will return the button to the Display Mode.

Note: Make sure that you check the presence LEDs to ensure that the output is not clipping.

SERIAL LED Indicator

If the rear panel Serial Mode DIPSwitch 11 is ON, then this LED illuminates. In this mode, the unit is being controlled serially using the Sonifex SCi software.

Fig 2-6: RB-DMX4 Serial Control Indicator LED

Headphone Output

The front panel headphone output is a ¼" (6.35mm) stereo jack socket capable of delivering over 80mW into 32Ω - 600Ω professional headphones at full volume. Higher impedance headphones may be used at reduced levels. Lower impedance headphones should not be used.

Please be aware that this headphone amplifier has been designed to cope with the varying different headphone and full scale line-up set-ups that are used. Consequently, the monitor attenuation DIPSwitch 10 should be turned on if the output sounds very loud and distorted at any time.

Fig 2-7: RB-DMX4 Headphone Output & Level Control

LEVEL Control

The front panel LEVEL control is a potentiometer that adjusts the level of the monitor output and provides a gain range of -70dB to +12dB.

Reset Button

In the unlikely event that the RB-DMX4 unit fails to respond, press the reset button to reboot the unit (see Fig 2-1 for location).

Rear Panel DIPSwitch Controls
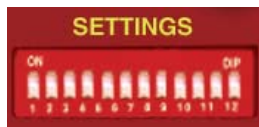
Fig 3-1: RB-DMX4 Rear Panel
DIPSwitch Block

The SETTINGS DIPSwitch block on the rear panel is used to configure the RM-DMX4:

Master Mode Sample Rate Selection (DIPSwitches 1-3)

These DIPSwitches allow you select which sample rate the output is set to when the unit is synchronised to the Master Mode. Set the DIPSwitches where:

Sample Rate (kHz)	DIPSwitch 1	DIPSwitch 2	DIPSwitch 3
32	OFF	OFF	OFF
44.1	ON	OFF	OFF
48	OFF	ON	OFF
88.2	ON	ON	OFF
96	OFF	OFF	ON
176.4	ON	OFF	ON
192	OFF	ON	ON

Synchronisation Source Selection (DIPSwitches 4-6)

These DIPSwitches allow you select which input sync source is used to synchronise the unit to. Set the DIPSwitches where:

Synchronisation Source	DIPSwitch 4	DIPSwitch 5	DIPSwitch 6
Input 1 & 2	OFF	OFF	OFF
Input 3 & 4	ON	OFF	OFF
AES/EBU Sync Input	OFF	ON	OFF
Word Clock Input	ON	ON	OFF
Video Sub Board	OFF	OFF	ON

Synchronisation Mode Selection (DIPSwitches 7-8)

These DIPSwitches allow you select the active sync mode. Set the DIPSwitches where:

Synchronisation Mode	DIPSwitch 7	DIPSwitch 8
Master Mode	OFF	OFF
Auto Sync Mode	ON	OFF
Auto Lock Mode	OFF	ON
Slave Mode	ON	ON

Stereo/Mono Operation of Input Gain and Monitor Select (DIPSwitch 9)

This defines whether the unit operates the input gain and monitor functions as a stereo pair or as mono channels.

Mode	DIPSwitch 9	Description
Stereo	ON	When ON, the gain applied to input 1 using pot 1 also alters the gain for input 2. Also when ON, the headphone monitor outputs a stereo signal made up of either Input 1 & 2 or Input 3 & 4.
Mono	OFF	When OFF, the gain of each channel is controlled individually by a gain pot. In Mono Mode the selected signal is sent to left and right earpieces of the headphone output.

Monitor Attenuation (DIPSwitch 10)

This defines whether the monitor signal is attenuated by 12dB. This is useful if you're using low impedance headphones which are too loud in everyday use.

Mode	DIPSwitch 10	Description
Attenuated	ON	When ON, the monitor signal is attenuated.
Unattenuated	OFF	When OFF, the monitor signal is unaffected.

Serial Mode (DIPSwitch 11)

This defines whether the unit is in serial mode. In serial mode the unit is controlled by the serial port, not by its DIPSwitch settings. For example for use with the Sonifex SCi software.

Mode	DIPSwitch 11	Description
Serial Control	ON	When ON, the unit is in serial mode.
DIPSwitch Control	OFF	When OFF, the unit is in normal operation.

Boot Mode (DIPSwitch 12)

With this DIPSwitch ON, the unit powers up into 'Boot Mode'. In this mode, the firmware in the unit can be upgraded using the SCi software. Note that this would be useful if a firmware update to the unit was interrupted, or corrupted which left the unit in an inoperable condition.

Mode	DIPSwitch 12	Description
Boot Mode	ON	When ON, the unit is in Boot Mode.
Normal Operation	OFF	When OFF, the unit is operates normally.

Applications of Use

Each physical input connector (INPUT 1 & 2 or INPUT 3 & 4) supplies the unit with two channels of audio data, left (1 and 3) and right (2 and 4). Similarly, each physical output connector (OUTPUT 1 or OUTPUT 2) supplies the outside world with two channels of audio data, left (1 & 3) and right (2 & 4). These inputs and outputs can be configured in a number of ways for different applications. Here are a few suggested methods of use:

Stereo Mix of Two Stereo Digital Inputs

- Connect two stereo input sources and select on the front panel.
- Raise DIP switch 1 and 3 ON for OUTPUT MIX bank 1.
- Raise DIP switch 2 and 4 ON for OUTPUT MIX bank 2.
- Connect OUTPUT 1 to output equipment.

Mono Mix of Four Input Sources to Create your Own Stereo Output

- Connect four mono inputs (for example four different musical instrument feeds) to the unit and select on the front panel.
- Select which inputs you would like on the LEFT of your stereo output and select ON for OUTPUT MIX bank 1.
- Select which inputs you would like on the RIGHT of your stereo output and select ON for OUTPUT MIX bank 2.
- Connect OUTPUT 1 to output equipment.

One to Four Mono Distribution/ Creating Dual Mono Outputs

- Connect one mono input to the unit INPUT 1 and select on the front panel.
- Raise DIP switch 1 ON for all OUTPUT MIX banks.
- Connect OUTPUTs 1 and 2 to output equipment.

Two to Four Mono Distribution Or Creating Dual Mono Outputs

- Connect two mono inputs to the unit INPUT 1 and select on the front panel.
- Raise DIP switch 1 ON for OUTPUT MIX banks 1 and 2.
- Raise DIP switch 2 ON for OUTPUT MIX banks 3 and 4.
- Connect OUTPUTs 1 and 2 to output equipment.

Four Channel Sample Rate Converter

The RB-DMX4 can be used as a sample rate converter or an input/output converter. To use the unit as a "Straight Through" device and take advantage of those features alone:

- Connect all desired inputs to the unit and select on the front panel.
- Raise DIP switch 1 on OUTPUT MIX bank 1.
- Raise DIP switch 2 on OUTPUT MIX bank 2.
- Raise DIP switch 3 on OUTPUT MIX bank 3.
- Raise DIP switch 4 on OUTPUT MIX bank 4.
- Connect the desired connector of OUTPUT1 and OUTPUT 2 to the output equipment and set the sample frequency that you want to convert to using the SETTINGS DIPSwitches on the rear panel.

Rear Panel Connectors

AEB/EBU Stereo Digital Outputs · S/PDIF Outputs · AEB/EBU Stereo Digital Inputs · S/PDIF Inputs · AEB/EBU SYNC Input · Optional Video SYNC Input · RS232 Input

Optical Outputs · Optical Inputs · Word Clock SYNC Input · Settings · Remotes Connector
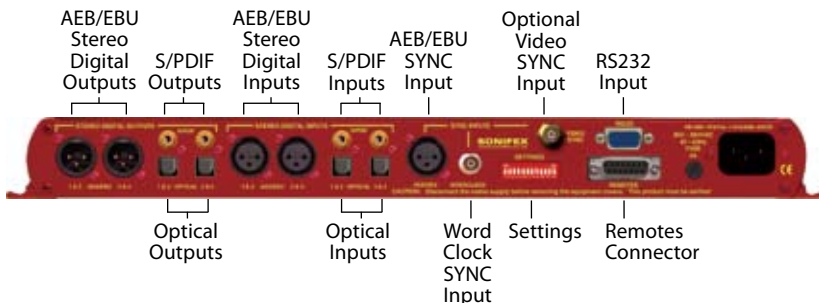
Fig 5-1: RB-DMX4 Rear Panel

AES/EBU Outputs

The 2 stereo digital output XLR 3 pin sockets have an impedance of 110Ω. They have the following connections:

Pin 1: Screen.
Pin 2: Phase.
Pin 3: Non-phase.

The signals on this connector comply with the IEC 60968 specification

S/PDIF Outputs

The 2 x stereo digital output S/PDIF phono outputs have an impedance of 75Ω.

Optical Outputs

The 2 x stereo digital audio optical outputs meet the TOSLink specification used by most professional & consumer equipment.

The outputs have an unweighted dynamic range of at least 138dB and a THD+N noise of, or better than, −137dB. The data at the outputs is presented as 24 bit wide.

AES/EBU Inputs

The 2 x stereo digital input XLR 3 pin sockets have an impedance of 110Ω. They have the following connections:

Pin 1: Screen
Pin 2: Phase
Pin 3: Non-phase

The signals on this connector meet the IEC 60968 specification

S/PDIF Inputs

The 2 x S/PDIF stereo digital phono inputs have an impedance of 75Ω.

Optical Inputs

The 2 x stereo digital audio optical inputs meet the TOSLink specification used by most professional & consumer equipment.

AES/EBU Sync Input

The digital input XLR 3 pin socket has an impedance of 110Ω. It has the following connections:

Pin 1: Screen
Pin 2: Phase
Pin 3: Non-phase

The signals on this connector meet the IEC 60968 specification

Word Clock Input

The TTL Word Clock synchronisation input has an impedance of 50Ω and uses a BNC connector.

Video Sync Input

The video sync input is presetned as a 75Ω BNC connector. See page vi for more information on the video sync boards available.

Serial RS232 Connector

The 9-way 'D' type socket connector carries a standard RS232 interface and allows direct connection to a serial port on a PC via a pin-to-pin cable. The pin assignments are as follows:

Pin 2: Transmit data
Pin 3: Receive data
Pin 5: Ground
All other pins are unused.

Remotes Connector

The remotes connector is a 15-way 'D' type socket that is currently reserved for future development. Displayed below are the pin connections and a description of what is available:

Pin 1 – Relay 1 Normally Open
Pin 2 – Relay 1 Normally Closed
Pin 3 – Relay 2 Normally Open
Pin 4 – Relay 2 Normally Closed
Pin 5 – Make to Digital Ground Input
Pin 6 – Internal Open Collector to Digital Ground Output
Pin 7 – Make to Digital Ground Input
Pin 8 – Digital Ground
Pin 9 – Relay 1 Common
Pin 10 – Make to Digital Ground Input
Pin 11 – Relay 2 Common
Pin 12 – 5 V Supply Maximum 200 mA
Pin 13 – Internal Open Collector to Digital Ground Output
Pin 14 – Make to Digital Ground Input
Pin 15 – Internal Open Collector to Digital Ground Output

Serial Port Control

The Serial Port allows the RB-DMX4 to be controlled and updated from a PC via a pin-to-pin serial cable, using the Sonifex Serial Control Interface (SCI) software. This software is available as a free download from the Sonifex website at www.sonifex.co.uk/sci.

Default Settings for the Serial Port	
Baud Rate:	19200
Data Bits:	8
Stop Bits:	1
Parity:	Even
Handshaking:	XON/XOFF

Fig 6-1: Serial Port Default Settings

Serial Interface Commands and Responses

Most of the commands follow the same structure: a 3 letter command followed by a colon, followed by a parameter (if any) and terminated by Carriage Return with optional Line Feed. A Line Feed character may be sent but it will be ignored by the RB-DMX4. Commands are not case sensitive.

Responses are CR & LF terminated.

After the RB-DMX4 has been powered-up, an initialisation string is sent "Initialising DMX4".

Following are the commands and the expected responses:

Command	Description	Response
Bnn:	Baudrate Change nn is the new baudrate value where: nn = 11 = 115200kbps nn = 57 = 57600kbps nn = 38 = 38400kbps nn = 19 = 19200kbps nn = 96 = 9600kbps	-ACK:
DWN:	Initiates a Firmware Upgrade	-ACK:

Command	Description	Response
FPS:	Front Panel & Unit Status aa = Input 1 & 2 Source Selection bb = Input 3 & 4 Source Selection where 00 = AES/EBU, 01 = S/PDIF, 02 = TOSLINK cc = Sync Mode Selection where 00 = Master, 01 = Auto, 02 = Auto lock, 03 = Slave mode dd = Serial Flag Indication where 00 = Serial mode off, 01 = Serial mode on ee = Frequency where 00 = 32k, 01 = 44.1k, 02 = 48k, 03 = 88.2k, 04 = 96k, 05 = 176.4k, 06 = 192k ff = Monitor Channel where 00 = OUTPUT1,01 = OUTPUT2, 02 = OUTPUT3, 03 = OUTPUT4 gg = Sync From where 00 = Input 1, 01 = Input 2, 02 = AES sync, 03 = Word clock, 04 = Video sync hh = Rear DIPSwitch Settings where hh is a hex value built from the sum of all applicable from: 01 = Stereo Monitor 02 = Monitor Attenuation ji = Mix Matrix1 – Output 1(i) and 2(j) lk = Mix Matrix2 – Output 3(k) and 4(l) i , j ,k and l are hex values built from the sum of: INPUT 1 = 0x1 INPUT 2 = 0x2 INPUT 3 = 0x4 INPUT 4 = 0x8	-FPS:aa_bb_cc_dd_ee_ff_gg_hh_ji_lk
FRQ:nn	Output Sample Rate Selection nn selects which sample rate is selected for the output where: 00 = 32kHz 01 = 44.1kHz 02 = 48kHz 03 = 88.2kHz 04 = 96kHz 05 = 176.4kHz 06 = 192kHz	-ACK:

Command	Description	Response
IGx:nn	Input Gain x is the channel which will be affected. nn is a hex gain value between 0x00 and 0xFE where: 00 = mute -> FE = 0dBFS	-ACK:
MAT:nn	Attenuate Monitor by 12dB nn selects between the two modes 00 = No attenuation 01 = 12 dB of attenuation	-ACK:
MMS:nm	Mix Matrix n selects the output channel, m is a hex value built for the sum of: INPUT 1 = 0x1 INPUT 2 = 0x2 INPUT 3 = 0x4 INPUT 4 = 0x8	-ACK:
MOD:nn	Sync Mode Selection nn selects the synchronization mode where: 00 = Master Mode 01 = Auto Mode 02 = Auto Lock Mode 03 = Slave	-ACK:
MON:nn	Select Monitor Channel nn selects which channel is monitored where: 00 = Output 1 01 = Output 2 02 = Output 3 03 = Output 4	-ACK:
MOS:nn	Mono or Stereo Selection nn selects between the two options where: 00 = Mono Mode 01 = Stereo Mode	-ACK:
OGx:nn	Output Gain x is the channel which will be affected. nn is a hex gain value between 0x00 and 0x03 where: 00 = 0dBFs 01 = 3dBFs 02 = 6dBFs 03 = 12dBFs	-ACK:

SERIAL PORT CONTROL

Command	Description	Response
SRQ:	Status Request -SRQ:aa_bb_cc_dd_ee_ff_gg_hi_jj_kkkk	

aa = Input1 Lock Status
bb = Input2 Lock Status
where 01 = locked and 00 = unlocked
cc = Sync Flash
where 01 = Flashing and 00 = Not flashing
dd = Input Gain For INPUT 1
where dd is a hex value representing the current gain
on this INPUT between:
00 = Mute -> FE = 0dBFs
ee = Input Gain For INPUT 2
where ee is a hex value representing the current gain
on this INPUT between:
00 = Mute -> FE = 0dBFs
ff = Input Gain For INPUT 3
where ff is a hex value representing the current gain
on this INPUT between:
00 = Mute -> FE = 0dBFs
gg = Input Gain For INPUT 4
where gg is a hex value representing the current gain
on this INPUT between:
00 = Mute -> FE = 0dBFs
hi = Output Gain For All OUTPUTS
i is a hex value representing the current gain on outputs 1
and 2 summed and h is a hex value representing the current
gain on outputs 3 and 4 summed where:
INPUT 1/3
0x00 = 0dB
0x01 = +3dB
0x02 = +6 dB
0x03 = +12 dB
INPUT 2/4
0x00 = 0dB
0x04 = +3dB
0x08 = +6dB
0x0C =+12dB

For example, if INPUT 1 and 2 are set to 3 dB gain and input 3 and 4 are set to
12 dB gain then:

h = 0x03 + 0x0C = 0x0F
i = 0x01 + 0x04 = 0x05

Command	Description	Response
SSx:nn	Source Select x selects which input is being changed where: 1 = Input 1 2 = Input 2 nn selects which source is used for that particular input where: 00 = AES/EBU 01 = S/PDIF 02 = Optical	-ACK:
SYS:nn	Sync Source Select nn selects which sync source is used where: 00 = Input 1 01 = Input 2 02 = AES/EBU 03 = Word Clock 04 = Video Sync Board	-ACK:
UID:	Unit Id	-UID:RB-DSD1
VER:	Version Number -VER:x.xxx,y.yyy Where x.xxx is the firmware version and y.yyy is the front panel firmware version number	

Error Messages

The following error messages can be returned for illegal commands

Err:01-Return if command not found
Err:02-Return if missing parameter
Err:04-Return if parameter out of range

SCi for RB-DMX4

SCi, the Serial Control Interface allows you control the RB-DMX4 remotely. The interface has three tabs including a control page, an indication page and a miscellaneous options page. The status of the connection, serial number and firmware versions are always visible at the bottom of the interface.

Note: Make sure that the RB-DMX4 is configured to operate via serial control by setting DIPSwitch 11 to ON. See page 7 for further information.
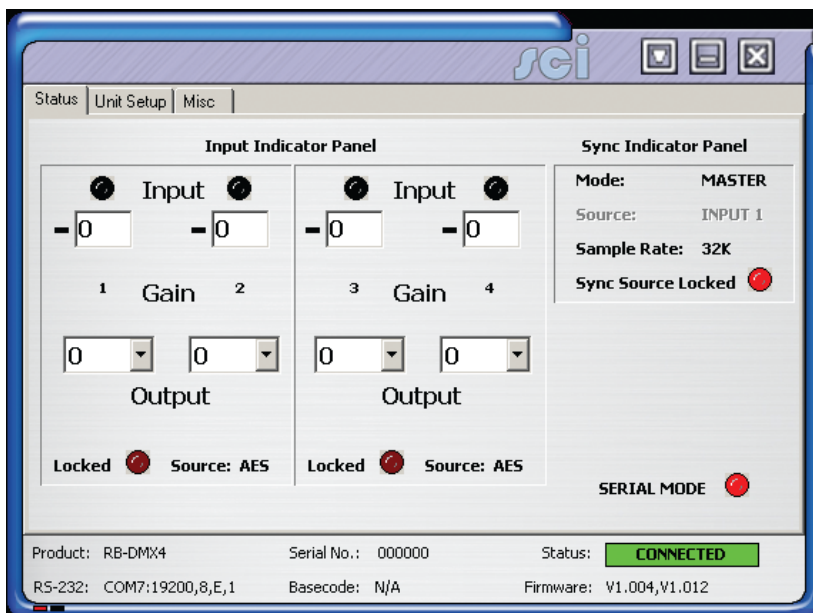
Status Page

Fig 7-1: Status Page

This page displays the current status of the unit. Each set of inputs has an indicator panel which displays:

Presence Level: The current audio status is displayed as it is on the front panel. (Please refer to page 3).

Locked LED: If the input is locked, this LED is lit.

Input Gain Boxes: Displays the gain of each input channel.

Output Gain Boxes: Displays the gain of each output channel.

Source Label: The source which is currently being used is displayed here.

Synchronization options are displayed in the sync indicator panel:

Mode: This displays the selected synchronisation mode.

Source: This displays the selected synchronisation source. This is disabled in Master Mode.

Sample Rate: This displays the current output sample rate.

Sync Source Locked LED: If the synchronization source is locked this led is lit.

The serial mode LED indicates whether the unit is in serial mode.
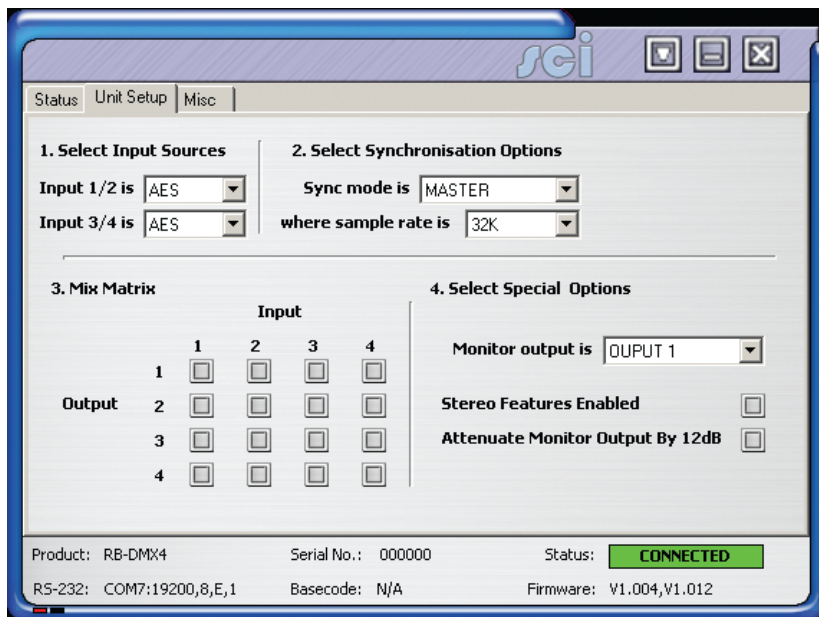
Control Page

Fig 7-2: Control Page

The Control Page is where you can configure your unit. For ease of use, the options have been split into four sections which you can visit in numbered steps:

1. Select Input Sources
Select which source you would like to use for both the Input 1 & 2 and Input 3 & 4 from the drop down boxes labelled "INPUT 1/2 is" and "INPUT 3/4 is" respectively.

2. Select Synchronisation Options
Select which sync mode to use from the first drop down box, labelled "Sync mode is". If "MASTER" is chosen, then simply select your output sample rate from the drop down box labelled "where sample rate is". If "AUTO", "AUTOLOCK" or "SLAVE" are selected, then a new drop down box labelled "from" will appear which allows you to select the synchronisation source.

SCi FOR RB-DMX4

3. Select Mix Matrix

Select which inputs are mixed onto which outputs simply by ticking the boxes in the matrix.

4. Select Special Options

Select which output is monitored by using the drop down box labelled "Monitor output is".

Stereo Features Enabled: Select this tick box for the input gain and headphone monitoring to operate in stereo mode instead of mono.

Attenuate Monitor Output by 12dB: If your headphone monitoring is too loud, select this tick box to attenuate it.

If serial mode is selected, all the controls are enabled. The controls are disabled if serial mode is switched off.
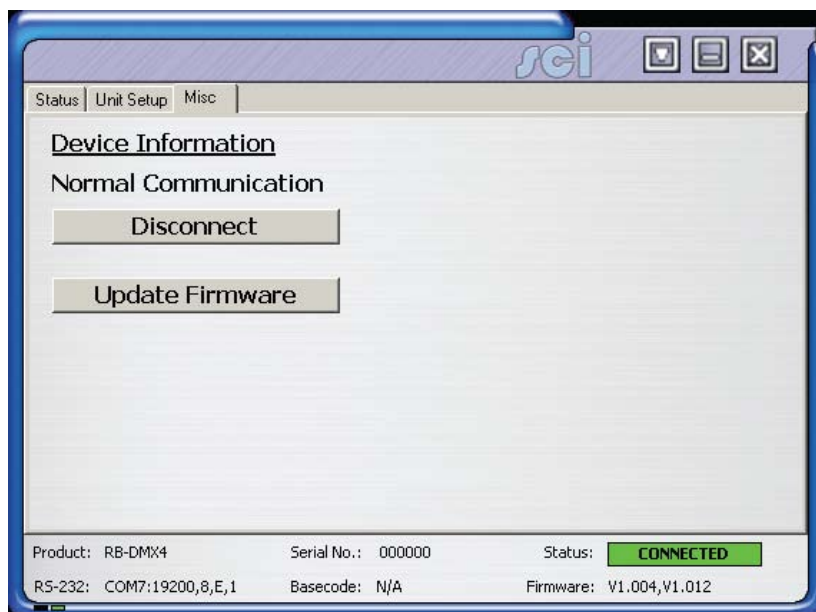
Miscellaneous Page

Fig 7-3: Miscellaneous Page

This page is used for the connecting and disconnecting SCi to the unit and for updating the firmware in the RB-DMX4.

Updating The Firmware

The RB-DMX4 firmware will occassionally be updated to add new features or correct any possible issues that may arise. Check for updates at:

http://www.sonifex.co.uk/technical/software/

To update the firmware click on the button labeled "Update Firmware" and then select the downloaded firmware file. Firmware files for the RB-DMX4 always have an ".ldr" extension. A progress bar will appear in SCi, indicating how much of the file has been uploaded to the unit.

When the unit switches to update mode, the front panel display LEDs extinguish. The left program LED is then used to display the status of the upload:

Uploading The Code: The LED flashes amber to confirm the unit is receiving the new firmware to the RAM in the unit.

Copying Code to Flash Memory: The LED is solid amber while the unit checks the integrity of the file and copies the file from RAM to flash memory.

Successful Update: The LED turns green for two seconds and the unit automatically resets and begins running the new code.

Unsuccessful Update: The LED turns red for two seconds and the returns to running the last firmware used.

Technical Specification For RB-DMX4

Audio Specification

Dynamic Range:	>138dB
Distortion and Noise:	<-137dB THD + N at 1kHz, ref 0dBFS
Input & Output Impedances:	110Ω ±20% AES/EBU balanced I/O 75Ω ±5% S/PDIF unbalanced I/O 75Ω ±5% TOSlink unbalanced I/O 50Ω BNC TTL word clock input
Signal Level:	Balanced: 3V/10V peak to peak min/max Unbalanced: Min 0.5V±20% peak to peak
Sample Frequencies:	32, 44.1, 48, 88.2, 96,176.4 or 192kHz
Bit Depth:	Up to and including 24 bit

Front Panel Operational Controls & Indicators

Digital Input Select:	AES/EBU, S/PDIF or TOSlink optical via INPUT 1 & 2 or INPUT 3 & 4 push-buttons
Mix Control:	Output mix selection system via front panel DIPSwitches
Input Gain:	Input gain control for four INPUT channels via potentiometers
Monitor Select Control:	Headphone monitor channel select and output gain via push button
Monitor Volume Control Range:	-70dB to +12dB gain
Indicators:	Input and output presence indicators via bicolour LEDS around each push button

Rear Panel Operational Controls

Master Select:	32, 44.1, 48, 88.2, 96,176.4 or 192kHz Frequency via rear panel DIPSwitches
Sync Source Select:	INPUT 1 & 2, INPUT 3 & 4, AES Sync, Word Clock, Video Sync via rear panel DIPSwitches

Sync Mode Select:	Master, Auto Sync, Auto Lock, Slave via rear panel DIPSwitches
Stereo Features:	Stereo gain control and monitor outputs via rear panel DIPSwitches
Monitor Attenuation:	12dB Monitor attenuation via rear panel DIPSwitches
Serial Mode:	Enter serial control mode via rear panel DIPSwitches
Boot Mode:	Boot up base code or firmware via rear panel DIPSwitches

Connections

Digital Inputs:	2 x AES/EBU XLR 3 pin female 2 x S/PDIF RCA phono 2 x TOSLink optical input
Digital Outputs:	2 x AES/EBU XLR 3 pin plug 2 x S/PDIF RCA phono socket 2 x TOSLink optical output
Sync Inputs:	1 x AES/EBU XLR 3 pin female 1 x Word Clock BNC 1 x Video Input (optional)
Remote I/O Port:	15 way D-type plug
Serial Port:	RS232, 9 way D-type socket
Mains Input:	Universal filtered IEC, continuously rated 85-264VAC@47- 63Hz, max 10W
Fuse Rating:	Anti-surge fuse 2A 20 x 5mm

Equipment Type

RB-DMX4:	4 x 4 channel digital audio mixer/router

TECHNICAL SPECIFICATION

Physical Specifications	
Dimensions (Raw):	48cm (W) x 10.8cm (D*) x 4.2cm (H) (1U) 19" (W) x 4.3" (D*) x 1.7" (H) (1U)
Dimensions (Boxed):	59cm (W) x 27.5cm (D) x 11cm (H) 23.2" (W) x 10.8" (D) x 4.3" (H)
Weight:	Nett: 1.4kg Gross: 2.0kg Nett: 3.1lb Gross: 4.4lb

Accessories	
RB-SYA:	Analogue video sync board (NTSC, PAL & SECAM)
RB-SYD:	Digital video sync board (SD-SDI & HD-SDI)
RB-RK3:	1U Rear panel rack kit for large Redboxes

* Note that this product is deeper than standard Redboxes