

SQN-4S mini 4:2 mk II Mixer



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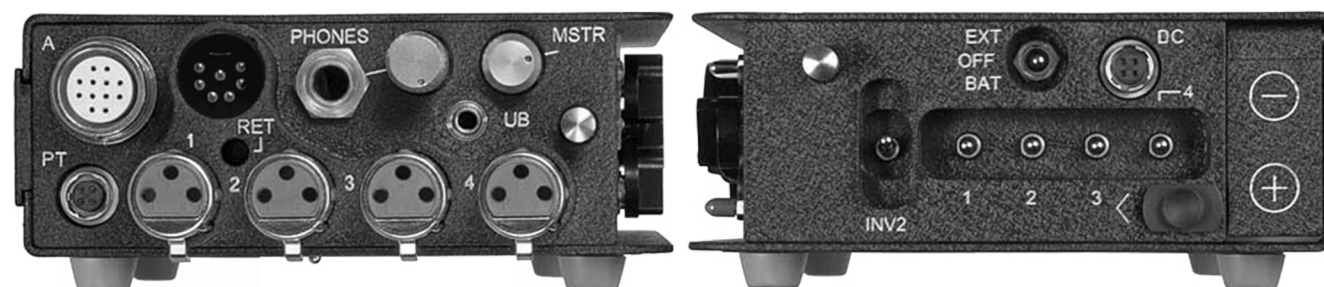
SQN-4S mini mk II Miniature 4:2 Stereo Mixer



Operating Instructions and Reference



Front Panel



Left Side (Connector) Panel

Right Side (Routing) Panel

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1. INTRODUCTION

The basic information necessary to allow a recording engineer to operate the **SQN-4S_mini** audio mixer is permanently displayed on its baseplate and cannot be lost. The aim of these instructions is to explain the mixer's facilities and functions in more detail to those who are already familiar with the microphones and techniques that are employed by professional sound recordists.

2. POWERING

INTERNAL BATTERY. The **SQN-4S_mini** should be powered by AA size cells, of which the most powerful presently available are Lithium cells. Alkaline cells are also suitable but will have a shorter operating life. The use of carbon zinc batteries, which may leak and cause extensive damage, is definitely not recommended. In any case when used in the **SQN-4S_mini** they give a small fraction (about one fifth) of the life of alkaline cells, so they are a false economy.

Rechargeable cells, preferably of the NiMH type for maximum capacity, may also be used but should be recharged using an external charger designed for the purpose.

If discharged cells are left in the mixer they may leak corrosive liquid and cause costly damage. Cells should always be removed from the mixer if it is to be stored for any length of time or transported in the cargo hold of an aircraft.

To fit the cells, slide the battery door catch on the right side of the mixer towards the front panel to release the door and insert two rows of three cells in series, so that the lower tube has the positive poles facing the door and the upper tube the negative poles, as is indicated on the door itself. If the cells are inserted with incorrect polarity the mixer will not function; an internal protection circuit prevents damage to the mixer power supply.

When operating from the internal battery supply, toggle the Power Selector Switch, situated at the right hand end of the mixer to the [BAT] position to power the mixer. The green LEDs within the meters light up indicating that the mixer is switched on.

The right channel meter doubles as a voltmeter for the power supply when the adjacent [BATT] push button switch is depressed. The mixer is guaranteed to work down to a battery voltage of 5 volts, so that as long as the battery meter reads on scale, performance will be to specification. If the voltage is allowed to fall lower then eventually the internal power rails will fall. This will affect the headroom of the output and monitor amplifiers and the setting of the Line-Up tone; ultimately the performance of the whole mixer will be degraded. It is worth noting that as the battery voltage falls, the current drawn by the power supply will increase to maintain the required power input. The battery voltage is, therefore, likely to fall quite quickly as the cells become exhausted.

EXTERNAL POWER SOURCE. To power the **SQN-4S_mini** from an external supply a direct current source in the range 5 to 18 volts and capable of delivering 2.2W should be connected to the 4-way connector [DC] on the right side panel and the adjacent Power Selector Switch set to the [EXT] position.

The mixer's power input terminals float with respect to the **SQN-4S_mini** ground, so a supply which does not share a ground with the mixer may be used, e.g. a camera battery. The power supply input of the **SQN-4S_mini** is protected against connection of an external voltage with reversed polarity. If it is desired to power the mixer from an external DC supply at higher voltage than 18v, reference should be made to the manufacturers.

EXTERNAL POWER FEED. When the mixer is connected to an external power source and the Power Selector Switch is in either the [BAT] or [EXT] position voltage is available, via self-resetting fuses, at the 4-way connector [PT] on the left side panel. Many users of the **SQN-4S_mini** prefer to power it and several extra pieces of equipment from an NP-1 camera battery, the whole being kept together in a special carrying bag (SQN-4MWB) and its accessory pouch (SQN-4AP).

3. OUTPUTS

The mixer is provided with two balanced line driver amplifiers of substantial capacity. Additionally, unbalanced feeds of the two outputs are available at a nominal line level of -10dBu with 200 Ohm source resistance. These signals are made available on the left hand side (connector) panel of the mixer. The output level at the multi-way connector [A] may be attenuated by 50 dB to provide a nominally microphone level feed using the toggle switch set into the mixer baseplate. The connection lists for the multi-way connectors are given in Section 16.

4. LINE-UP TONE

A calibration Tone of 1kHz with distortion below 0.1% may be injected into both output channels by setting the 3-way front panel [TONE/MIC] switch to the left. The form that the tone takes depends on the setting of the [GANG 1-2] switch. When this switch is in the unganged [0] position the tone is continuous in both channels. Either of the other two positions gives an EBU coded tone signal (the left channel interrupted for 250ms every 3s) to indicate that the recording which follows is true stereophony. The tone mutes and replaces the main audio. The calibration level for a given meter reading is indicated on the baseplate of the mixer and, unless specially requested, it will be at the Nominal Line Level. Tone is also fed to the direct outputs of the XLR-7M.

5. CALIBRATION OF THE RECORDER

The recorders that are used with the **SQN-4S_mini** are almost invariably fitted with some form of input gain control. In these circumstances the absolute calibration levels of both the mixer and the recorder become irrelevant: what must be considered are the relative calibration points which are Nominal Line Level (OVU) and Nominal Peak Level on both instruments and how they are to be related.

The basic calibration used at SQN is to place the Nominal Line Level at PPM4, 'TEST' or OVU and then to treat the Nominal Peak Level as being 8dB above this, in the case of the PPM or VU meter or 6dB above in the case of the Nordic type of meter. The limiter is then set to come into operation on a steady tone at 1dB below the Nominal Peak Level. This ensures that the mixer output will not exceed the Nominal Peak Level when measured using a Peak Programme Meter. The Line-Up tone is then usually set to the Nominal Line Level. In any case, the calibration points, including the limiter setting are shown on the individual mixer baseplate.

When interfacing to an analogue recorder with its typical slow overload characteristic, what is required is to place the mixer's Nominal Peak Level at the correct point which will ensure that the recorder will not be overloaded by a limited transient output from the mixer. Many analogue ENG recorders use VU meters, with which the Peak Level is off scale. The reference point we use, therefore, is the Nominal Line Level - the level to which the mixer's Line-Up tone is set. Experience has shown that most of the usual ENG recorders are calibrated so that their Nominal Line Level or OVU is only 6dB below the level at which distortion is beginning to increase. Accordingly, it has become the practice to adjust the recorder's gain control to place the mixer's Line-Up tone at -2dB on the recorder's VU meter. Some recordists prefer to go further and leave themselves a little more recorder headroom by placing the line up tone at -4dB on the recorder's meter.

Interfacing to a digital recorder with its much more sudden and unforgiving overload characteristic requires that the Nominal Peak Level of the mixer be placed below the peak level of the recorder. This is because the limiting, as carried out on the mixer assumes that the following recorder is tolerant of some degree of overload for periods up to 1ms, hence the emphasis on the measurement using a Peak Programme Meter in the paragraph above. Fortunately, digital recorders, because of their clipping characteristics, are almost always fitted with fast peak meters, reading on a sample by sample basis. It is easy to set the matching between the mixer and the recorder experimentally using limited transients such as sharp handclaps. Typically, the Line-Up tone should be placed 12dB below the allowed peak level.

6. MONITOR RETURN INPUTS

The **SQN 4S_mini** features twin auxiliary inputs on its Multi-way main I/O connector [A] which are intended to accept a return signal from whatever recorder the mixer is feeding. The input sensitivity is set by adjusting the screwdriver-operated potentiometer marked [RET] recessed into the left hand side panel of the mixer. It can usually be fixed with sufficient accuracy by ear by operating the [MIXER / RET] switch situated above the [PHONES] switch to and fro with the line-up tone on and adjusting for parity of loudness. This feature allows before/after comparison of off-tape monitoring, or when used with a recorder that lacks off tape monitoring, it can be used as a check that mixer outputs are at least reaching the recording inputs. The [MIXER / RET] switch affects only the headphone signals.

There is an additional sensitivity switch for each channel of the monitor return inputs, accessible by removing the baseplate. These slide switches, located on the vertical board, allow the sensitivity to be reduced by 10dB for use with recorders having line-level returns.

Almost all ENG recorders feature an 'Earphone Monitor' output on a 3.5mm jack, intended for the cameraman's use and the practice has grown of using it for audio confidence monitoring. This jack can be used by the SQN-RTS recorder interface cable (aka 'tails') for monitoring a single selection of Left, Right or Left + Right, by use of the recorder monitoring switches. Separate tracks may be monitored where the recorder is fitted with a 3-pin or 5-pin XLR connector by using an SQN-RTS/3 or -RTS/5 recorder interface cable. Cable looms SQN-BLT and SQN-BCT incorporating screened quad stereo pairs in a single flexible cable of only 7mm diameter have been developed at SQN for use in connecting such recorders with the Main I/O [A] of the **SQN-4S_mini**.

7. MICROPHONE / LINE LEVEL INPUTS

The XLR-3F input connectors conform with the IEC standard (Pin 1 Ground and Pin 2 In Phase).

CHANNELS 1 & 2 The SQN-4S_mini is designed to accommodate all professional microphones and assumes a source impedance in the range 150-600Ω. It is outside the scope of this manual to describe in any detail the various types of microphone which may be employed, but the type will determine the settings of switches set into the baseplate of the mixer. Whilst the **SQN-4S_mini** has sufficient current capacity to supply any make of condenser microphone, the use of microphones which have a particularly large current drain with battery-powered equipment will need careful consideration. Some marked improvement in performance or special tonal characteristic should be required as compensation for the reduced battery life when using internal batteries.

The primary purpose of the Microphone Attenuators [ATTEN] is to provide a rough level match between the input signals from microphones of varying sensitivities so as to allow comfortable handling of the gain controls. The 'attenuators' are, in fact, switched gain controls so that there is no need to fear a worsening of noise performance from their use. Note: any measurement of noise in the microphone amplifier requires that the input be loaded with a 200Ω resistance.

It is, of course, not good practice to rely on attenuators (or gain controls) when using sensitive condenser microphones close to loud sounds, such as motor sports or pop music, since such signals may well overload the microphone's own first stage. The ambient noise level may even prevent this being heard on your headphones. Dynamic microphones may be more appropriate.

Rotary faders were selected for the **SQN-4S_mini** because of their inherently better environmental sealing and because they provide more mechanical movement in a small space than a slider. The specially designed control knobs incorporate some of the advantages of the slider in that they can be pushed from the side and their position is unequivocally seen and felt. Turning over a wide arc is achieved with the tip of the finger or thumb resting on the point of the arrow design.

CHANNELS 3 & 4 These channels are intended to work with self-powered microphones, in particular Radio Microphones. They have no powering, a 10dB lower gain than the primary channels, a single step of attenuation and a single step of bass cut. In effect, they will behave as the primary channels with attenuations 2 & 3.

ALL CHANNELS All channels can be switched to balanced LINE LEVEL. The attenuator and fader controls operate as before.

8. DIRECT OUTPUTS

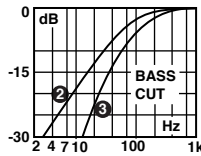
Direct outputs from all four channels are available at pre-fader level from the XLR-7M socket on the connector panel. If preferred the mixer can be ordered with these outputs at post-fader level.

9. MASTER GAIN CONTROL

The Master fader, located on the connector side panel controls the gain of the two output channels simultaneously. There is a reserve of gain of 3dB above the 0dB calibration point (which is located by a mechanical detent), so that this control can be used to raise the overall level of a mix as well as to fade in and out.

10. BASS CUTS

A Bass Cut switch for each of channels 1 & 2 is situated next to its fader allowing for bass attenuation of the signal with cutoff frequency that depends on the setting as shown in the accompanying graph, reproduced from the base label. These are employed for a variety of purposes, such as reduction of 'boominess' in hard or 'live' acoustic locations, or from deep voices, as well as reducing extraneous traffic rumble, 'mains hum' from electrical appliances and so on. Perhaps the most common use for bass cuts is to assist in the reduction of wind noise outdoors, but a suitable windgag on the microphone will also be essential.



Bass cut switches for channels 3 & 4 are situated on the bottom plate of the mixer. These bass cuts have two positions: off and the curve at position ③ of the graph.

11. AUDIO LEVEL METERS

The basic type of metering employed on the **SQN-4S_mini** is the Peak Programme Meter (PPM). This was chosen as providing the maximum information about the relationship between the signal level and the overload point of the recorder. Admittedly, peak meters do not necessarily give a true representation of the loudness of the signal and some recordists prefer the VU type of meter which we can also provide. The meters can only give a useful indication of the recording level when the combination of mixer and recorder has been calibrated. Each meter is permanently illuminated while the mixer is switched on, allowing operation in dim light. The illumination requires minimal current from the batteries.

For those unfamiliar with the BSI (BBC style) PPM scale, the intervals between scale graduations represent a 4dB difference, so that with the nominal Line Level (0dBu) represented by 4, the nominal Peak Output Level of the mixer (+8dBu) occurs at 6 on the scale. This 'Nominal Peak' is a simplification of the arguments, since in practice the BBC has adopted various preferred peak levels for different sound sources and even individual musical instruments. Other PPM scales have not followed the BBC design and are all expressed in decibels, which makes them more readily intelligible. They also usually feature a TEST arrow at 0dBu (0.775V) for calibration purposes. The 'nominal peak' level referred to above tends to be seen as +6dB where the scale is calibrated in 3dB steps (e.g. the 'Nordic Norm' pattern adopted by the Scandinavian Broadcasting Consortium) or +8dB where calibration is in 4dB increments (e.g. the SMPTE 'preferred' scale published in 1989 where this peak level is scaled as '0').

VU meters also vary in their calibration. The original VU measured zero at zero dBm in a 600Ω system. Modern practice, based originally on the improved high level performance of analogue recording tape, is to place zero VU at +4dBm. Either calibration can be provided and will be noted on the mixer baseplate.

12. OUTPUT LIMITERS

Location recording frequently puts the recording engineer in a situation in which he or she has no control over the ambient sound level. Accordingly, the **SQN-4S_mini** has been provided with a pair of output peak limiters that may confidently be employed at all times. Coming into operation just below peak level, they accommodate overloads of up to 20dB with an attack

time-constant of half a millisecond and a release time of 100ms.

Peak limiting is an extremely non-linear process that relies on the 'masking' characteristics of the ear to render the effect essentially inaudible when executed properly and used in moderate amounts. It is bad practice to make a habit of 'riding' the limiters: the LEDs should only light on the occasional unexpected peak if the levels are correctly set. Allowing the limiters to be operated by low frequency or sub-audio rumbles may produce apparently random audible clicks. The bass cuts should be used to remove such signals so that the limiters are operated only by signals in the wanted audible range.

The limiters are actuated by a switch [LIM] on the front panel and in the [M]ono position each output channel is separately limited, with actual limiting being indicated by an LED for each channel, placed between the meters. With stereo recording, limiting can introduce a further problem since, if only one channel of a stereo pair is subjected to limiting, the effect is to shift the stereo image. The [LIM] switch, therefore, has a third [S]tereo position in which the degree of limiting is governed by the higher of the two output channel levels. This setting should be used when the mixer output is stereo, of either type AB or MS.

13. MONITORING HEADPHONES

The quarter inch jack [PHONES] of the **SQN-4S_mini** will accept any standard stereo plug. Headphones of any impedance may be employed although impedances of around 25-200Ω will make best use of battery power. For location work, it is advisable to employ headphones with good ear sealing even though they can be uncomfortable when worn for long periods of time. Increasing the headphone level to drown the directly audible sound in noisy situations could prove fatiguing or even damaging to the hearing in the long term, particularly if the limiters are not used. The control knob on the left hand side panel allows the headphone output level to be adjusted.

A rotary [PHONES] switch on the front panel allows the operator to select various sources for the monitored signals, including the output of an MS matrix which will allow an MS signal being output from the mixer to be monitored as the equivalent AB signal. This switch has the following functions.

- S** Stereo
- R** Right Channel
- L** Left Channel
- MS** MS Matrix (MS heard as AB stereo)
- L+R** Sum of Left & Right Channels
- O** Mute

Below the rotary [PHONES] switch is a three position toggle switch which allows the selection for monitoring of the mixer output [MXR], the return signal from the recorder [RET] or a pre-fade listen signal from channel 4 [PFL4].

14. SLATING MICROPHONE

A microphone is mounted behind the front panel near the centre of the mixer. This microphone, brought into use by moving the [T/MIC] switch on the front panel to the right, is intended for recording identification announcements and slating marks on the output channels. The output of the microphone is levelled by a compressor and overrides the main audio, appearing on the mixer outputs and in the monitoring system. If the monitoring mode is set to [RET] at the time the switch is operated, it automatically reverts to the internal or [MXR] setting. This is so that the recordist, if working with a recorder equipped with off-tape monitoring, will not have to talk over a delayed version of the announcement. The inclusion of the compressor means that a usable recording can be made by speaking in a normal voice over a range of 1.5m to 250mm from the mixer, depending upon the ambient noise level.

15. MIXING & MATRIXING CONTROLS

The **SQN 4S_mini** is intended to work in various modes and particularly to accommodate the use of Mid-Side microphones and Mid-Side recording. The CH1/CH2 pair is treated as a potential Stereo Channel, with or without MS matrixing. This is in addition to the usual routing of individual channels to either output.

CH1 & CH2

The operation of the CH1/CH2 pair is controlled by the [GANG 1–2] and [INV2] switches as follows:

TWIN MONO with the [GANG 1–2] switch at [0]. The CH1/CH2 faders operate independently. The routing switches on the right hand side (routing) panel of the mixer can direct the signals to either or both of the two mixing busses.

STEREO with the [GANG 1–2] switch at [S]. The input and output from the pair are treated as an AB stereo signal. The gains of both channels are controlled by the CH1 fader. The channels should be routed: CH1 to Left, CH2 to Right. In this mode the CH2 fader must be set to maximum [0] or the CH2 signal will be attenuated.

MS USE of the STEREO MODE: If an MS signal is passed through the mixer with the [GANG 1–2] switch at [S], the CH2 fader can be used as a width control.

MID-SIDE with the [GANG 1–2] switch at [MS]. The input to the pair is treated as an MS stereo signal which is matrixed into AB stereo. The gains of both channels are controlled by the CH1 fader. Both input channels should be routed to both output channels (routing switches centred). The CH2 fader acts as an MS width control by altering the relative level of the CH2 side signal: a setting of 10 will give a relative level of 100% or normal width.

Selecting [MS] introduces an inversion into the signal from CH2 sent to the Right output. When both channels are routed to both output channels (switches centred), the outputs are:

$CHL = CH1 + CH2$
 $CHR = CH1 - CH2$ which are the conditions for matrixing MS to AB

The [INV2] switch acts on CH2, independently of the settings of the other switches. When it is moved downwards, it inverts the phase of the signal. This has the incidental effect of interchanging left and right in an MS encoded input. This can be useful when the MS mic is rigidly fixed to a boom and rotated from being above the subject to below, when left and right will become interchanged.

CH3 & CH4

The controls available for the CH3/CH4 pair are the routing switches on the right hand side panel of the mixer. These allow either of the channels to be routed directly to either or both output channels.

16. MULTI-WAY I/O CONNECTOR WIRING

MAIN IN/OUT [A]		POWER THROUGH [PT]	XLR-7M OUTPUTS	
A Live	} Balanced Output CHL	1] External Power Out	1. Ground	4. CH1 pre-fade
B Return		2] Negative (-)	2. CHL	5. CH2 pre-fade
C Live	} Balanced Output CHR	3 Not Connected	3. CHR	6. CH3 pre-fade
D Return		4 Ext. Pwr. Out Switched (+)		7. CH4 pre-fade
E Live	} Monitor Return Input CHL			
F Return				
G Live	} Monitor Return Input CHR			
H Return				
J Gnd	L Unbal. Output CHL	POWER INPUT [DC]		
K Gnd	M Unbal. Output CHR	1] External Power In and		
		2] Internal Cells Out Neg. (-)		
		3 Internal Cells Out Pos. (+)		
		4 External Power In Pos. (+)		

17. CONNECTOR LIST

Manufacturers part numbers for connectors to mate with those on the mixer:

MIXER CONNECTOR	MATING CONNECTOR	MANUFACTURER
MAIN I/O [A]	PRC05P12M	Tajimi
POWER I/O [DC] & [PT]	HR10A7P4P	Hirose
INDIVIDUAL CH. OUTPUTS	XLR-7F	Cannon, Neutrik etc.

18. WARRANTY & SERVICE

- The **SQN-4S_mini** is guaranteed for a period of 24 months from the date of purchase. This guarantee covers defects in manufacture, workmanship and materials and includes the cost of parts, labour and return carriage.
- In order to make a claim under this guarantee, the equipment should be returned to SQN Electronics Ltd either directly or through the retailer from whom it was purchased, accompanied by both the original invoice (or a copy) showing the date of purchase and a statement giving a clear description of the fault
SQN Electronics Ltd regrets that it cannot be held responsible for any loss or damage to the equipment while it is in transit from the customer and it will be the responsibility of the customer to ensure that it is properly packed and insured. Nor can SQN Electronics Ltd be responsible for any costs incurred by the customer in sending the equipment, unless by prior agreement.
- SQN Electronics Ltd will examine the equipment and, if a fault is found which is caused by a defect in manufacture, workmanship or materials, SQN Electronics Ltd will repair the fault free of charge.
SQN Electronics Ltd reserves the right to replace equipment with that of a similar kind and/or value where it has been discontinued or is considered to be uneconomic to repair.
- SQN Electronics Ltd gives no other warranty than that contained in this guarantee. It is therefore recommended that the user acquires familiarity with the equipment as detailed in the Operating Instructions & Reference, carries out a full function check and makes a test to confirm the status of the equipment before commencing any important work.
- SQN Electronics Ltd shall not be held responsible for any losses or damage of any kind, whether direct or consequential, arising from the use or misuse of the equipment or by reason of its being out of service either through a claim being made under this guarantee or otherwise.
- This guarantee may become invalid should the equipment be found to have been:
 - * misused, damaged or rendered inoperative by use contrary to the Operating Instructions & Reference delivered with the equipment
 - * dismantled by any third party
 - * neglected
 - * altered from its original specification without the prior written agreement of SQN Electronics Ltd.
- This guarantee shall be void if the equipment has been:
 - * damaged by impact or dropping
 - * damaged by water or other liquids
 - * damaged by sand or moisture
 - * mishandled or tampered with
 - * damaged by leakage from batteries.
- Any retailer or distributor supplying the equipment is not acting as a legal agent for SQN Electronics Ltd and has no authority to vary the terms of the guarantee on our behalf.

19. Technical Specification

Mixer Inputs CH1 & CH2	Transformerless balanced inputs using standard Cannon XLR-3F connectors. Each channel is switchable for: 1. Selection: a) 48V Phantom b) Dynamic (150 to 600Ω) c) Line input 2. Attenuation: 0dB, −10dB or −20dB 3. Bass Cut: Flat, −6dB or −12dB at 50Hz		2) Stereo [S] Channels ganged. CH1 & CH2 gain stages are controlled by the CH1 fader. The CH2 fader acts as an attenuator and its maximum clockwise rotation yields a 1:1 relationship with CH1. Stereo output requires routing CH1 to LEFT and CH2 to RIGHT. 3) Mid-Side [MS] Channels ganged. CH1 & CH2 gain stages are controlled by the CH1 fader. The CH2 fader acts as an attenuator or 'image width control' and its maximum clockwise rotation yields a 1:1 mid to side relationship. Stereo output requires routing CH1 & CH2 to BOTH (routing switches centered). Note: the CH2 right output feed is phase inverted relative to the left output feed.
Sensitivity	−78dBu for nominal line level (PPM4, 0VU) with the channel gain at maximum and the master gain at 0dB		
Max Level, Mic Inputs	−20dBu (+4 dBu with full attenuation)		
Line Level	Line Attenuation is 40dB before the mic preamp.	Phase Switch	Channel 2 can have its phase inverted by means of a switch [INV2] on the right hand side panel. Note: this has the incidental effect of interchanging left and right in an MS encoded signal.
Noise Figure	−130dBu (A weighted) from a 200Ω source.		
Mixer Inputs CH3 & CH4	Transformerless balanced inputs using standard Cannon XLR-3F connectors. Each channel is switchable for: 1. Selection: a) Dynamic (150 to 600Ω) b) Line input 2. Attenuation: 0dB or −10dB 3. Bass Cut: Flat or −12dB at 50Hz	Channels 3 & 4	Each channel can be routed to LEFT, RIGHT or CENTRE.
		Master Gain	The master gain control is located on the left hand side panel. It controls the level of all four channels. It is normally placed in its detented calibrated position and provides a reserve of 3dB extra gain above this setting.
Sensitivity	−68dBu for nominal line level (PPM4, 0VU) with the channel gain at maximum and the master gain at 0dB	Monitor Return Input	Balanced inputs with a range of sensitivity from −20dBu to +20dBu for loudness parity with the internal monitoring. The sensitivity is adjusted by a screwdriver preset on the left hand side panel.
Max Level, Mic Inputs	−20dBu (+4 dBu with full attenuation)		
Line Level	Line Attenuation is 40dB before the mic preamp.	Balanced Outputs	Two line driver amplifiers provide balanced outputs to the Main I/O Multi-way connector.
Noise Figure	−126dBu (A weighted) from a 200Ω source.	Output Attenuators	The level at the Multi-way connector may be attenuated by 50dB to provide a nominally microphone level feed.
Frequency Response	20Hz to 20kHz +0, −1dB, referred to 1kHz.	Line Drivers	Electronically balanced quasi-floating sources with a clipping level above +20dBm into 600Ω. Distortion at the nominal peak level of +8dBm is less than 0.01% with a 600Ω load 20Hz to 20kHz. The output resistance is 75Ω. The outputs may be connected to unbalanced loads if required.
Crosstalk	Isolation, channel to unrelated channel: 75dB at 1kHz, 60dB at 15kHz.		
Channel Configuration	The routing arrangements for CH1 & 2 differ from those for CH3 & 4.		
Channels 1 & 2 [GANG 1–2]	The operation of the CH1, CH2 pair is controlled by the GANG 1-2 switch on the front panel. This switch has three positions: 1) Twin MONO [O] Channels unganged. Each input can be routed to either or both of the output channels.	Unbalanced Outputs	1) the 3,5mm stereo socket [UB] carries a separately buffered output of the mix at a line level of −10dBV 2) an XLR-7M socket carries an output of the mix as above and also direct outputs of all 4 channels at pre-fader level (post-fader to special order).

Meters	Twin peak reading, logarithmic level meters with Peak Programme Meter (PPM) dynamics. Scaling may be BBC PPM, Nordic Norm, or SMPTE. VU meters can also be provided. The meters are normally calibrated with the mixer driving a bridging load of 10kΩ. While the mixer is operating, the meters are illuminated by low power light emitting diodes.	Pre-fade Listen	An extra position [PFL4] on the monitoring source selector switch selects Pre-Fade Listen for channel 4.
		Slatting Microphone	A microphone is mounted behind the front panel near the centre of the mixer. When in use, the output of the microphone is levelled by a compressor and displaces the normal audio, appearing on the mixer outputs and in the monitoring system. While the microphone is active, the monitoring mode automatically reverts to the internal or [MXR] setting. The Slatting Microphone switch on the front panel is a three position toggle, shared with the Line-up tone.
Line Output Level	The nominal line level is normally set at 0dBu for PPM metered mixers and +4dBu for VU metered mixers. Peak level, which is used as a reference for the limiters, is considered to be 8dB above this setting. Other calibration levels are readily available to order.		
Output Limiters	[O]ff [M]ono [S]tereo (ganged) Attack time constant 0.5ms, release time 100ms. Limiter range is 20dB. An LED for each output channel indicates limiter action.	Batteries	Six AA size cells in a quick-change compartment. The acceptable range of voltages is 5 to 18 Vdc allowing the use of most cell technologies.
Line-up Tone	The Line-up tone is a sine wave at 1kHz with distortion below 0.1% which is inserted into both channels, displacing the audio output. When the [GANG 1–2] switch is in either of the ganged positions, the left hand channel tone is interrupted for 250ms every 3s. The tone switch on the front panel is a three position toggle, shared with the Slatting Microphone.	Battery Test	The right channel meter has a suppressed-zero battery voltage scale, selected by a front panel push button.
		External Power	A supply in the range 5 to 18 Vdc may be used. Consumption will be 2.2 watts maximum. The input terminals float with respect to ground. Either or neither side may be grounded at will, thereby allowing the use of floating supplies or grounded supplies of either polarity. There will be no possibility of hum-loops being formed.
Monitoring	Amplifiers with adjustable gain capable of driving most types of headphone to a suitable level. Headphones with a resistance of around 25-200Ω per side will make best use of battery power. Pre-Fade listening to input Channel 4 is possible. As MS matrixing of the two output channels is also possible, an MS recording may be monitored as the equivalent AB stereo. The headphone gain control is on the left hand side panel. Please note that with some sets of headphones damage to the hearing may be possible if the phones gain is habitually set too high.	Temperature Range	The mixer is designed to work over the temperature range of −20 to +60 °C.
		Dimensions	The dimensions of the mixer case are: Height 44mm, Width 210mm, Depth 120mm.
		Weight	The weight of the mixer without batteries is 1.1kg
Monitoring Mode Selector	The monitoring mode rotary selector switch on the front panel [PHONES] has the following functions. S Stereo R Right Channel L Left Channel MS MS Matrix (MS heard as AB stereo) L+R SUM of Left & Right Channels O Mute		
Monitoring Source Selector	A front panel toggle switch selects the monitoring source as either internal [MXR] or external [RET]		