SQN-3M Users handbook

1. INTRODUCTION All of the information necessary for a recording engineer to operate the SQN-3 Miniature Mixer is permanently displayed on its baseplate and cannot be lost. In seeking to amplify certain points in this manual we apologise in advance to those whose training or experience has rendered such explanations superfluous, but they often stem from enquiries the manufacturers have received.

Notable features of the SQN 3M are:

- Three MIC input channels with 48V or Tonader powering, individually switchable
- Each channel switchable to line.
- A fourth dedicated Line input
- A 1 kHz line-up tone.
- A choice of Peak or VU metering.
- A slating mic with automatic gain control.
- Pre-Fade Listening to Channel 3.
- A high quality peak limiter, modelled on that fitted to the SQN IVe.

The SQN-3 achieves an extremely low noise performance which equals or surpasses the standards commonly achieved by studio desks. This large signal-to-noise ratio enables the SQN-3 to be used in any situation and with digital recorders and the highest quality of microphone without any fear that the mixer could restrict the overall results obtainable.

2. POWERING

1. Internal Batteries

   The SQN-3 should be powered by 6 Mallory Type MN1500 alkaline batteries (or equivalent AA size alkaline cells). The quiescent consumption of the mixer is 75mA and with dynamic microphones at least 12 hours' continuous operation can be expected from fresh cells.
   Alternatively nickel cadmium or nickel metal hydride accumulators may be employed for maximum economy, and can be recharged in situ via Pins 2(-) and 3(+) of the 4-way Hirose socket by connecting a suitable constant current trickle charger. Battery removal and replacement is in any case very rapid if the cells have to be removed for recharging. Accumulators fitted with solder tags are unsuitable for this equipment.
   The use of ordinary carbon zinc batteries, which may leak and cause extensive damage, is NOT recommended. In any case in the SQN-3 they give a small fraction (about one fifth) the life of alkaline cells, so they are a false economy. If fitted in an emergency, it is MOST IMPORTANT they be removed immediately after use.
   Similarly any type of battery should be removed if the mixer is to be stored unused or

transported particularly by air.

To fit cells slide the battery door catch towards the front panel to release the door and insert two rows of three cells in series so that the lower hole has the positive poles facing the door and the upper hole the negative poles, as indicated on the door itself.

When operating from the SQN-3 battery supply, switch the POWER Selector Switch (top right on front panel) to 'INT' to power the mixer.

The Peak Reading Level Meter doubles as an accurate voltmeter for the power supply when the adjacent BATT. TEST push button switch is pressed.

The specially developed power supply of the mixer operates from a minimum of 4,8V , so it is possible to drive the mixer on alkaline cells, for instance, until they fail completely without the loss of microphone powering voltages. When batteries are failing, the headphone signal will distort before there is any degradation of the mixer output.

2. External Power Source

Any DC supply in the range 5 to 18V (1.5W minimum) can be connected to the SQN-3 Series 4000 via Pins 1(-) and 4(+) of its 4-way Hirose socket.
Any Nagra tape recorder, for instance, regardless of its chassis polarity can be used to power the mixer. The power input terminals float with respect to the SQN-3 ground, so a supply which does not share a ground with the SQN-3 may be used e.g. a camera battery.

The power supply input of the SQN-3 is protected against connection of an external voltage with reversed polarity. If it is desired to power the SQN-3 from an external DC supply at higher voltages than 18,5V reference should be made to the manufacturers.

To power the SQN-3 from an external supply the Power Selector Switch on the front panel must be switched to "EXT".

3. MICROPHONES The three identical microphone inputs are wired to conform with the IEC standard (pin 1 earth, pin 2 in phase and +ve for T powering).

The SQN-3 is designed to accommodate all professional microphones, and assumes a source impedance in the range 150-600 Ohms.

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 setting of the front panel Attenuator switches and the Mic. Power Selector switches set into the baseplate of the

SQN-3. While the SQN-3 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.

The primary purpose of the Mic. Attenuators is to provide a rough level match between the input signals of microphones of differing sensitivities, so as to allow comfortable handling of the gain controls. In the SQN-3, incidentally, this is not achieved by the usual method of introducing resistor pads into the circuit, which will produce as much noise from a costly capacitor microphone as from a dynamic type, but by altering the gain of the input amplifier.

It is of course, a dangerous practice to rely on attenuators (or gain controls) to achieve a signal reduction when using sensitive condenser microphones in proximity to loud noises, such as motor sports or pop music, since such signals may well overload the microphone's own first stage. In those conditions the ambient noise level can even prevent such a disaster being detected on your headphones. Dynamic microphones may be found more suitable in these situations.

Rotary faders had to be selected for the SQN-3 because of their proven sealed construction, but the specially designed control knobs incorporate some advantages of the slider in that they can be pushed from the side and their position is unequivocally seen and felt. The knobs cannot be gripped, and turning over a considerable arc is achieved with the tip of the finger resting on the point of the arrow design. A bass cut switch for each mic. channel is situated next to its gain control allowing for attenuation of the signal by 4dB with a 6dB per octave slope or 10dB with a 12dB per octave slope at 100Hz. These are employed for a variety of purposes, such as the reduction of 'boominess' in hard or 'live' acoustic locations or from male voices, as well as reducing extraneous traffic rumble, hum related to the frequency of the supply of 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 is also essential.

4. LINE INPUTS The fourth XLR-3 connector on the left hand side of the SQN-3 Series 4000 allows the connection of a balanced input over the range of -10dB to +20dB sensitivity. The input level is controlled by a small knob so labelled above the Cannon sockets. On a small microphone mixer like the SQN-3 the source for such a signal may be expected to be at a fixed level, such as the output from a radio mic. receiver or a public address system; hence this control is treated more as a pre-set. When this channel is unused set the control to zero to avoid the possibility of unwanted noise being generated.

Each MIC channel also has a slide switch on the baseplate which will add -50dB attenuation before the Mic input allowing the Mic channels also to be used for Line level signals, with the added refinement that the Attenuator and Bass Cut controls can still be employed if needed. Note that it is necessary to set the MIC POWERING to DYNAMIC when using the

channels as line inputs.

5. MONITOR RETURN INPUT The SQN-3 Series 4000 mixer features an Auxiliary amplifier for a balanced input (Pins B2 (earth), B4 (live) and B5 (return)) over the range -19dB to +11dB chiefly used for monitoring. The input level is set by adjusting the screwdriver-operated potentiometer recessed in the XLR-3 connector block and in the absence of instruments can generally be set with sufficient accuracy by ear when operating the Phones Mixer / Aux switch situated below the Master fader to and fro. This feature allows Before / After comparisons of off-tape signals, or, when used with a recorder which lacks off-tape monitoring , it can be used as a check that the mixer output is at least reaching the recorder input.

Many E.N.G. recorders feature an Earphone Monitor output on a 3.5mm jack intended for the cameraman's use, often with warning of tape end or other problems, and because it is fed from the recording head the practice has grown of using it for audio monitoring (confidence) even though this signal is usually degraded by time-code and noise reduction encoding and is an unbalanced signal of 8 Ohm impedance and very low level (typically -16dB). This may be connected to Pins B4 and B5 (without earthing). Interface leads are available from SQN which carry the audio feeds and monitoring return in a single flexible cable (6mm diameter in coiled or straight versions). Please refer to the manufacturer's current list.

The Phones Mixer / Aux switch only affects the headphone signal and has no effect on the SQN-3 output or metering.

If the Auxiliary Input is not being used, the more common 3-pin DIN connector may be used to take an output from Socket B.

6. MASTER GAIN CONTROL The Master fader not only allows the whole programme mix to be faded in or out but permits its level to be increased by up to to 3dB from the nominal setting.

7. LEVEL METER The level meter is of fast response peak reading design with a log calibrated linear scale, and uses full wave rectification.
Though the scale bears some resemblance to that used in VU meters, it should be noted that the meter characteristics are closer to those of a Peak Programme Meter with similar attack and decay times. 0dB on the scale represents peak level (PPM 6).

8. LIMITER The Limiter is of original design and may confidently be employed at all times,

since it gives rise to none of the undesirable audible effects, such as clicks and other extraneous noises often associated with such devices. Coming into operation just below peak level, it accommodates overloads of +18dB with an attack time of half a millisecond (100ms release time). A red LED below the meter lights when the Limiter is functioning. It should only flash on in the event of unexpected peaks and if it remains lit for most of the time, too high a level has been set; when 'riding' the Limiter in this way it would be too much to expect that its functioning will pass unnoticed as described above.

9. MONITOR HEADPHONES The SQN-3 is fitted with a 6.25mm stereo headphone jack able to accommodate Gauge A or B connectors, but unless specially ordered is supplied wired for a mono plug.

Headphones with impedance in the range between 50 Ohms and 1k Ohm may be employed. Those of lower impedance may not provide sufficient volume.
The control knob next to the Line Input control allows the output level to be adjusted over the range zero to 1.5V. As the SQN-3 is virtually noise free do not be tempted to set too high a level which will give undue emphasis to noise produced in the microphones themselves. The hissing noise heard on turning up a loaded microphone channel is of course generated by the microphone itself, not by the SQN-3 which merely amplifies it. Note that an input channel without an attached microphone will be extremely noisy. It is important to sure that the faders of all unused channels are at zero.

10. SLATE MIC The mixer now incorporates a slate or announcement mic with an automatic gain control. The microphone is placed behind the front panel between the TONE / MIC switch and the CH2 Fader. It is activated by pressing the TONE / MIC switch to the right. The mic output replaces the main audio. The switch is biased to return to the off position when released. If the monitoring is switched to external, it is automatically returned to internal while the slate mic is active. This is so that the recordist will not be troubled by having to speak over a possibly delayed off-tape monitoring of his voice.

11. PRE FADE LISTENING A third sprung right hand position on the MXR / AUX switch allows Pre Fade Listening to Channel 3.

12. OUTPUTS The output amplifier of the SQN-3 has a clipping level of +18dB into 600 Ohm loads and over 20dB where the load impedance is higher which will usually be the case. This means that overload distortion is virtually impossible so far as the mixer is concerned. However the recordist must ascertain the relevant clipping level of the recording amplifiers into which the mixer output is fed and the relevant parameters for recording tape being used to know where he stands. If in doubt, use the Limiter.

Series 4000 SQN-3 mixers offer three different outputs, all of which can be used

simultaneously:-

1. Line Output 1
   A balanced line level output is constantly available from a standard male Cannon XLR-3M connector; Floating source with an output resistance of 160 Ohms.
2. Line Output 2
   Derived from Line Output 1 on pins B1 (live), B2 (earth) and B3 (return) of 5-way D.I.N. socket and with the same characteristics. This output may be switched to Mic. level (-50dB) to feed recorders or other devices lacking a satisfactory line input, by activating the toggle switch below the connector panel.
3. Line Output 3
   An unbalanced output of 8.2mV (at peak level) is available from a 3.5mm stereo jack accepting a mono or stereo plug, intended for feeding any ancillary equipment, such as cassette recorders used for transcription .

13. LINE-UP TONE Pressing the TONE / MIC switch on the front panel to the left (where it will latch) generates a 1. 1kHz tone for lining up external equipment at -8dB (=PPM 4) in accordance with standard practice in British broadcasting. In other territories or to special order this level may be pre-set differently (internal adjustment - see Service Data manual). When activated, the tone displaces the main audio..

14. OUTPUT CONNECTIONS With balanced and unbalanced outputs at line and mic. levels, there is scarcely any device which cannot be fed from your SQN-3. Possible modes of connection are as many and various as the types of equipment that require a feed. The manufacturers produce many types of standard interface ex-stock and can supply special looms to user's requirements.

15. SERVICE The SQN-3M is guaranteed to be free from defects in workmanship and materials for a period of 24 months following delivery from the factory. If any problem should be encountered during or after this warranty period, the owner is urged to return the mixer to the factory where it will receive prompt attention. This small instrument contains hundreds of components, the majority of which are on just two multi-layer PCBs. The scope for costly damage in the hands of the inexpert is therefore quite considerable, and if incorrect parts are substituted it is unlikely that the original specification will be maintained.

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16. HISTORY The SQN-3 was conceived as a 4-channel mono mixer for Kudelski's Nagra

SNN tape recorder by the design team which produced the original SQN-1 Control Unit for the SN in 1973. The SQN-3 intended for SN use was designated Type C (for Control Unit) and first appeared in June 1980. At the same time a mixer without SN controls - the Type M - was released for users of 1/4 inch Nagras and other recorders, since no portable mixer with the facilities and performance of the SQN-3 had previously been available. These models had a serial number commencing 1000 (SERIES 1000) and the SQN-3C continued unchanged until it was discontinued in September 1988.

In September 1981 the SQN-3 Type M was considerably modified to meet the growing needs of broadcast video users. This model (known as the SERIES 2000) with Serial Numbers commencing 2000 or 20000 remained in continuous production for exactly ten years with only small modifications in the light of continuing development.

The SERIES 3000 with Serial Numbers from 31000 was introduced in September 1991 and differed from the Series 2000 only in that the side connector panel was re-modelled to provide for a Cannon XLR-3 male output, with an unbalanced output available from a 3.5mm jack socket and the same 4-way Hirose powering / charging socket as our other mixers. At the same time the output mic / line level switch was moved to the baseplate and provision was made for Channel 3 to be switched to accept line inputs in situations where two had to be accommodated.

The SERIES 3000 (version II) with Serial Numbers from 34000 was introduced in January 2001. The internal electronics of this version were totally revised with the addition of extra functions while the mechanical construction remained the same and only the front panel appeared different. The limiter circuit was changed to be similar to that used in the current stereo SQN mixers. The meters were illuminated by light emitting diodes, giving a brighter light than the original glow tubes.
The added functions are:

- A slating mic with automatic gain control, activated by an extra position on the TONE switch.
- Pre-Fade Listening to Channel 3, activated by an extra position on the Phones MXR / AUX switch.
- A new limiter circuit, modelled on that fitted to the SQN IVe.
- From Serial No. 34200, all three Mic Channels could be switched to Line.

The SERIES 4000 (version III) with Serial Numbers from 35000 was introduced in June 2002. The modifications are:

- The channel attenuators have been moved to the front panel, making them more readily accessible.
- The rotary MIC POWERING selectors on the base have been replaced by slide switches. The 12V Phantom setting has been dropped.
- The MIC / LINE attenuator function, which was previously incorporated with the MIC POWERING has ben separated out onto a second slide switch per channel.