System 9098

Equaliser

by Rupert Neve the designer

AMEK

User Guide

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User Guide

Serial No: A | | | | | | |

IMPORTANT

For convenience, write your serial number in the box above and keep this guide in a safe place. The number can be found on the rear of the product and also on the Authentification Certificate.

This number MUST be quoted in all communications in order to obtain technical support and spare parts from either the factory or your dealer.

AMEK is a trading division of Harman International Industries Ltd.

Information contained in this manual is subject to change without notice and does not represent a commitment on the part of the vendor. AMEK shall not be liable for any loss or damage whatsoever arising from the use of information or any error contained in this manual or through any mis-operation or fault in hardware or software contained in the product.

It is recommended that all maintenance and service on the product should be carried out by AMEK or it's authorised agents. AMEK cannot accept any liability whatsoever for any loss or damage caused by service, maintenance or repair by unauthorised personnel.

Part No: MANRNEQ Issue 3

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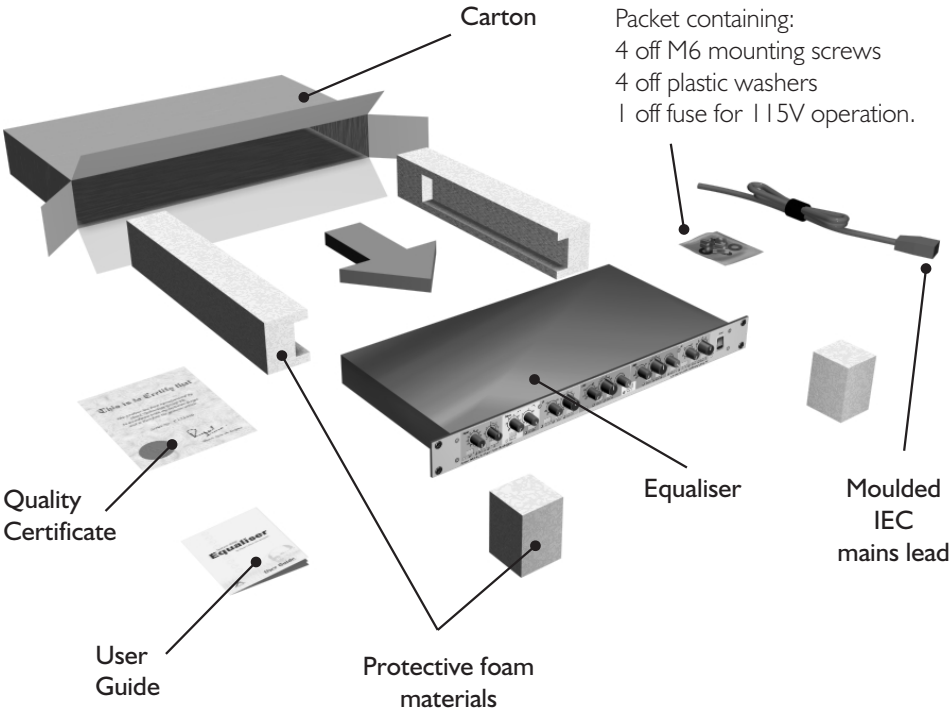
Contents

Unpacking

Check List

The following items are included with the product.
It is recommended that packaging materials are retained until all expected items are accounted for and found to be operating correctly.



Caution

For your own safety and to avoid invalidation of warranty, all text marked with these Warning Symbols should be read carefully!
Please keep this information!

Important information. Read this before proceeding.

Hazard or unsafe practice which can result in severe personal injury or death.

Cautionary Advice.

Important

Please read this manual carefully before connecting this apparatus to the mains for the first time!
Obey the following safety instructions. Read and understand these instructions before operating the apparatus or doing troubleshooting, testing, adjustments or repairs. Failure to comply with the safety instructions may result in personal injury.

Warning

To avoid the risk of fire, do not expose this unit to rain or moisture. Unplug this apparatus during storms or when unused for long periods of time.

Warning

Do not attempt to operate this apparatus with the top cover removed!

Caution

The apparatus will operate as a free standing unit without requiring any special cooling arrangement but should not be allowed to be accidentally or deliberately covered in any way. Do not obstruct the ventilation slots in the upper and lower surfaces.

Safety

Earthing

This apparatus MUST be earthed!
Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

115V/230V Operation

Before adjusting the operating voltage, always switch off the unit and remove the AC power cable!

To adjust the operating voltage, use a flat blade screwdriver to click the voltage selector across to the required position until the legend 115V or 230V appears in the window and fit the appropriate fuse supplied in the fixings pack.

Changing the Fuse

Before changing the fuse, always switch off the unit and remove the AC power cable!

Using a suitable flat blade screwdriver, press the fuse cap inwards gently and twist anti-clockwise to release the cap. Fit the new fuse to the cap and replace it in the fuseholder by reversing the procedure.

Caution

For continued protection against risk of fire replace only with same type fuse 200mA T (230V) or 400mA T (115V). Fuse types are 20mm anti-surge.

Ventilation

When mounting the apparatus, take care not to obscure the ventilation slots in the upper and lower surfaces of the case.

Maintenance

There are no user serviceable parts inside. Refer all servicing to qualified and AMEK approved service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally or has been dropped.

Mains Cable

The supplied IEC mains cable must be terminated correctly to the AC mains supply before use. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles and the point where they exit from the apparatus.

Use only an approved AC plug or power distribution device. The three cores are colour coded as follows:

Green/Yellow	=	Safety Earth
Brown	=	Live
Blue	=	Neutral

The Green/Yellow core in the mains cable is a safety ground and must be connected at all times!

Sécurité

Précaution

Pour votre sécurité et afin de ne pas interrompre la garantie il est important de lire attentivement les paragraphes marqués d'un symbole!
Conserver ce document!

Importante information. Priere de lire avant utilisation.

Hazadeuse ou dangereuse manipulations peuvent provoquées de graves blessures ou même la mort.

Note de précaution.

Important

Ce manuel est à lire attentivement avant de brancher cet appareil pour la première fois! Suivre les instructions de sécurité. Lire et comprendre ces intructions avant l'utilisation de l'appareil ou avant dépannage, essai, ajustement ou réparation. Ne pas se conformer aux instructions de sécurité peut provoquer de graves blessures.

Avertissement

Afin d'éviter un risque de feu, ne pas exposer l'appareil à la pluie ou à l'humidité. Débranchez l'appareil en cas d'orage éléctrique ou si l'appareil n'est pas utilisé pendant une longue periode.

Avertissement

Ne pas essayer de faire fonctionner l'appareil si le couvercle à été enlevé!

Précaution

Cet appareil fonctionnera de lui-même sans supplément de ventilation mais ne doit en aucun cas être recouvert, afin ne pas bloquer les fentes de ventilation inférieures et supérieures.

Terre

Cet appareil DOIT être branché à la terre !
Ne pas désactiver le système de sécurité de la prise polarisée ou la prise de terre. La prise polarisée à 2 contacts dont un plus large que l'autre.La prise de terre à 2 contacts et un troisième pour la terre. Le contact large et le troisième contact sont fournis pour votre sécurité. Si la prise fournie ne convient pas à votre prise de courant consulter un électricien afin de changer la prise de courant périmée.

115V/230V Fonctionnement

Avant le réglage du voltage, toujours éteindre et débrancher l'appareil!

Pour le réglage du voltage, utiliser un tourne vis à tête plate afin de déclancher le voltage sur la position choisie jusqu'à ce que 115V ou 230V apparaisse dans la fenêtre et mettre le fusible approprié qui se trouve dans le kit fourni.

Changer le Fusible

Avant de changer le fusible, éteindre l'appareil et enlever la prise d'alimentation!

Utiliser un tourne vis à tête plate, appuyer sur le capuchon du fusible doucement vers l'interieur et tourner dans le sens contraire des aiguilles d'une montre pour dégager le capuchon. Mettre le nouveau fusible dans le capuchon et remettre en place en faisant la procédure inverse.

Précaution

Pour protection soutenue contre risque de feu, remplacer seulement avec fusible de meme type 200mA T (230V) ou 400mA T (115V). Les fusibles sont de type IEC 20mm protection-surtension (pour fusibles).

Sécurité

Ventilation

A l'installation de l'appareil prendre garde à ne pas obstruer les fentes supérieures et inférieures de ventilation.

Entretien

Il n'y a aucune piece à l'intérieur de l'appareil que l'utilisateur doit toucher. Reporter toute revision/entretien ou réparation au personnel qualifié de AMEK. Une revision est à faire lorsque l'appareil a été endommagé ou lorsque la prise où le cable d'alimentation ont été endommagé, lorsqu'un liquide a été répandu où un objet est tombé sur l'appareil, lorsque l'appareil a été exposé à la pluie ou l'humidité ou ne fonctionne pas normalement ou est tombé.

Cable de Secteur

Le cable de secteur IEC fourni doit être correctement au cable d'alimentation avant l'utilisation. Protéger le cordon d'alimentation afin d'éviter qu'il soit piétiné, écrasé ou pincé, en particulier au niveau des prises de courant, des fiches femelles et des points de sorties de l'appareil.
Utiliser seulement une prise de courant conforme. Les 3 cables à l'intérieur du cable d'alimentation sont de couleurs suivantes:

Vert/Jaune	=	Prise de Terre
Marron	=	Phase
Bleu	=	Neutre

Le cable vert/jaune à l'intérieur du cable d'alimentation est la sécurité terre et doit être toujours connecté!

Installation

Location

This product is designed and screened to minimise internal electromagnetic emissions and provide immunity to external electromagnetic fields.
To reduce the risk of performance degradation due to external interference, do not site this unit close to sources of strong magnetic fields such as power supplies, power amplifiers, loudspeakers etc.

Rack Mounting

This product is designed to be rack mounted using the screws and washers supplied to help preserve the finish of the facia panel.
The facia graphic layer is under-surface printed to provide a robust hard wearing surface designed to last the life of the product in virtually any operating environment. Failure to use the supplied fixings may result in damage to the facia surface which can invalidate the warranty.
It is recommended that additional rack-mount side supports are used in conjunction with the facia panel fixings, particularly when the unit is mounted in a flite case or vehicle where vibration and transit shocks can be expected.

Powering up and Clicks

Clicks may be heard from in/out switches when the product is powered up, these will dissipate after approximately 10 minutes. This is perfectly normal.

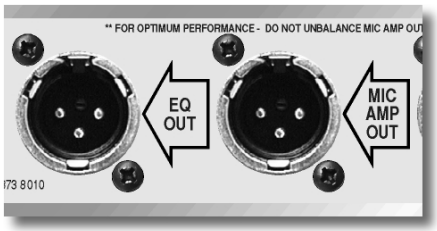
Cleaning

The product should be cleaned with a soft brush around the controls. If the facia becomes dirty, use a damp cloth with a little household soap to remove the dirt. DO NOT use solvent cleaners under any circumstances or the facia may be permanently damaged and warranty invalidated!

Audio Connections

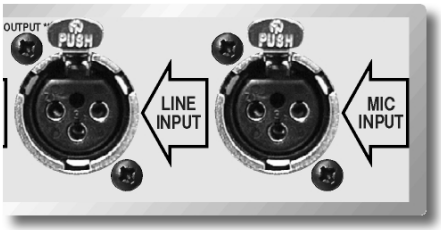
Inputs

The Mic and Line inputs are electronically balanced via standard 3 pin XLR female connectors and use Rupert's TLA (transformer-like-amplifier) principle which emulates the useful operating characteristics of a transformer. For best performance, balanced operation is recommended.



Outputs

The Mic amp and EQ outputs are both balanced via standard 3 pin XLR male connectors. The Mic amp is electronically balanced whilst the main EQ output uses a transformer.



Insert Point

To create the effect of an insertion point between the Mic amp stage and the main EQ, select LINE which routes the Line amp directly to the EQ. The dedicated Mic amp output can now be used as an insert send with the return signal fed into the Line amp.

Earth Link

The CHASSIS GROUND post is internally connected to both the case and the safety earth. If the link is removed for technical reasons (such as earth loops), then the ANALOGUE GROUND post must be wired separately to the installation technical earth point.

Overview

by Rupert Neve

The SYSTEM 9098 EQ uses the same basic circuit configurations that have been successful over many years. New amplifying devices and better quality components result in lower noise, lower distortion and the ability to handle higher frequencies.

All my original equalisers were based on Class A circuits which used the linear portion of the amplifier characteristic resulting in small amounts of second and third harmonic distortion which do not cause harsh sounds. Unfortunately, Class A amplifiers are inefficient, run at high current and produce heat.

Class B or Class AB circuits consist of symmetrical amplifier pairs so arranged as to cancel out much of the inherent non-linearity producing higher output with less heat. Their efficiency makes them very desirable for use where many amplifiers must be housed within a small volume. Most of the well-known Integrated circuits fall into one of these categories.

The two amplifier curves of the symmetrical Class B amplifier do not fit exactly together resulting in a kink or discontinuity. This produces a “spike” and high order distortion of an audio signal i.e. harmonics above the second and third. Negative feedback is often not very effective in reducing this type of distortion, which is particularly unpleasant to the ear.

The reason for this lies in the fact that many of the harmonics introduced by the “crossover spike” or switching click are not related to the music content of the signal. The SYSTEM 9098 EQ makes use, where possible, of integrated circuits which are so designed as not to produce crossover distortion.

Where more power is required, I have used a biasing circuit which provides much of the Class B efficiency with a Quasi-Class A performance. At a number of points, discrete transistors have been used to further extend the IC performance. The result is an equaliser which has the solidity and sound of Class A without the cost, heat and weight penalties.

We have also left behind cumbersome and expensive hand cabling, noisy connectors, heavy separate power supplies and the assembly techniques which contribute nothing but nostalgia and add nothing to the performance. Apart from the robustness, repeatability and reliability, we have now achieved AFFORDABILITY!

The frequency range has been extended to be effective well above the conventional audio band. Professional audio engineers have known for many years that the sonic quality of audio equipment does not appear to relate fully to the technical specifications. Human hearing demonstrably cuts off somewhere below 20kHz so for most of us and for a time, it seemed to make sense that our equipment should cut off there too. More recently, research has shown that the experienced listener is right and it has been positively established that equipment which can faithfully handle signals well above 20kHz gives a greater sense of enjoyment and fullness. These are qualities we would have associated with mid and lower frequencies.

It seems that the presence of these super high frequencies, provided that they actually occur in the original acoustic sound, can influence the way we hear sound within the traditional hearing band. Even if the out-of- band frequencies are severely attenuated, the effect is worthwhile.

The HIGH FREQUENCY control is therefore designed to peak above 20kHz and can give a scintillating quality to the sound. Although extreme HF response is desirable, out-of-band signals must be free of self generated noise and distortion. If the input signal contains unwanted noise, typically produced by digital processing, the LOW PASS filter can be a valuable tool! It's turnover frequency range extends as high as 30kHz in order to remove inaudible distortion and processing products which might otherwise affect the way we hear music within the conventional audio band. The lowest frequency on the HIGH PASS filter is 20Hz.

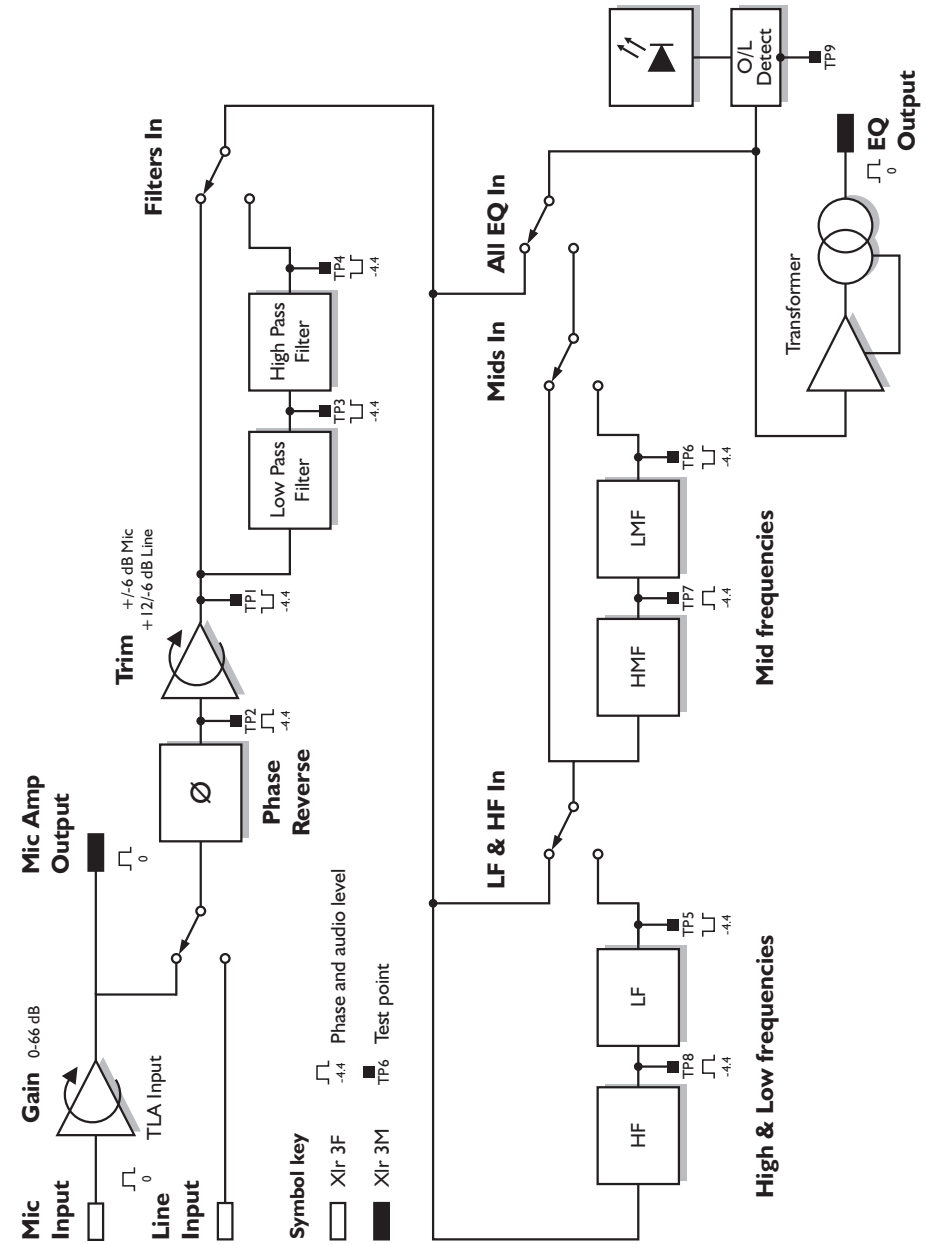
Below this there is virtually nothing musical but the filter does let you remove any very low frequency building rumbles or other unwanted low frequencies. The upper end of its range can be helpful in removing a great deal of the spill from adjacent low frequency instruments in multi-track work. The low frequency section is one of the most important tools in the equalisation toolchest.

In the more extreme settings, dramatic effects can be imparted to the kick drum for example and many famous recordings bear testimony to it's effectiveness. At the other extreme it is also possible to provide the most subtle warming of the signal without otherwise affecting its naturalness. The circuitry has very low basic phase shift imparting a very "solid" quality to the sound and this make a relatively small amount of equalisation very effective.

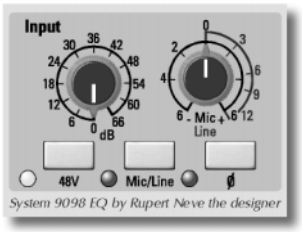
My traditional equaliser curves are steep-sided, providing very powerful tools. GLOW changes the curve shape to provide greater or less warmth, altering the overall sound without changing its character. The HF SHELF function raises or lowers the whole range of frequencies above the turnover frequency and can subtly alter the tonal balance without altering the relationship of the higher harmonics. If the PEAK function is selected, the fairly steep slopes of the equalisation curve can alter the nature of an instrument by changing the relationship of harmonics to the fundamental.

The overlapping mid range sections of the SYSTEM 9098 EQ are very powerful and much more flexible than previously, enabling the frequencies specific to a musical instrument to be raised or lowered. On the other hand, a broad bandwidth may be selected to adjust the tonal balance. SHEEN changes the curve shape to provide an alternative balance which can alter the overall sound without changing its nature whilst providing that "old-fashioned" character.

Block Diagram



Operational Guide



Mic Input

The high quality Mic amplifier uses the TLA (transformer-like-amplifier) concept and is capable of output levels greater than +25dBu. The gain range is from 0dB to 66dB in 6dB steps using a rotary switch.

This wide dynamic range allows the Mic amp to easily accept low levels from sensitive microphones and high levels from close-miking techniques without the use of passive pad networks.

Phantom Power

A phantom power (+48V DC) switch is provided for use with condenser type microphones. When selected, phantom power appears only on the Mic input XLR connector.

Fine Trim

The fine trim control provides a continuously variable +/- 6dB adjustment around the current setting, effectively extending the overall range to a possible 72dB.

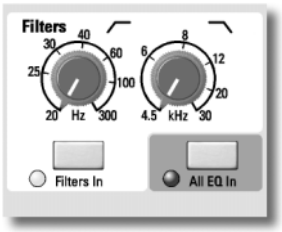
Inputs

Line Input

When switched to Line operation, the stepped gain control is not used and the fine trim variable gain range changes to -6dB to +12dB using the secondary blue scale.

Phase Switch

The Phase switch operates after Mic/Line selection allowing phase inversion of the incoming signal from either input to the EQ stage. It has no effect on the dedicated Mic amp output.



Filters In

Both filters are switched in simultaneously.

High Pass

The High Pass filter operates over a frequency range of 20Hz to 300Hz with a slope of 18dB/octave allowing the removal of unwanted low frequency noise components such as rumble and hum.

Low Pass

The Low Pass filter operates over a frequency range of 4.5kHz to 30kHz with a slope of 18dB/octave. The extended range allows the filter to remove unwanted harmonic distortion in the conventional audio band caused by audio components in the inaudible upper frequency bands.

Filters

All EQ In

The All EQ In switch places the entire EQ into circuit simultaneously and acts as a master EQ enable switch in conjunction with the Mids In and HF/LF In switches which must be operated for anything to happen. Refer to the block diagram on page 13 to fully understand this relationship.

Low Frequency

The LF band operates over a frequency range of 30Hz to 300Hz with a variable cut/boost range of +/- 18dB.
For finer control of complex programme material this range can be reduced to +/- 9dB using the related switch.

Low frequency

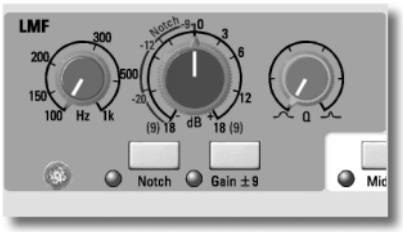
Bell/Shelf

In Bell mode the LF response curve is symmetrical around the current frequency setting with a Q factor of approximately 0.7 providing the ability to subtly boost or cut the signal around the chosen frequency with attenuation occurring either side of the centre frequency.

In Shelf mode the response curve remains flat after the centre frequency and continues at this gain setting until the lowest frequency limit is reached.

Glow

Normally the EQ provides steep sided curves allowing powerful tonal changes. The Glow switch subtly alters the response curve shape to give greater or less "warmth" altering the overall sound without changing it's character.



Low Mid Frequency

The LMF band operates over a frequency range of 30Hz to 1kHz with a variable cut/boost range of +/- 18dB.
For finer control of complex programme material this range can be reduced to +/- 9dB using the related switch.

Q Control

The Q control defines the bandwidth over which the LMF control is active. The Q range is 0.65 to 2 providing gentle enhancement using a low setting to a hard resonant sound using a high setting. The higher settings generate a narrow and sharper response curve.

Low mid frequency

Notch

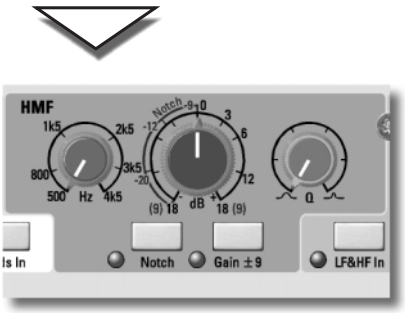
With Notch selected, the LMF section is converted to a band stop filter creating a narrow attenuation band with minimal effect on the rest of the sound.
The level control only operates over the "cut" part of it's range giving variable depth with an increased range indicated by the secondary blue scale. The frequency control defines the centre point with the Q control adjusting the notch width.

To notch out a troublesome frequency, set a low Q (wide curve) with a small amount of level cut and adjust the frequency control until some attenuation is heard. Once the notch is "tuned" to the desired frequency, the level and Q controls can be used to shape the notch curve to achieve the required effect.

Operational Guide

High Mid Frequency

The HMF band operates over a frequency range of 500Hz to 4.5kHz with a variable cut/boost range of +/- 18dB.
For finer control of complex programme material this range can be reduced to +/-9dB using the related switch.



High mid frequency

Q Control

The Q control operates in an identical manner to the LMF section.

Notch

The Notch mode operates in an identical manner to the LMF section.

Mids In

Both LMF and HMF sections are switched in and out of circuit together. The master EQ In switch must be operated at the same time for anything to happen.

Operational Guide

High Frequency

The HF band operates over a frequency range of 2kHz to 21kHz with a variable cut/boost range of +/- 18dB.
For finer control of complex programme material this range can be reduced to +/-9dB using the related switch.

High frequency

Bell/Shelf

Bell mode operates in an identical manner to the LF band except that a Q factor of approximately 0.45 is used.

Shelf mode operates in a similar manner to the LF band with the curve remaining flat after the centre frequency up to the highest frequency limit which in this case is in excess of 100kHz. Shelf mode raises or lowers the whole range of frequencies above the turnover point subtly altering the tonal balance without affecting the higher harmonics.

HF & LF In

Both LF and HF sections are switched in and out of circuit together. The master EQ In switch must be operated at the same time for anything to happen.

Sheen

Normally the EQ provides steep sided curves allowing powerful tonal changes. The Sheen switch subtly alters the response curve shape to give greater or less "warmth" altering the overall sound without changing it's character.

Overload

The overload LED is factory preset to illuminate at +24dBu (about 2dB before clipping occurs).
Note that high Q settings with a lot of boost can cause overload to occur whilst the final output level is not that high!

Specifications

Mic Amplifier

Frequency Response - source 200R - load 10k.

0dB gain	<10Hz	-3 dB
	20Hz	-0.2dB
	20kHz	-0.1dB
	>110kHz	-3dB
66dB gain	10Hz	-3dB
	20Hz	-1.2dB
	20kHz	-0.4dB
	>60kHz	-3dB

THD + Noise - source 200R - load 10k - measured @ +20dBu.

0dB gain	20Hz	<0.01%
	20kHz	<0.01%
66dB gain	20Hz	0.03%
	20kHz	0.06%

Noise - source 200R - 22Hz to 22kHz (RMS)

EIN	66dB gain	-128dBu
Output Noise	0dB gain	-105dBu

Specifications

Equaliser (Line Amplifier)

Frequency Response - source 200R - load 10k - gains Unity

All EQ bands and filters bypassed	20Hz to 20kHz	+/- 0.2dB
All EQ bands only in	20Hz to 20kHz	- 0.15dB to +0.6dB
All EQ bands and filters in	20Hz to 20kHz	-3dB to +0.6dB (20Hz filter)

THD + Noise - source 200R - load 10k - measured @ +20dBu.

All EQ bands and filters bypassed	20Hz 20kHz	<0.01% <0.01%
All EQ bands and filters in	20Hz 20kHz	<0.01% <0.01%

Output Noise - source 200R - 22Hz to 22kHz (RMS)

All bypassed	-104dBu
All in	-90dBu

Crosstalk

Mic amplifier to Equaliser - Input signal to mic amp +20dB, gain set to 0dB. Line input selected with source termination 200R. Measured at EQ output.

All EQ bands and filters bypassed, gain unity	20Hz	-122dB
	1kHz	-89dB
	20kHz	-65dB

Equaliser to Mic Amp - Input signal to Line amp +20dB, gain set to 0dB. Mic input source termination 200R. Line input selected. Measured at Mic Amp output.

All EQ bands and filters bypassed, gain unity	20Hz	-119dB
	1kHz	-106dB
	20kHz	-82dB

Audio Connectors

Inputs	3 pin Female XLR Pin 1 Screen - Pin 2 Hot - Pin 3 Cold
Outputs	3 pin Male XLR Pin 1 Screen - Pin 2 Hot - Pin 3 Cold

General

Size	19" 1U rack unit. (482 x 44.5mm) Depth including connectors 310mm
Weight	3.9kg
Power consumption	15VA (typical)

Warranty

1. **Amek** is a trading division of Harman International Industries Ltd.
End User means the person who first puts the equipment into regular operation.
Dealer means the person other than Amek (if any) from whom the End User purchased the equipment, provided such a person is authorised for this purpose by Amek or it's accredited Distributor.
Equipment means the equipment supplied with this manual.

2. If within the period of twelve months from the date of delivery of the Equipment to the End User it shall prove defective by reason only of faulty materials and/or workmanship to such an extent that the effectiveness and/or usability thereof is materially affected, the Equipment or the defective component should be returned to the Dealer or to Amek and subject to the following conditions, the Dealer or Amek will repair or replace the defective components. Any components replaced will become the property of Amek.

3. Any Equipment or component returned will be at the risk of the End User whilst in transit (both to and from the Dealer or Amek) and postage/shipping must be prepaid.

4. This warranty shall only be available if:

a) The Equipment has been properly installed in accordance with instructions contained in Amek's manual; and
b) The End User has notified Amek or the Dealer within 14 days of the defect appearing; and
c) No persons other than the authorised representatives of Amek or the Dealer have effected any replacement of parts, maintenance adjustments or repairs to the Equipment; and
d) The End User has used the Equipment only for such purposes as Amek recommends, with only such operating supplies as meet Amek's specifications and otherwise in all respects in accordance with Amek's recommendations.

5. Defects arising as a result of the following are not covered by this Warranty:
Faulty or negligent handling, chemical or electro-chemical or electrical influences, accidental damage, Acts of God, neglect, deficiency in electrical power, air-conditioning or humidity control.

6. The benefit of this Warranty may not be assigned by the End User.

7. End Users who are consumers should note their rights under this Warranty are in addition to and do not affect any other rights to which they may be entitled against the seller of the Equipment.

Notes

Notes

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Part No: MANRNEQ

AMEK

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