

User Manual for



PHILTER – Vintage passive EQ

This manual is also available as a pdf download, Go to: www.phaedrus-audio.com



RISK OF ELECTRIC SHOCK
DO NOT OPEN!

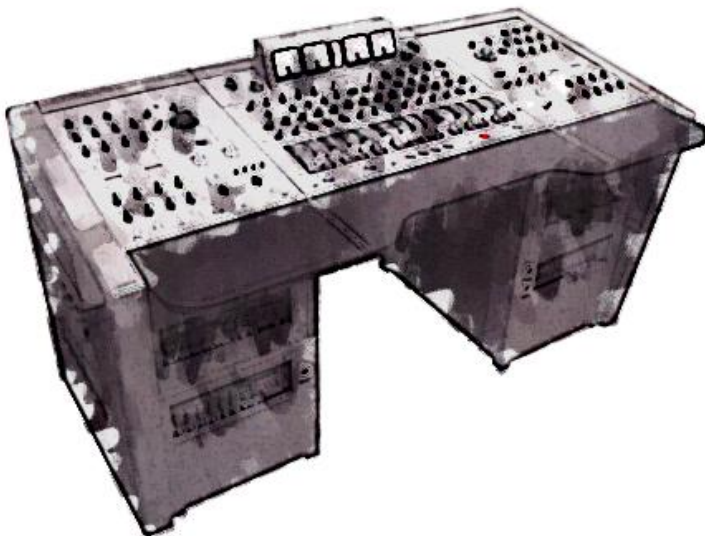
Preface – About Phædrus Audio



Phædrus Audio was formed to design, manufacture and sell high-quality products for the professional and semi-professional audio market. Phædrus Audio's founders remain inspired by the music and the recording practices of the fifties and sixties, and are motivated to re-establish the values of the great audio-technology legends of the past with their ideals of transparency, hand-built quality, and serviceability. Using modern manufacturing techniques and the benefits of modern component technology, Phædrus Audio's aim is to reproduce the quality and character of classic equipment but in a modern, highly reliable, and cost-effective way.

Chapter 1 - Background

The Phædrus Audio products came about because two, recording musicians wanted to own a "classic" console from the nineteen-sixties. Ideally a famous EMI, REDD, all valve (vacuum tube) mixer used to record The Beatles.



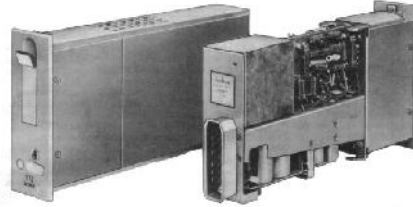
But those desks make a collection of hen's teeth look positively prosaic - as well as cheap! So, we set about researching with the idea of producing a replica console.

In order to do this, first it was necessary to have a design for the amplifier modules around which the mixers of this vintage are organised.

In the famous EMI REDD mixers, these amplifiers were either the German manufactured V72(S) amplifiers or the, very rare, EMI built, REDD.47 amplifiers.

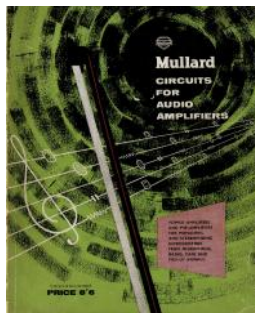
IRT	Institut für Rundfunktechnik G. m. b. H. der Rundfunkanstalten der Bundesrepublik	Broschur- Beschreibung V 72
	Studioverstärker	Ausgabe 1 vom 15.10.1959 Blattzahl: 8 Blatt: 1

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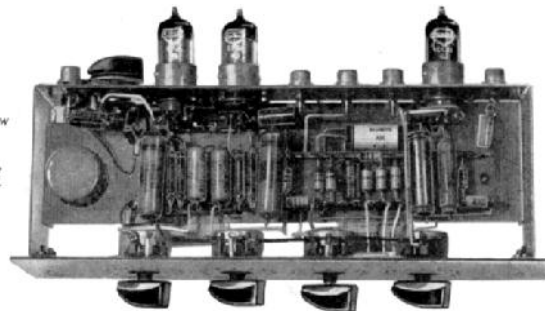


V72 and REDD.47 modular amplifiers

Ironically, despite the fact that many more V72 amplifiers exist than do REDD.47s, the EF804 valves which the German amplifiers use are no longer in current production and are becoming very expensive: whereas the EF86 and ECC88 (E88CC) valves employed in the REDD amplifiers remain in production and are widely available. So, a new amplifier, designed from the common source of Mullard's reference audio designs, and thereby sharing a common heritage with the REDD amplifiers, was developed. We called this amplifier the Phædrus "PHILHARMONIC" (literally, *music loving*). This PHILHARMONIC amplifier forms the heart of the Phædrus Audio LONDON Mark II console. The PHILHARMONIC amplifier circuit is described in detail below in section *Circuit descriptions*.



Underside View of Prototype input-mixing Pre-amplifier



Mullard published many reference designs which were used by EMI in developing the REDD amplifiers. At Phædrus Audio, we went back to these same references to develop our products.

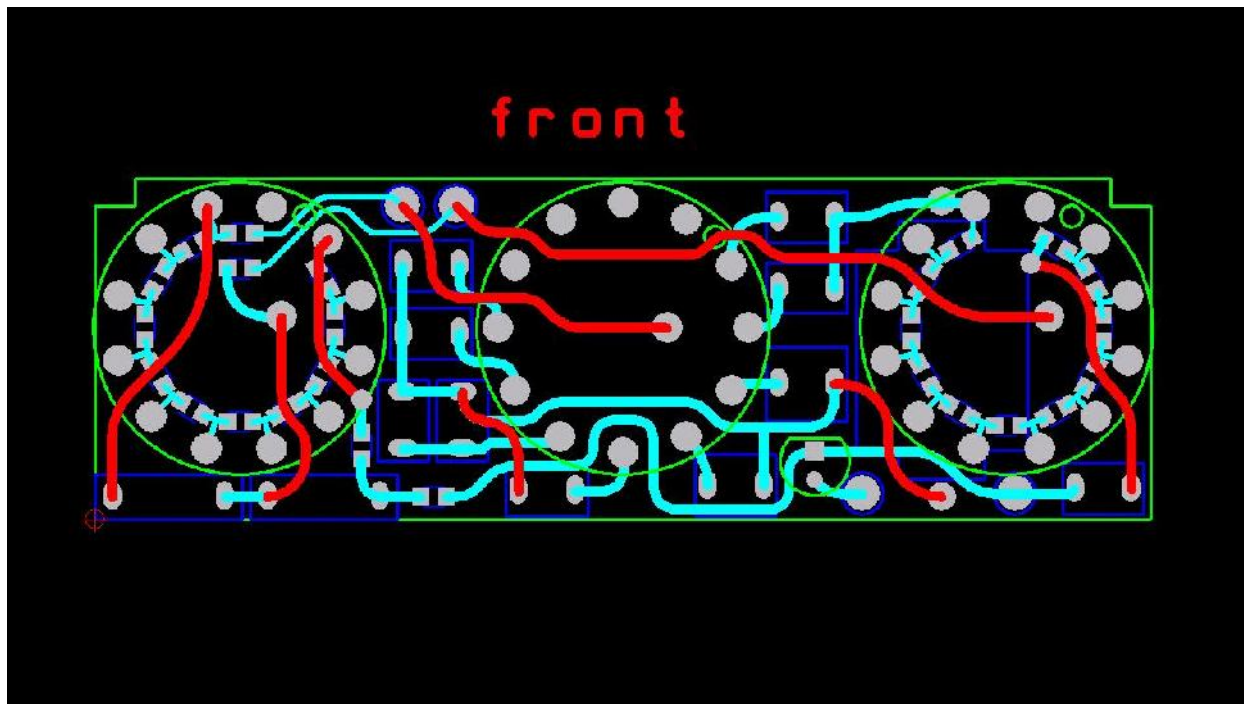
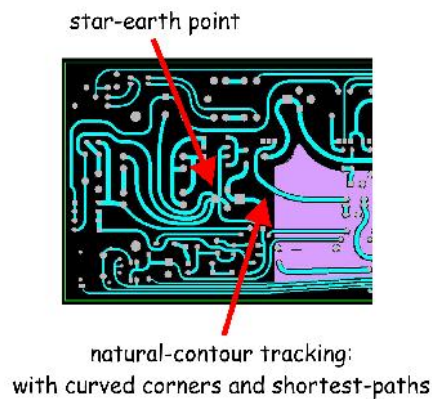


The prototype London Console (Mark II)

Construction - or star earths (grounds) and curly tracks

Given their vintage, the V72 amplifiers and the REDD.47 amplifiers were built on a metal chassis, with the components hardwired onto tag-strips. Although Phædrus Audio equipment uses printed circuit boards to ensure consistent performance and reliability, the equipment follows "classic" practices such as star earths and "natural contour" tracking, just like hook-up wire.

Every Phædrus Audio product is hand assembled and individually tested. A test pro-forma is provided with every unit. Phædrus Audio offer comprehensive service for products both inside and outside of their warranty period.



Chapter 2 - Warranty and Service

Please register your purchase with Phædrus Audio at www.phaedrus-audio/registration.htm . This will simplify service & repair should you need this service. Your name will be placed on our mailing list (unless otherwise requested) for future updates and new product announcements.

Service

If you experience a problem with a Phædrus Audio Ltd. product, contact:

support@phaedrus-audio.com

We will diagnose the problem remotely and advise you of the warranty status. If a repair or replacement is required, we will issue a Return Merchandise Authorization (RMA) number and tell you where to send the unit to be repaired. You MUST have an RMA number before you return the equipment to Phædrus Audio Ltd.'s support service. Be sure to write RMA number on outside of shipping box and to include your name, address, phone number, a copy of original sales invoice and a detailed description of the problem. Phædrus Audio Ltd. will not accept responsibility for loss or damage in shipping or for equipment returned without valid paperwork and/or a valid RMA number. Remember, warranty is void if product serial numbers have been removed or altered, or if the product has been damaged by abuse, accident or unauthorized modification and/or repair (see Phædrus Audio Ltd. Limited Warranty for details). There are no user serviceable parts inside.

PLEASE RETAIN YOUR SALES RECEIPT. IT IS YOUR PROOF OF PURCHASE COVERING YOUR LIMITED WARRANTY. LIMITED WARRANTY IS VOID WITHOUT SUCH PROOF OF PURCHASE.

Phædrus Audio Ltd.'s Limited Warranty

This limited warranty is valid only if you purchased the product from Phædrus Audio Ltd. or from a Phædrus Audio authorized dealer in the country of purchase: a list of authorized dealers can be found on Phædrus Audio website www.phaedrus-audio.com, or by contacting sales@phaedrus-audio.com. Phædrus Audio Ltd. warrants that the equipment it manufactures shall be free from defects in material and workmanship for a period of one (1) year from the original date of purchase; unless a longer minimum warranty period is mandated by applicable local laws. If equipment fails due to such defects within this period, Phædrus Audio will, at its option, repair or provide a replacement for the defective part or product. Valves (vacuum tubes) are excluded from the one-year warranty, but are warranted for 90 days from day of purchase. This warranty does not extend to any Phædrus Audio Ltd. product that has been damaged or rendered defective as a result of: accident, misuse, or abuse; or by the use of parts not manufactured or supplied by Phædrus Audio Ltd.; or by unauthorized modification or attempted repair to the product; or by acts of God/Nature (accident, fire, flood, etc) or any other condition that is beyond the control of Phædrus Audio Ltd. There are no user serviceable parts inside. This limited warranty is invalid if the factory-applied serial number has been altered or removed from the product. This limited warranty is extended exclusively to the original buyer (customer of Phædrus Audio Ltd., or authorized retail dealer) and is not transferable to anyone who may subsequently purchase the product. No other person (retail dealer, etc.) shall be entitled to give any warranty promise on behalf of Phædrus Audio Ltd. Phædrus Audio Ltd. makes no other warranties, expressed or implied, of merchantability, fitness for a particular purpose or otherwise. Phædrus Audio Ltd. liability is limited to repair or replacement by Phædrus Audio Ltd., at its sole discretion and, in no event, will Phædrus Audio Ltd. be liable for any direct, indirect, special, incremental or consequential damages resulting from any defect in the product, including lost profits, damage to property and, to the extent permitted by law, damage for personal injury, even if Phædrus Audio Ltd. has been advised of the possibilities of such damages.

Shipping Charges

For any hardware defects experienced by the customer while the product is under warranty, Phædrus Audio Ltd. will incur the shipping cost to the customer and the customer is responsible for the shipping costs to Phædrus Audio Ltd's designated after-sales service office. For defective products that are out of warranty the customer is responsible for all shipping costs to and from Phædrus Audio Ltd's designated after-sales service office.

Extended warranty and out-of-warranty services

Various services are available from Phædrus Audio Ltd. These include repair services for equipment once the warranty period has expired, and the ability to extend the warranty period. These are:

PHILTER-REP - Repair of a defective PHILTER equaliser, charged at a flat-rate

PHILTER-MISEAJOUR - Mise à jour for PHILTER*

PHAE-EXTWARR - Extends standard warranty (see above) by a further year**

* A mise à jour service includes a complete inspection, re-valve (re-tube) and the implementation of any engineering updates as well as a re-test to performance specification.

** If extended warranty is ordered after the initial warranty has expired then the intervening period is charged without exception.

Please contact your dealer or Phædrus Audio Ltd. for current prices.

Warranty service conditions are subject to change without notice. For the latest warranty terms and conditions and additional information regarding Phædrus Audio Ltd. limited warranty, please see complete details online at www.phaedrus-audio.com.

Chapter 3 - Safety

General

Before using any piece of equipment manufactured by Phædrus Audio Ltd., be sure carefully to read the applicable items of these operating instructions and the safety suggestions. Keep them for future reference. Follow the warnings indicated on the unit, as well as in the operating instructions.

Selection of PSU

Suitable PSUs for the Phædrus Audio Ltd. products are available as line items from Phædrus Audio.

They are:

PHAE-PSU(110) - 110V mains plugtop PSU; plug is North American type.

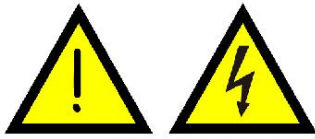
PHAE-PSU(220Euro) - 220V mains plugtop PSU; plug is European type

PHAE-PSU(220UK) - 220V mains plugtop PSU; plug is 3 pin 13 AMP, British type

A 12V AC supply is required for the Phædrus Audio PHILTER. A direct current (DC) supply is NOT suitable and will damage the unit. If a supply is sourced elsewhere than from Phædrus Audio, it must have the following specifications:

- 12V AC, 12 Watt supply or greater (> or = 1000mA supply current)
- Must be suitable for connection to the appropriate mains voltage
- Must be Class-II, double-insulated
- Must have 30% regulation or better
- Must contain one-shot thermal fuses, resettable fuses, or Polyswitches for over-current protection.

UK and Euro units should comply with **EN 60950-1** and **CE** requirements and **only PSUs with UL and CSA** approvals should be provided on North American units. Units supplied to other countries should be verified to comply with the relevant standards which obtain in those territories.



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User Access & Servicing

Phædrus Audio equipment employs thermionic valve (vacuum-tube) technology and employs hazardous voltages for the high-tension supplies. THE USER SHOULD NOT ATTEMPT TO SERVICE THE UNIT. ALL SERVICING SHOULD BE REFERRED TO QUALIFIED SERVICE PERSONNEL OR FACTORY ONLY.

Phædrus Audio products should NEVER be connected to the external power supply or in any other way energised when the case is opened and/or the circuit board is accessible.

Ground (earth) issues

Phædrus Audio Ltd.'s products are all powered by external (12V AC) power supplies which should be double insulated, class-II types (see above). It should therefore be appreciated that,



A CONNECTION TO EITHER THE PHAB, the PHAME, PHILTER or the PHI product CAN NEVER BE RELIED UPON PROVIDE A PROTECTIVE OR SAFETY EARTH (GROUND). This advice obtains IRRESPECTIVE OF THE SETTINGS OF ANY "EARTH OR GROUND LIFT" SWITCHES.

General Safety Instructions

- Do not operate Phædrus Audio equipment near any source of water or in excessively moist environments.
- Keep your Phædrus Audio equipment away from babies, children and pets.
- Do not let objects do not fall, or liquids be spilled, into the enclosure.
- Situate the Phædrus Audio equipment away from heat sources or other equipment that produce heat.
- Ensure Phædrus Audio equipment has adequate ventilation. Improper ventilation will cause overheating, and can damage the equipment.
- When cleaning Phædrus Audio equipment, remove all connections to the unit; including power and gently wipe with a clean lint-free cloth; if necessary, gently moistened with lukewarm or distilled water. Use a dry lint-free cloth to remove any remaining moisture. NEVER use aerosol sprays, solvents, or abrasives on Phædrus Audio equipment.
- Phædrus Audio equipment should be serviced by qualified service personnel or returned to Phædrus Audio Ltd. when: an object (or objects) have fallen into the enclosure; or liquid has fallen into, or been spilled into the unit; or the unit has been exposed to rain or high humidity; or the unit does not operate normally or exhibits a marked change in performance; or the unit has been dropped, or the enclosure has been damaged.

Chapter 4 - Instructions for use



Typical connection set-up for the PHILTER

PHILTER

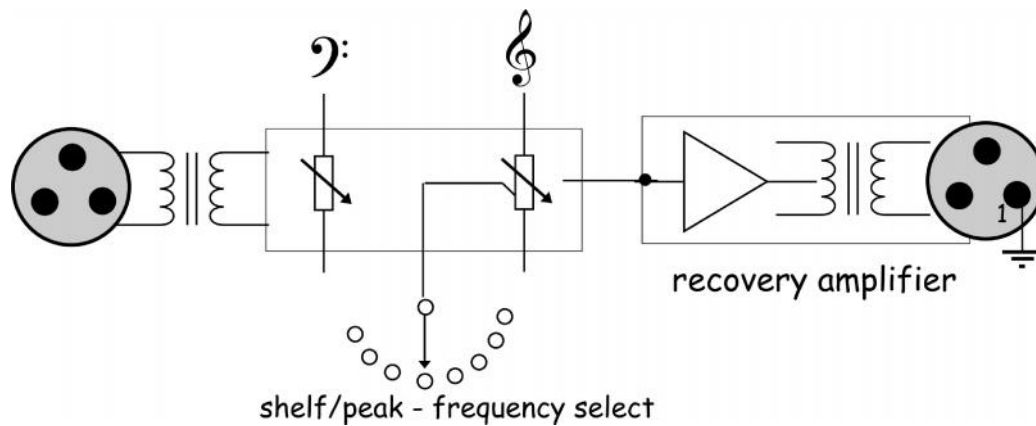
Application and connections

The PHILTER equaliser is a self-contained, line-level device. The loss due to the passive equaliser circuitry is made-up in the included, internal line-amplifier. The figure below is a block-diagram, of the unit. The unit is connected by balanced, earth-free connections on professional XLR connectors. Operating levels are covered below.

One word of warning: remember the line-amplifier makes up for the loss in the passive Q circuits when the controls are central (and no boost is applied). In a passive equaliser, boost is actually provided by reversing the loss of the equaliser over a range of frequencies. In other words, when boost is applied, bass frequencies are “un-cut”. This means that, when large degrees of boost are applied, it may be necessary to reduce the signal level sent to the PHILTER to stop it overloading.

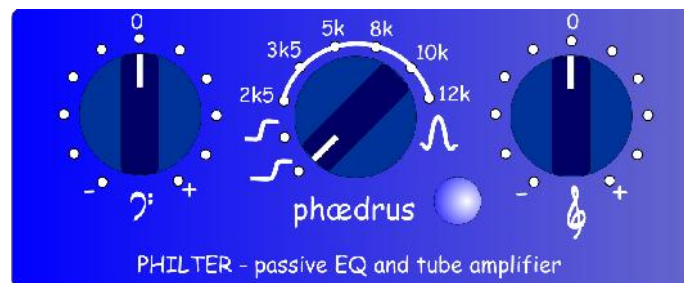
Overload indicator

To prevent inadvertent clipping due to high levels of boost, the PHILTER contains a clip detect circuit which turns the blue power LED red when the audio level is 3dB below peak. This indicator should only be allowed to flash red occasionally in operation.



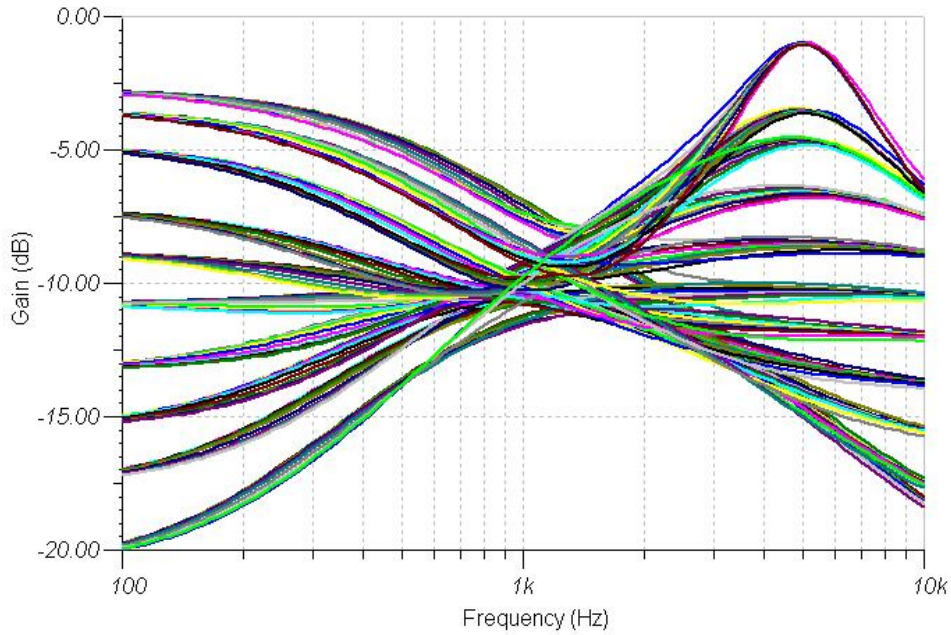
Architecture of the PHILTER equaliser

Controls



Bass, Treble and Frequency-select controls

The equalisation controls on the PHILTER are simple and intuitive to operate. Remember, these circuits were invented well before the complex, analogue equalisers of the nineteen-seventies. When the middle frequency-control is turned to the two most anti-clockwise positions, the bass and treble controls (marked with the appropriate music clefs) act as they do on a hi-fi; as a boost and cut control: clockwise to boost (in 2dB steps); anti-clockwise to cut (in 2dB steps). The central control may be used to modify the character of the treble-frequency boost. Depending on the frequency setting: 2.5kHz; 3.5kHz; 5kHz; 8kHz; 10kHz; 12kHz, when the treble control is rotated clockwise beyond the central position, boost is applied with a broad peak in the response at the indicated frequency. Note that this control is NOT active when treble-frequency cut is applied; this always remains as a shelving response. The graph below illustrates the 121 separate response curves which result from the 121 combinations of treble and bass control when the central switch selects the 5kHz, peaking-response. Note that the cut curves do not exhibit a complementary notch to the boost peak.

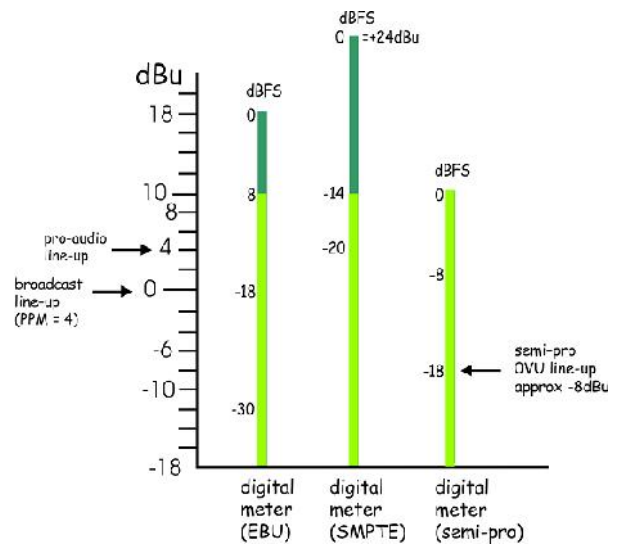


Operating levels

Because of the vintage of the PHILTER design, and its origin in German manufactured broadcast television and radio equipment, the envisaged operating level for this equipment is slightly lower than modern recording industry standards. When feeding downstream equipment, the output level should be set to a nominal 0dBu (0.775V RMS).



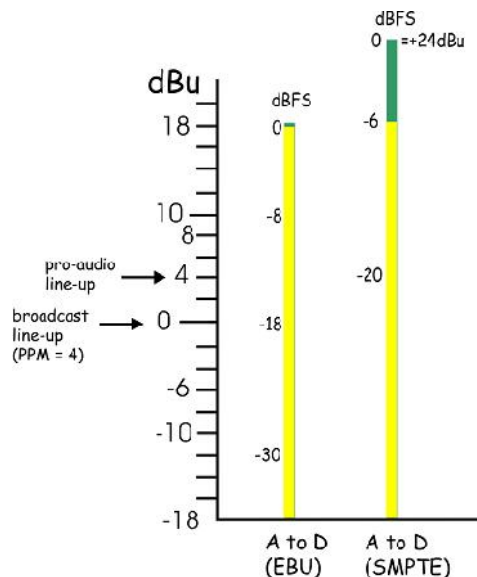
This means that if monitoring the output on a standard VU instrument, the input attenuator should be set so that the output level reads around -4VU, with occasional peaks to 0VU on programme. On a digital meter, this is equivalent to signal peaks reading +6dB above recording industry standard +4dBu alignment level. This is equivalent to +10dBu (or -8dBFS on equipment aligned to EBU R64-1992 standard and -14dBFS on equipment aligned to SMPTE RP155 as illustrated). On a broadcast standard PPM, peaks should be set to read 6 on the BBC scale, or +8 on the European EBU scale. Output level is sufficient easily to modulate semi-pro' equipment (mixers, DAT, solid-state recorders and many sound cards) to 0dBFS.





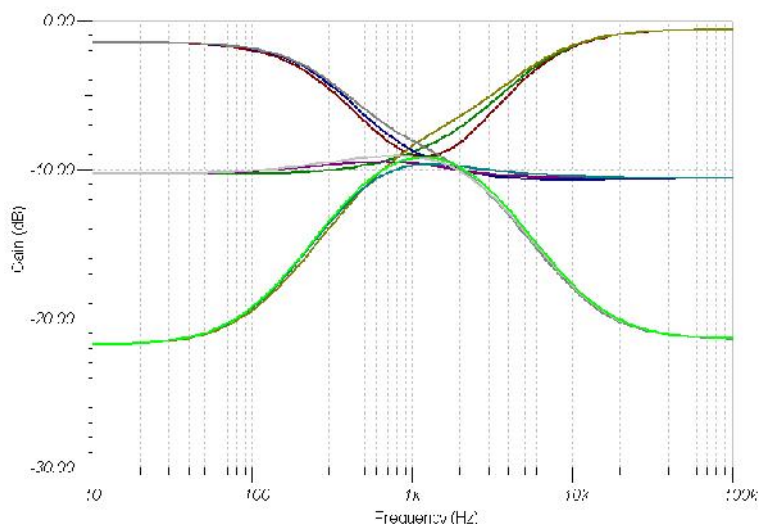
That said, the headroom on the PHILTER is considerable, and no noticeable distortion is evident when operating the equipment at standard recording industry levels of +4dBu=0VU, or even higher. There is thus considerable scope for experimentation with over driving

this vintage circuitry to explore its character in gradual overload. For example, peaks may be allowed to reach +18dB above alignment level without clipping. The Phædrus Audio PHAB and the PHAME preamplifiers and the PHILTER equaliser may thus be used directly to feed modern A to D conversion equipment aligned to EBU or SMPTE standards following the recommendations illustrated (right).

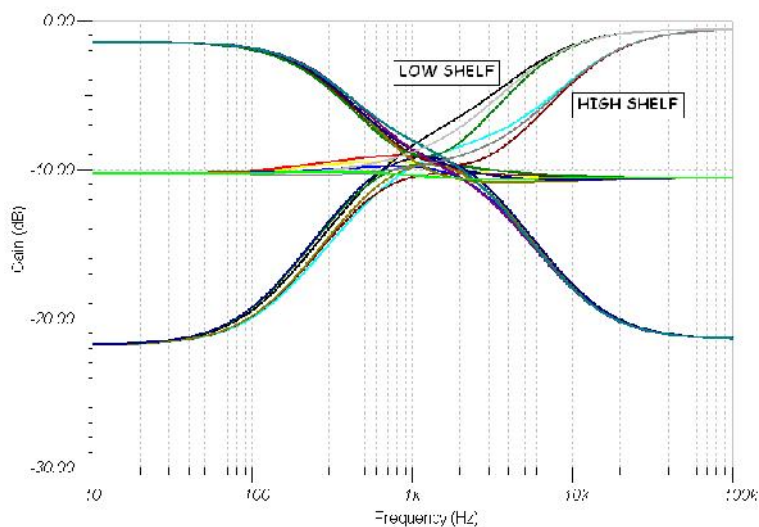


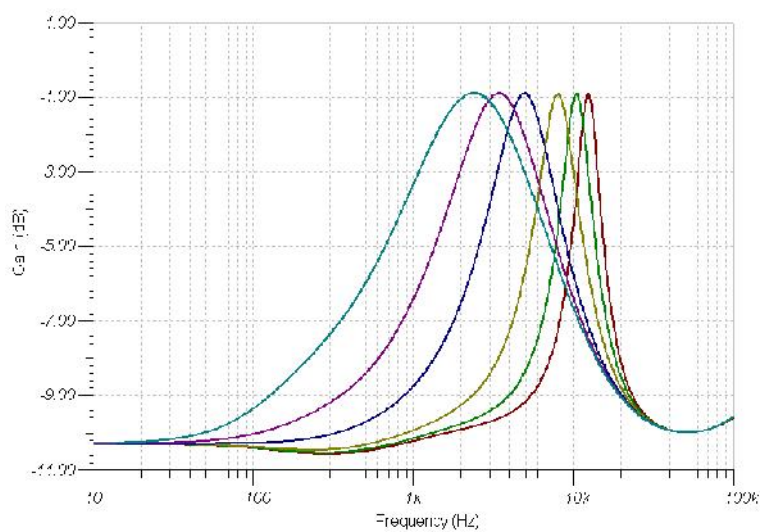
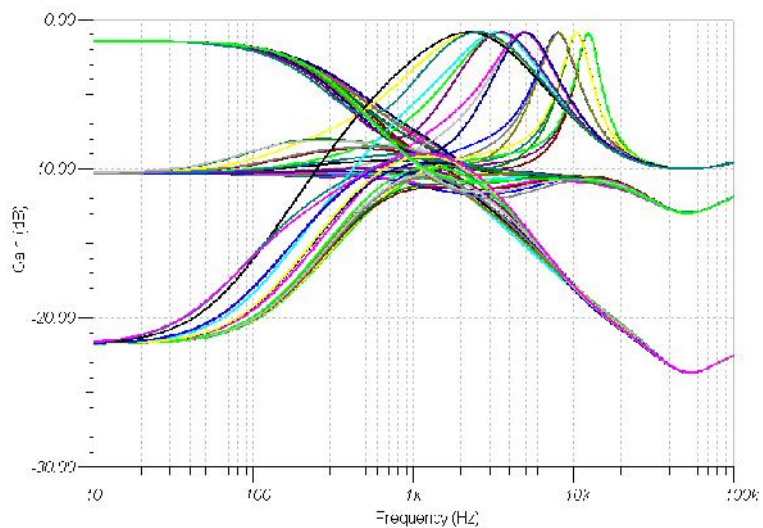
Equaliser performance

Equaliser performance is best defined graphically and that is how it is presented below.

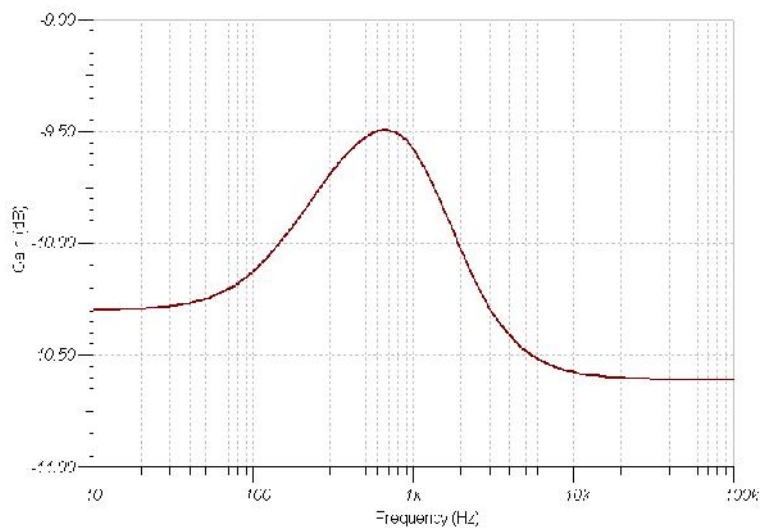


Control extremes

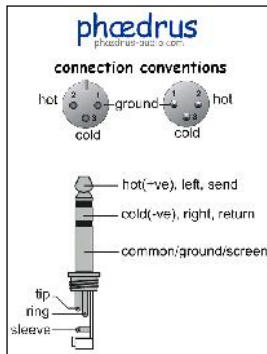




Mid-position response <1dB variation



Specifications



Electrical connections

Input:

Unbalanced: 3 pin XLR Connector
Pin 1 – Ground
Pin 2 – (+) Signal
Pin 3 – Connect to Pin 1

Balanced: 3 pin XLR Connector
Pin 1 – Ground
Pin 2 – (+) Signal
Pin 3 – (-) Signal

Output:

Unbalanced: 3 pin XLR Connector
Pin 1 – Ground
Pin 2 – (+) Signal
Pin 3 – Connect to Pin 1

Balanced: 3 pin XLR Connector
Pin 1 – Ground
Pin 2 – (+) Signal
Pin 3 – (-) Signal

PHILTER Specification

Circuit configuration: Vintage style, inductor/capacitor passive EQ

Output: Balanced

Maximum output level: +18dBu @ 1kHz

Input: Balanced

Maximum input level: +18dBu @ 1kHz

Gain: Nominally 0dB, maximum boost is +10dB

Frequency response: 40Hz to 15kHz, ± 1 dB; 15Hz to 30kHz ± 3 dB, control flat.

Distortion: <1%, 40Hz @ -4VU (0dBu), gain 40dB

Noise: <-120dB referred to input

Power supply: 12V AC

Power consumption: approximately 1 Watt

Phaedrus Audio Ltd. reserves the right to alter these specifications without notice.

Declaration of Conformity

The Manufacturer of the Products covered by this Declaration is

Phædrus Audio Ltd.
head office address

The directives covered by this declaration are:

89/336/EEC Electromagnetic Compatibility directive
73/23/EEC Low Voltage Equipment directive

The products covered by this declaration are:

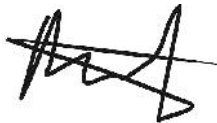
Phædrus Audio PHAB – microphone preamplifier; Phædrus Audio PHAME – instrument preamplifier; Phædrus Audio PHILTER – passive equalizer & tube recovery amplifier and Phædrus Audio PHI – DI-Box.

The basis on which conformity is being declared:

The manufacturer hereby declares that the products identified above comply with the protection requirements of the EMC directive and with the principal elements of the safety objectives of the Low Voltage Equipment directive, and that the following standards have been applied:

IEC INTERNATIONAL STANDARD 60065 - Audio, video and similar electronic apparatus – Safety requirements

The technical documentation required to demonstrate that the products meet the requirements of the Low Voltage Equipment directive has been compiled and is available for inspection by the relevant enforcement authorities. The CE mark was first applied in 2011.



Signed:
Date:

Richard Brice, Technical Director
January 2011