

Q.U.A.D. *Amplifier*



 ACOUSTICAL

ACOUSTICAL Q.U.A.D. AMPLIFIER

.... For the closest approach
to the original sound in
speech and music reproduction

Introduction

Low distortion wide range amplifiers have been produced for many years for laboratory use. Such an amplifier used with a microphone under carefully controlled conditions and connected to a high grade loudspeaker system will provide reproduction, in many cases, quite indistinguishable from the original sounds.

The Q.U.A.D. is the logical development of such an amplifier.

Since the instrument will be used for practical programmes, a new technique of control has been developed. This takes into account the inherent quality of the programme signal itself, a factor of the utmost importance if the final result is to bear a close resemblance to the original sound. This development in turn releases the treble and bass controls so that they can fulfil their true function of correction rather than compromise.

The complete instrument, besides being capable of amplifying a PERFECT programme input with the highest degree of accuracy yet achieved, is also capable of providing the nearest approach to the original sound which it is possible to obtain from ANY practical programme source.

The main amplifier

The main amplifier is supplied for convenience on a separate chassis without controls. It can also be supplied with protective covers as a separate portable unit.

The function of the main amplifier is that of amplifying the output from the control unit with the highest possible standard of accuracy. The main amplifier supplies the power for the control unit and also for any other auxiliary apparatus.

The compact construction is the result of logical design for reliability, craftsmanship, efficiency and accessibility.

The quality control unit

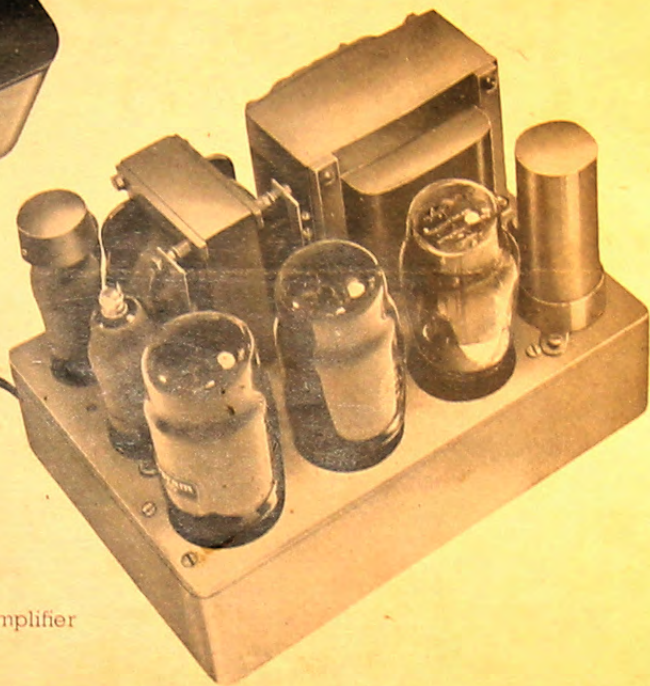
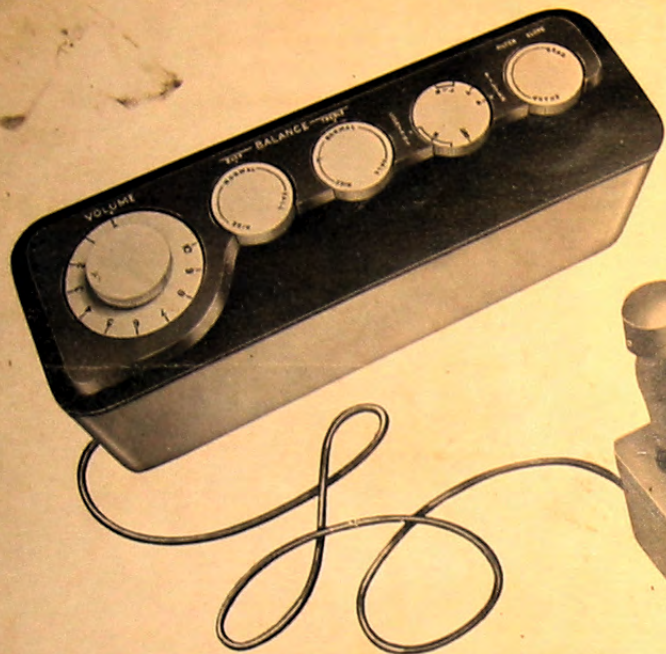
The unit is constructed on a die-cast aluminium panel housing the five controls, four of these controls being mounted flush with the front of the panel and arranged for thumb adjustment.

The large control is for volume adjustment. The second and third controls modify the treble and bass balance of the equipment to compensate for the room conditions under which it is used. Once set they will rarely require further alteration. The fourth and fifth controls adjust the equipment to suit the useful range of the recording or programme material available.

The controls are simple to operate and enable the optimum quality of reproduction to be obtained from all programmes or recordings.

The complete unit is coupled to the main chassis with a four-foot cable supplied with the equipment. Two inputs are provided so that the control unit will operate with all pickups, microphones or other inputs.

The Control Unit



Q.U.A.D. Amplifier

VOLUME CONTROL

BASS and TREBLE CONTROLS

Compensation for the listening room and conditions under which the equipment is used.

CONTROL SWITCH

Giving level response as a comparison standard when setting bass and treble controls.



VOLUME

BASS BALANCE TREBLE

CONTROL SWITCH

FILTERS

- NII. Very good programme quality—good radio transmission—first-class noise-free recordings, etc.
- A. Average transmission—Good British recordings—Good microgroove recordings.
- B. Poor reception conditions—average recordings, etc.

CONTROL SWITCH

Adjusting the range to suit the quality of the programme material available

SLOPE CONTROL

Adjusting the characteristics of the filters to obtain the highest possible performance from any programme under any conditions of use.

JOY
MOD



VOLUME

BASS BALANCE TREBLE

FILTER SLOPE

0
1
2
3
4
5
6
7
8
9
10

NORMAL
RISE
FALL

NORMAL
RISE
FALL

STEREO
M
W
L
R
OUT

SHARP
GRAD

VOLUME CONTROL

BASS and TREBLE CONTROLS

Compensation for the listening room and conditions under which the equipment is used.

CONTROL SWITCH

Giving level response as a comparison standard when setting bass and treble controls.

FILTERS

- NIL. Very good programme quality—good radio transmission—first-class noise-free recordings, etc.
- A. Average transmission—Good British recordings—Good microgroove recordings.
- B. Poor reception conditions—average recordings, etc.

CONTROL SWITCH

Adjusting the range to suit the quality of the programme material available.

SLOPE CONTROL

Adjusting the characteristics of the filters to obtain the highest possible performance from any programme under any conditions of use.

Circuit description

The main amplifier circuit is practically identical to its forerunner the QA.12 amplifier. The heart of the circuit is the output stage and output transformer. The thirteen sections on the transformer are very tightly coupled and are connected so that portions of the load are applied to the cathodes, anodes and screen circuits. The arrangement is such that the valves appear as triodes but with less than half the non-linearity of a conventional push-pull triode circuit. The efficiency is increased and the effects of unbalance due to valve depreciation is lessened.

Two EF.37 valves in push-pull are R.C. coupled to the output valves. The push-pull signal is developed in the EF.37 stage and is largely self-balancing through cathode and screen circuits.

The very low phase shift in the main amplifier enables up to 30 db overall feedback to be applied without correction. In view of the low inherent inter-modulation, these large degrees of feedback are not required, nor are they desirable, since in all feedback

circuits, frequency components well beyond the operating range are not attenuated by the feedback and are, therefore, presented to the input stages at a level greatly in excess of their original value. These frequency components are significant in practical applications of music reproduction.

Overall feedback to the extent of 12db is applied, partly for damping and partly to provide a large safety margin in the specification for changes in valve characteristics with use.

This arrangement provides a very low distortion content for audio frequencies yet without incurring modulation distortion from very low beats produced by choral singing, strong unison playing, etc.

Although there is no single method of specifying the "quality" of an amplifier, the levels obtained for *all* forms of distortion provide in aggregate a standard of quality as yet unparalleled on any equipment offered to the public.

The quality control unit incorporates the development of a low pass filter the slope of which can be continually varied from 10db per octave to 100db per octave. Since the inherent distortion in any programme material usually increases with frequency at a predetermined rate, this development makes it possible to realise the highest obtainable performance from any programme. The range of the slope control covers all requirements due to tracing distortion from disc, tape and film, while the sharper slopes are, of course, ideally suitable for whistle suppression, discontinuity and the more severe distortions encountered. The frequency at which the filter commences to operate is switchable and covers all practical requirements.

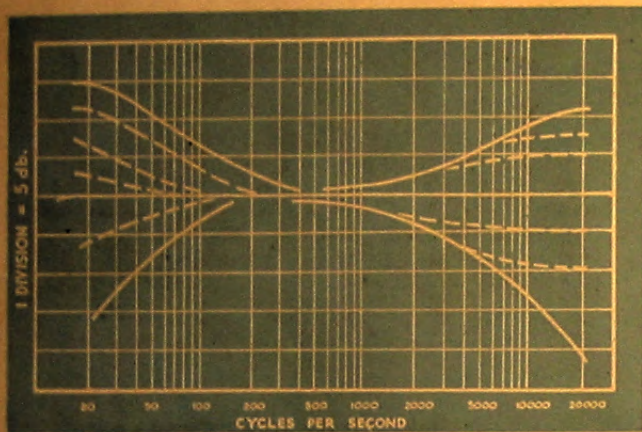
Since the bass and treble controls no longer have to contend with harmonic and similar programme distortions they can be designed more accurately to fulfil their correct function. The bass control varies in slope and turnover point and is ideal as compensation for room characteristics. Small increases at very low frequencies are not accompanied by increases in the low-middle register. The treble

control varies the response from 700 c/s upwards and once reached, the slope does not increase further with frequency. The "amount" of treble is of course not affected by the low pass filters since these modify the higher harmonics only and do not operate in the treble musical register.

The switched level response on the filter control enables the settings of the bass and treble controls to be compared with level response without upsetting the settings themselves. In this way, the most subtle adjustments of balance can be made to suit all requirements.

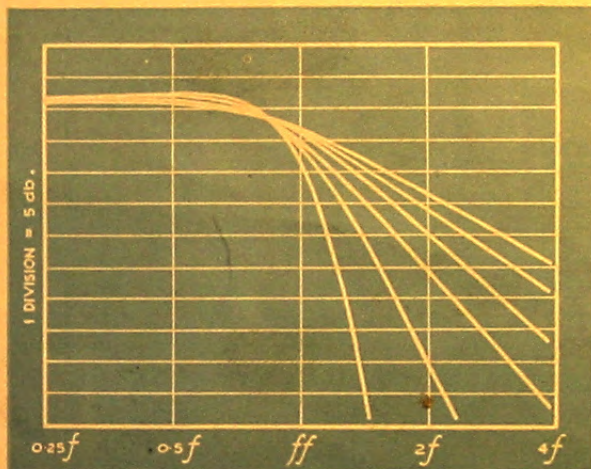
The control unit incorporates two stages of amplification with fixed negative feedback. The volume control is applied in the feedback circuit of the second stage.

Two inputs are provided, one of which incorporates fixed bass compensation for record reproduction. A single cable provides power to the control unit and carries the audio signal. The coupling impedance is 25k Ω .



Curves showing slopes of response provided by bass and treble controls. Adjustment is continually variable.

Curves showing range of filter slope control. The frequency ff has two switched positions shifting the curve bodily along the frequency axis.



Dynamic specification

The following figures are pass figures on final test and include control unit, coupling cable and main amplifier. Source impedance $20k\Omega$.

Frequency range: (input A).

Within 0.3db 20-20,000 c/s	} Resistive and inductive loads measured at 0 and -10db referred to 10 watts.
Within 2db 15-30,000 c/s	

Volume control settings shall not affect response by more than 1db in the 20-20,000 c/s range.

Bass and treble controls: To published curves within 1.5db including intermediate settings.

Filter frequencies: (ff) 6 & 8 Kc/s \pm 500 c/s.

Filter slope: 10db to 100db per octave.

Input B as above but with 6db per octave basic additional rise below 300 c/s. \pm 2db + 15db max.

Distortion content (max.) resistive load—
12 watts output middle frequencies.

Second not more than 0.1% - 60db.

Third not more than 0.2% - 54db.

Total higher order not more than 0.05% - 66db.

Total distortion not more than 0.25% - 52db.

Tests repeated with functional meter including intermodulation products from low audio and subsonic frequencies. Beats and other components outside the feedback range will not cause intermodulation due to overload provided they are 10db or more below peak signal level.

Stability: Shall be maintained with 30db feedback applied with resistive and inductive loads.

Effective internal impedance: not more than 1.2Ω with 15Ω output.

Input A: Maximum source impedance $20k\Omega$.
Internal impedance. $1.5M\Omega$.
Input for full output. 10 mV.
Max. Input 100 mV.

Input B: Internal impedance $50k\Omega$.
Input for full output 50 mV.
Max. Input 0.5 V.

Background: . -75db or $4\mu V$ at input whichever is greater.

Static specification

Supply voltage :

200-250 A.C. single phase.
40-80 c/s (or to specification).

Supply consumption : 80 watts.

Additional supplies available from amplifier.

6.3 V, 2A CT.
300V, 25mA (neg. chassis)

Output impedance : 7 Ω and 15 Ω .

Valves : ECC.35, EF.37, EF.37, KT.66,
KT.66, 5U4G.

Weights : Main amplifier, 14 lbs.
Quality control unit, 5 lbs.

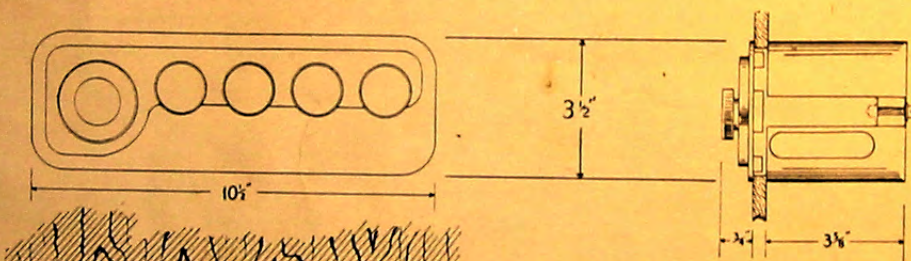
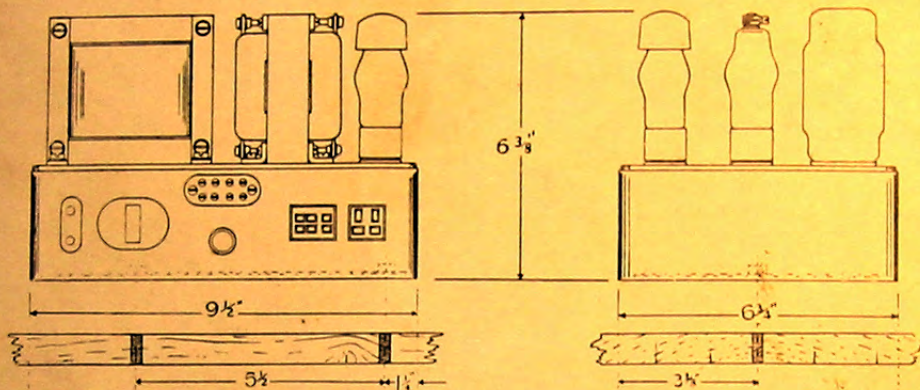
Finish : Steel chassis and all steel parts
bonderised rust-proof processed
and cellulosed.
Panel—Die-cast aluminium. Steel
grey finish. Machine engraved.
Knobs—Aluminium. Frosted silver
finish.

Metal work, finishing, rust-proofing,
transformer winding, tropicalisation, assembly,
production and final testing are all carried
out under constant supervision by our A.I.D.
approved inspection section. The equipment
is subject to full K.70 standards.

The type number Q.U.A.D. includes the
main amplifier, quality control unit and coup-
ling cable complete and ready for immediate
use. The comprehensive and easily understood
instructions ensure the finest performance
being obtained without specialised knowledge
of any kind.

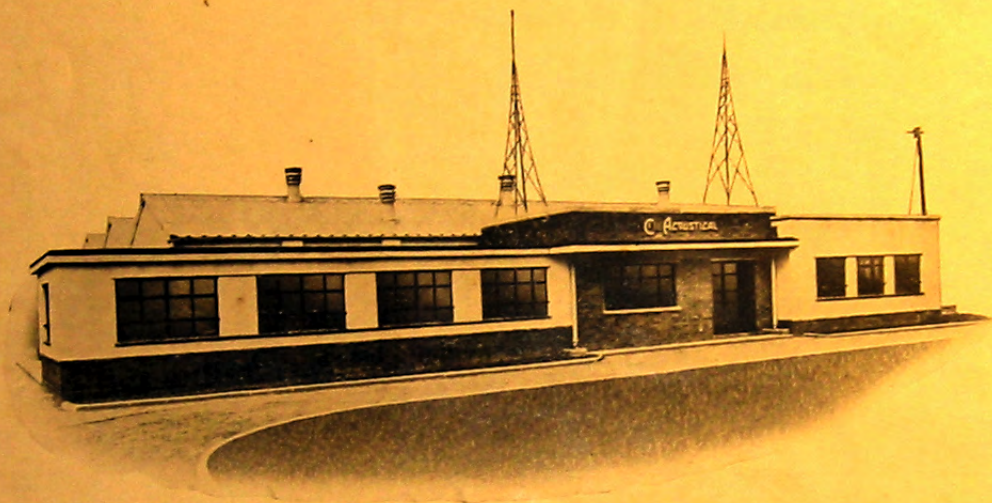
Price complete : £33.

Guarantee : The equipment, with the exception of valves, carries a fully
comprehensive guarantee for a period of 12 months from date of purchase.
Valves carry the makers' guarantee of three months.



CUT-OUT
 $10'' \times 3''$ with $\frac{1}{8}''$ radius corners.

The quality control unit may be fitted to cabinet panels of any thickness from $\frac{1}{8}''$ to $\frac{3}{4}''$. The cut-out required is shown on the left. The unit is inserted from the front and will locate automatically. The cover is fitted from the rear and will hold the unit firmly in position.



The Laboratories at Huntingdon

THE ACOUSTICAL MANUFACTURING CO., LTD., HUNTINGDON, HUNTS., ENGLAND. Telephone : Hunts. 361