

EQUIPMENT REVIEWED



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ACOUSTICAL
QUAD 22
CONTROL UNIT
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Manufacturer's Specification. Inputs: Radio/tape 70 mV at 100K; mic. 1.5 mV at 100K; pickup sensitivity and impedance dependent on adapter unit. Push-button selectors, volume and on/off, bass, treble, filter slope, filter switch 5, 7 and 10 Kc/s. Harmonic Distortion: < 0.2%. Hum and Noise: — 70dB. To operate with Quad II amplifiers. Manufactured by Acoustical Manufacturing Co. Ltd., St. Peter's Road, Huntingdon, Hunts.

I FIRST became acquainted with the original Quad II amplifier system about ten years ago. The extreme versatility of the pre-amplifier, and its small power requirements, indicated its usefulness as a general purpose pre-amplifier in the laboratory and test rooms for evaluating pickup response curves. Also, the very low inherent distortion and high signal to noise ratio enabled it to be used with specialised test equipment for evaluating the distortion content of pickups. At the same time, the power amplifier being very compact it could be easily accommodated for use in direct listening tests.

The short term stability of the pre-amplifier is better than half a dB, and the long term stability is better than 1 dB, whilst the variation in sensitivity is less than 1 dB for a change of 30 volts in the power supply (nominal 230 volts AC). These stability figures, together with the ability to vary the response of the amplifier over an extremely wide range, were the initial reasons for its specification as a piece of test equipment, although not specifically designed for that purpose.

100,000 hours!

It says much for the standard of workmanship and quality of components used that four pre-amplifiers, working for 50 to 60 hours per week have now clocked a total working life in excess of 100,000 hours and the total failures to date have been five valves! Whilst two power amplifiers with a total operating life in excess of 40,000 hours have required three output valves, two rectifiers, and one smoothing choke!

With the advent of stereo tape, what more natural than to use two Quad pre-amplifiers and power amplifiers to complete the system? Later, when stereo disc was announced, the equipment was sufficiently flexible to accept stereo pickups without any modification. In order that non-technical users could operate the equipment, the only addition was a "ganged" volume control fitted to the input.

Of course, I immediately began pestering Peter Walker for a stereo pre-amplifier, and eighteen months ago received one of the early production models. This functioned perfectly satisfactorily until last Christmas Eve, when the EF 86 in the left hand channel developed a heater-cathode short. At this time, the amplifier had clocked approximately 2,000 working hours. A second stereo system was installed for the diffalt half of the family in September last year, together with the Decca ffs pickup and my own loudspeakers, giving many hours of pleasure and wonderment to our friends!

So much for the stability and reliability of the equipment. It is possible that it may have been equalled by other manufacturers, but I am sure it has never been excelled.

In decor, the 22 Pre-amplifier is stamped with the familiar features of its Quad II parents. The facilities provided are stereo/monaural pickup, stereo/monaural tape, stereo/monaural radio,

with provision for "tape out" from any of the above inputs. The "tape out" is unaffected by the volume control or tone controls but the pickup equalisation provided by the plug-in equaliser adapter is applied.

In the Quad 22, two plug-in adapters are used, one covering the pickups, and combines stereo/monaural types or separate stereo and monaural pickups. It is possible to mix crystal and magnetic units in any combination, and according to the list of adapters at present available, approximately 250 combinations of pickups can be used. In the case of the tape adapter, it is possible to use either stereo tapes or monaural, and by using a special microphone adapter, stereo microphones can also be connected to the system. At present stereo radio is only a pious hope, but provision has been made for the power supply to a second radio receiver and/or adapter unit in addition to the normal main radio receiver. Three power outlet sockets provide a total of 70 milliamps at 330 volts HT, and 6 amps at 6.3 volts LT. Two outlet leads connect the 22 pre-amplifier to the main power amplifiers, and in the mono position the spare amplifier power input is disconnected.

Some idea of the versatility may be obtained from the fact that, on pressing the "Stereo" and "Disc" push buttons, normal stereo is obtained, whilst by additionally pressing the "Monaural" button the inputs of the two amplifiers are connected in parallel and monaural operation is obtained from two channels. (The stereo connections of the pickup are disconnected and the appropriate monaural connection is brought into play). By pressing the "Monaural" button only, single channel operation is obtained. The remaining push buttons allow for equalisation of the majority of 78,lp. and stereo records, and according to the equalisation guide.

Bruel & Kjaer test equipment used

Subjectively, we cannot praise this piece of equipment too highly, but sometimes objective measurements do not bear out the high hopes of one's first impressions. In the case of the Quad 22 the measurements fully confirmed our aural impressions! It is well known to most technicians that if a person is predisposed towards a product (or an experiment) he reads the meters "on the right side" and has great difficulty, even with the best of intentions, in not improving the performance by a dB or so here and there. Conversely, if he has a dislike for a piece of equipment it can equally be damned by using the "confidence limits" in the right direction. In order to eliminate as far as possible human bias in objective measurements, we make use of the Bruel & Kjaer automatic level recorder.

Fig. 1 shows the system calibration immediately before the tests were made. It is seen to be flat within half a dB from 20 to 20,000

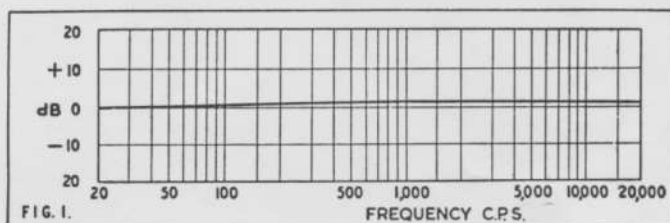


FIG. 1.

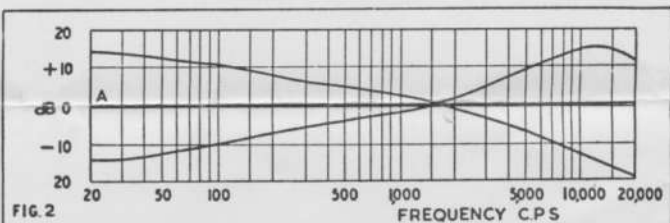


FIG. 2

c/s. In the following performance figures, the complete system was used. That is, the Quad 22 pre-amplifier and two Quad power amplifiers, the power amplifiers being loaded with two loudspeaker systems. This, in our opinion, is a much more stringent test than

testing the pre-amplifier by itself (fed into a dummy load), or feeding the power amplifier into a resistive load. It is well known that some amplifiers using a high degree of feedback are extremely sensitive to variation in load impedance and phase angle. The results obtained under our set-up are considerably more stringent than purely laboratory conditions and are indicative of what will happen under normal user conditions.

We checked both channels separately and found that, with the channel equalising control set at zero, the yellow channel was 1 dB greater in sensitivity than the blue, but did not evaluate whether this very small difference was in the pre-amplifier or the power amplifier or a combination of both. The range of the controls

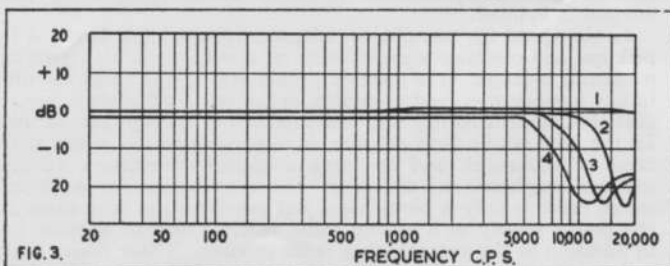


FIG. 3.

● Low pass filter settings—cancel, 10, 7, and 5 Kc/s.

("Treble" and "Bass" and "Filter") were again within 2 dB of each other at zero, half-way, and at maximum and minimum.

Fig. 2 shows the overall response of the equipment, curve A with the "Filter" control set to cancel and the other curves showing the maximum variation of "Bass" and "Treble" cut and boost.

Fig. 3 shows the response of the system with the "Bass" and "Treble" controls set to level and the "Filter" controls set to maximum (25 dB) at cancel, 10 Kc/s, 7 Kc/s, and 5 Kc/s cut off. As is common with this type of network, the response drops very sharply to a minimum at about one octave above the nominal cut off frequency and then starts to rise again slowly.

Fig. 4 shows the effect of the filter control with the bass set to level and the treble set to maximum cut. Here it will be seen that the rise after the frequency of maximum attenuation has been completely eliminated, whilst Fig. 5 shows the three main record equalisation settings, namely pre-1954 coarse groove (78 r.p.m.

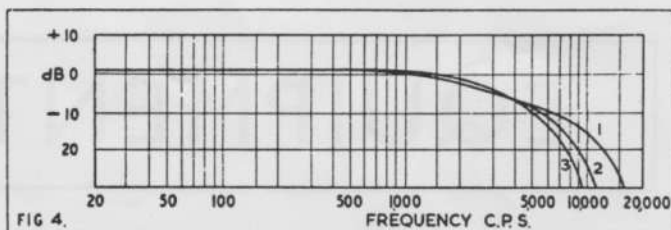


FIG. 4.

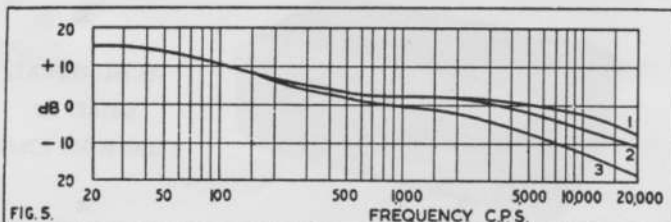


FIG. 5.

● Maximum Top Cut (above), record equalisation (below).

shellacs); modern coarse groove (78); and modern fine groove (45 and 33 $\frac{1}{2}$). No British Standard Specification exists for the pre-1954 records, but the current British Standard requirements are completely met by curves 2 and 3.

Circuitwise, the unit consists of two completely separate amplifying channels, in which the various controls are "ganged" on common spindles. The first valve is a low noise EF 86, in which the basic equalisation for record, tape, etc., and overall maximum gain is controlled by negative feedback applied over this stage. This is followed by an ECC 83, the tone controls being placed in the feedback path between the two sections of the valve. The output of the second section is taken through the variable steep cutting filter and then to the output leads. As can be expected, the layout is complex, but it is not over-crowded and should offer no difficulty whatever to a competent service engineer. Indeed, all components can be replaced without disturbing any others, and the workmanship is of the standard one expects from telemetering equipment used in guided missiles. Mr. Peter Walker and Mr. John Collinson have every reason to be proud of their efforts!

Stanley Kelly