

than before and many firms told me that at last they seem to have got to the end of the servicing troubles. The 10 in. and 12 in. tube receivers seem to be obsolescent. On the other hand I believe that a 21 in. tube (which I understand has become standard across the water) is too large for ordinary domestic use: one has to get too far away from it to get the best balance in the picture. For the ordinary household a 14 in. or 17 in. is all that one really requires.

Now, what about the Show as a whole? My conclusion is simple and definite. I thought it considerably more interesting, and indeed exciting, than those of the past few years. There was a feeling of optimism about both among exhibitors and on the part of the visitors. Most

firms told me that business was distinctly good. Decca, for example, had more orders than they could cope with all at once, and that same story was told by many others.

I should like to think that it was the growing realisation of what can be done in the way of quality at a reasonable price that has caused the change. No doubt that has had something to do with it, as has also the fact that both Mullard and G.E.C. have indicated that the day of home construction has not ended. But candour compels me to admit that these are but minor matters. The one thing that stood out was the high hopes that the lifting of the Hire Purchase restrictions has caused.

Is there a moral to this? I leave it to you.

TECHNICAL REPORT

By P. WILSON, M.A.

The Pamphonic "1002" Amplifier and "1002A" Pre-amplifier (Price 40 gns.)

Specifications:

"1002" Amplifier

Input: By octal socket which also provides H.T. and L.T. power for pre-amplifiers and thence for radio tuners, etc.

Input impedance: 600 ohm signal source.

Output power: 25 watts.

Output impedance: 3.75 ohms or 6.6 ohms or 15 ohms or 60 ohms.

Circuit: Three stages with cathode coupled phase reverser in second stage and push-pull tetrodes in "ultra-linear" circuit in output stage. First stage is two halves of double triode in parallel. Positive and negative feedback from output transformer to cathode of first stage.

Valves: ECC83 (Mullard), ECC81 (Mullard), two of KT66 (Osram), GZ32 (Mullard).

Sensitivity: 0.35 V for 15 watts output.

Frequency response: Flat from 2 c/s to 80,000 c/s.

Distortion: Less than 0.05% at 15 watts.

Hum and noise: Better than minus 90 db.

Output damping: Infinity.

"1002A" Pre-amplifier

Circuit: Three stages plus cathode follower output.

Fixed correctors for magnetic pickup input to compensate for recording characteristics.

Variable bass and treble boosts and attenuators of Baxandall type.

Steep cut filters.

Valves: Two of Mullard ECC40.

Controls: Input Selector for Tape, Radio, Mag. P/U, Microphone.

Three positions for Mag. P/U: 78; N.A.B.; LP.

Bass: From minus 15 db to plus 15 db at 50 c/s.

Treble: From minus 20 db to plus 15 db at 20,000 c/s.

Filter: Roll-off at 4, 7 and 12 kc/s. Slope, 22 db per octave.

Volume: With ON-OFF switch.

Input:

Microphone: High impedance (1 megohm). Sensitivity 3 mV.

Mag. P/U: Input impedance 1 megohm. Sensitivity 15 mV in 78 position, 10 mV in N.A.B. or LP positions.

Radio/Tape: These inputs are equivalent with sensitivity 100 mV.

At first sight it would seem that these two units are similar to the Pye units which I

reviewed in June; but in fact they are different, though they had the same designer. The principal differences are in the main amplifiers where different valves are used for the early stages, and here the KT66's are used as tetrodes in an "ultra-linear" circuit, whereas in the Pye the more conventional triode circuit is used. Both have about 26 db of negative feedback and both have enough positive feedback (which is adjustable) to enable the damping factor to be infinite.

The ultra-linear circuit is comparatively new, but it is becoming increasingly popular so as to enable the higher wattage output characteristics of beam tetrodes to be combined in large measure with the linearity and freedom from harmonic distortion of triodes. It makes more severe demands upon the output transformer so that the necessary feedback can be secured without instability; but the technique of transformer design has improved beyond recognition in the past few years.

This Pamphonic unit shows how completely successful the new technique can be. An output of 25 watts has been secured with complete stability and a remarkably low distortion factor. To secure this a certain amount of range has been sacrificed in the frequency response; but a flat characteristic up to 80,000 c/s should suffice, and more than suffice, for all audio applications. At the bass end of the scale the response is well maintained even to the fantastically low figure of 1 c/s; but of course there is no special virtue in going so low as that: it just happens to be the result of good design. Incidentally, it is important for the response to transients that the input impedance should be matched at 600 ohms. This, apart from anything else, indicates the value of having a cathode follower in the output of the pre-amplifier.

My own tests verified the makers' specification in every particular. There was indication of a ringing above 100 kc/s, but this did not affect the proper functioning for ordinary audio purposes.

The range of effective response is of course affected by the setting of the pre-amplifier. At the level setting, when the pre-amplifier is switched to radio/tape, the range of response appears to be from about 30 c/s to 40,000 c/s. The designer tells me that he deliberately made as sharp a cut as possible below 30 c/s. I entirely approve this decision; at present at any rate there is more to be lost than gained by extending the response below that point. I remember that a few years ago I was puzzled to know why an amplifier I had constructed on the most generous principles would persist in overloading with comparatively small input—as I thought. I found later that the loudspeaker cone could be seen to move in and out in time with a

"swinger" record; I was reproducing 78 cycles per minute, i.e. 1.3 c/s, at large amplitude and this very nearly overloaded the amplifier on its own!

The number of pre-selected input conditions is smaller for this pre-amplifier than it is for some others. For all ordinary circumstances however, it is adequate; and the means of adaptation to other extraordinary purposes are simple enough to anyone who knows his way about these things. Some hints about this are given in the installing and operating instructions; but I feel that it would have been an advantage if these had been extended somewhat so as to refer to more particular applications, using different standard makes of pickup for example. Similarly, more detailed advice might have been given to indicate the appropriate settings of the bass and treble controls to give a fine adjustment for various recording characteristics.

These controls are graduated from minus 5, 4, 3, 2, 1, Flat and so on to plus 5. When I tested the response of the pre-amplifier I naturally set these controls at Flat and cut out the filter control altogether. I naturally supposed that this should give a level characteristic, but I was wrong. A square wave input, viewed on an oscilloscope from the output of the amplifier, showed a clear tailing off in both treble and bass. A completely level response was, however, obtained when the treble control was set at plus ½ and the bass control at plus 1½. At my instance, the makers checked up on other amplifiers in their research laboratories and found that the same settings were applicable on these as well. I mention these facts not at all because they could reasonably be regarded as faults in the pre-amplifier; the consistency is on the contrary a tribute to the design; but for the benefit of other users who have not my facilities.

With this qualification my measurement tests were in entire accordance with the makers' specification.

In my listening tests, I have as usual enrolled many folk, to act as a sort of jury. I found many years ago, when I was helping the School Broadcasting Council, that this method can be developed into as accurate a measuring technique as any instrumental method. And it has the advantage that the measuring instruments can give reasons for what is shown on their dials. There has been nothing but approval.

If this is not "Absolute Fidelity", it is only because we have not yet adventured far into the realm of 3D in sound.

I cannot of course say that in this respect the "1002" is unique. I can in fact think of perhaps half a dozen other amplifier systems which I would place alongside it; and I should find great difficulty in deciding to which I should give my casting vote if I were chairman in the equivalent of a beauty contest.

But I am quite content to take it as my standard of reference for the future (or until I am persuaded that something else is definitely to be preferred). And in view of the extensive calibrations I have made of its performance, this is what I propose to do.

Need I say more?

Note: I have just been informed that as from September 27th, Pamphonic Reproducers Ltd. have opened new offices and showrooms at 17 Stratton Street, Mayfair, W.1. Telephone Grosvenor 1926/7.

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