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Origin of Speakers.

An Introduction

When on board H.M.S. Bugle as audiologist, I was much struck with certain facts in the nature of high fidelity as it was distributed in various parts of the world. These facts seemed to throw some light on the Origin of Speakers - that mystery of mysteries.

It is quite conceivable that an audiologist, reflecting on the mutual affinities of speakers, might conclude that they had descended from other speakers. Nevertheless, it would also have to be shown how the many speakers inhabiting this world would have been modified, so as to acquire that perfection of structure which justly excites our admiration.

It is thus of the highest importance to understand the order of descendency amongst high fidelity components that leads to modifications within speakers.

In this Abstract, I shall consider the Struggle for Survival arising primarily from the fecundity of manufacturers. I will then demonstrate how any speaker, when it varies in a manner profitable to itself, will survive through Natural Selection, the fittest of these causing extinction of less improved forms.

Furthermore, I can entertain no doubt that the view which most audiologists until recently held - namely that all speakers had been independently created - is erroneous. I am convinced that each speaker is merely a lineal descendent of other high fidelity components, originating with the tantale, and following on in a verifiable order to the tone arm, the cartridge, the amplifier and, finally the speakers. Thus do speakers in their resplendent colours and shadings, reveal their adaptation to all that has gone on before.



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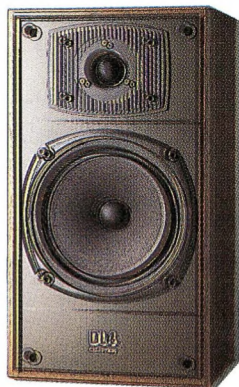
HI-FI FOR PLEASURE, FEB. 1985.

“High quality sound
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HI-FI NEWS, MARCH 1985.

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GRAMOPHONE, JULY 1985.



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recommended.”

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“A pair of DL6's
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HI-FI NEWS, MARCH 1985.

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HI-FI CHOICE, AUTUMN 1985.



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HI-FI FOR PLEASURE,
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HI-FI NEWS, MARCH 1985



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Comparing as many competing products as possible under consistent test conditions, *Hi-Fi Choice* is the ultimate buying guide. This issue offers comprehensive coverage of current loudspeaker models.

Many years ago, the loudspeaker was regarded as easily the most important part of the hi-fi system; more recently, the importance of choosing the right speakers has been under-rated in some quarters. Paradoxically, this is because speaker improvements have tended to reveal the real shortcomings of other parts of the system, so that enthusiasts, dealers and reviewers started to focus more attention on the subjective qualities of turntables and amplifiers.

Spurred on by fierce competition, speaker manufacturers have made good use of new materials, new technology and manufacturing methods, to bring out modestly-priced speakers which in many cases can make some larger and more expensive models look (or rather sound) silly. It is still true that for that final bottom octave of 'organ' bass, large loudspeakers (in a large room) are necessary. But it is also true that the newer 'compact' designs, which fit so much more happily into modern domestic environment, now give little away to models of traditional 'monitor' proportions.

Recent trends towards higher sensitivity (defined as the sound level a speaker will produce from a given input power) and higher power handling (the amount of power the speaker will accept without damage) have combined to make speaker-to-amplifier matching much less of a problem than it used to be. Any recent hi-fi amplifier is likely to offer at least a genuine 20 watts per channel and with averagely-sensitive speakers this will be sufficient to give normal listening levels in a moderate-sized room. In practice a larger amplifier should produce better results, and this is particularly true if Compact Disc replay is involved. The CD medium is capable of reproducing transient peaks of very high level, many times greater than the average music signal level; and though these may have a duration of only a few milliseconds they are crucial to the 'life' and dynamic quality of some music. If these peaks are to reach the listener, the amplifier must be able to deliver enough power and the speaker must be able to convert it into sound.

Attention to the subtleties of crossover design, and the availability of improved drive units, has allowed many smaller manufacturers to produce excellent products through painstaking research and development, rather than the application of 'high tech' design or manufacturing. Here, a high standard of craftsmanship will make the speakers a satisfying purchase.

While the sound of speakers has to be judged primarily in terms of 'accuracy' or 'neutrality', that is, truthfulness to the original, the finer points of sound quality must remain a matter of personal taste, this being bound up in all probability with the listener's taste in music. With most speakers, the comments in our 'blind' panel tests showed a fair degree of consistency from one listener to another, which is perhaps in itself encouraging. Some models did bring out mixed reactions, and in some cases speakers proved themselves more suitable for classical or rock. It is hard to lay down precisely what makes a speaker suitable for one type of music or another; a truly excellent speaker should perform well whatever the programme material, but undoubtedly some faults (such as woolly bass, lack of transient 'attack' and extreme treble clarity) may be more tolerable to the classical music listener, while others (such as midrange colorations, excessive treble energy, lack of stereo image depth) may be less important to the rock listener.

Stereo image, clean bass performance and overall realism do depend to a possibly surprising extent on optimum placement of the speakers in the room. Most speakers are designed to be placed on stands so that the treble units are at ear height, and should be a distance from walls.

The design of the stands themselves is important too, and it is now accepted that rigid stands which mechanically couple the speaker to the floor will produce the best results.

Optimum distance from side and rear walls will depend on both the speaker and the room — so the best advice is to look first at the maker's instructions, then experiment where necessary.

If the speakers are to be placed against the wall, it is really essential to get a pair that have been designed for this positioning — several are to be found in this book.

Finally, the speakers need to be connected to the amplifier. The apparently simple subject of speaker cable has become a controversial one lately, as the old wisdom of 'the thicker the better' is replaced by a growing support for 'single strand' cable. There is some theoretical justification for the claim that a single strand conductor of say one square millimetre cross section, give a clearer sound than multi-strand types. But before entering into the rarefied 'fine tuning' aspects, you'll need to shortlist some loudspeakers. This issue of *Hi-Fi Choice* will help you do just that.

Steve Harris

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LOUDSPEAKER BUYER'S CHECKLIST

High frequency sounds from the tweeter may "beam" in some designs while others have purposely tailored vertical or lateral dispersion patterns. The speaker needs setting to put the tweeter at an appropriate height for the ears of seated listeners.

Grilles on or off? Many speakers sound better with grilles removed, because of the diffractive effects of the grille frame. Can you live with naked drive units?

Efficiency. A more efficient speaker is one which is better at converting electricity into sound. A speaker of 90dB sensitivity will sound literally twice as loud as one of 80dB for the same power. To achieve the same by upgrading amplifier power would require a 50w amp be replaced with a 500w model! Higher efficiency may save you expenditure on unwanted amplifier power.

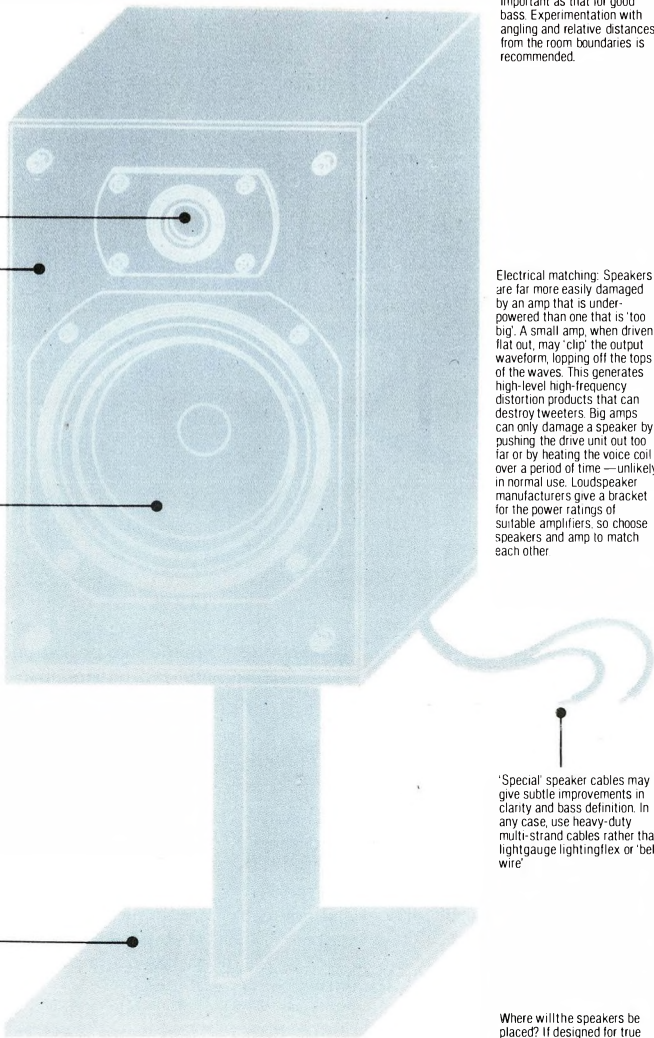
The stands should be inert, rigid and coupled to the floor to prevent the speaker rocking or moving. The speaker system will then be able to produce clean deep bass and stable stereo imagery.

Angling speakers inwards can improve stereo imagery. Room placement for good stereo is as important as that for good bass. Experimentation with angling and relative distances from the room boundaries is recommended.

Electrical matching. Speakers are far more easily damaged by an amp that is under-powered than one that is "too big". A small amp, when driven flat out, may clip the output waveform, chopping off the tops of the waves. This generates high-level high-frequency distortion products that can destroy tweeters. Big amps can only damage a speaker by pushing the drive unit out too far or by heating the voice coil over a period of time—unlikely in normal use. Loudspeaker manufacturers give a bracket for the power ratings of suitable amplifiers, so choose speakers and amp to match each other.

"Special" speaker cables may give subtle improvements in clarity and bass definition. In any case, use heavy-duty multi-strand cables rather than light-gauge lighting flex or "bell wire".

Where will the speakers be placed? If designed for true bookshelf or near wall location, they will only give a balanced output in that location. Speakers designed for free space do best on stands and will boom if put near walls or corners.



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TECHNICAL INTRODUCTION

Here the author gives a complete and detailed explanation of the latest series of loudspeaker tests, covering both objective measurements and subjective evaluation techniques.

In this, my sixth edition of HFC Loudspeakers, the test standards and content of the last issue have been fully maintained, and in some respects improved upon. With a new batch of 45 or so models to test, this including some revised and improved versions of established designs. A major priority here concerned the dovetailing of new data into existing material, which then had to be carefully reassessed to ensure that as far as possible it was consistent with the generally improving standard of loudspeaker performance.

While the wealth of test data, both objective and subjective, that is gathered together in a test of HFC standard can be of tremendous help to the reviewer, the task of allocating precise value judgements and final ratings remains an onerous one. Taken overall, around 100 speakers have been included in the programme, and this fortunately provides a powerful platform on which to base the judgements. Taken in the context of the whole series of Loudspeakers editions under my authorship, the long-term library of reviews actually extends to over 350 models, some of which — for example the BBC *LS3/5a* and Spondor *BC1* — are still extant, though they were initially reviewed in the earliest editions.

If changes are made to the review format or indeed if some new influential factor emerges — and of course this has happened in the last couple of years with the introduction of Compact Disc digital material — earlier reviews do require very careful reassessment. To this end, as has been our policy in previous years, we have included a continuing re-evaluation of our 'reference' models; those established models previously reviewed and appearing again in the new programme of listening tests this time round included the Quad *ESL63*, Spondor *SPT*, BBC *LS3/5a*, B&W *DM110*, Tannoy *Mercury* and Celestion *SL6*. These all helped to establish a key to the mean performance of those models reviewed originally in the previous issue, relative to those tested here for the first time.

So many worthy models were available for the new edition that it proved very hard to make a final decision as to which to include and which to leave out.

Our aim has always been to provide as many reviews as possible within the time and space available for the project, and in recent years we have had to reassess the true worth of the 'live-versus-recorded' listening tests. While philo-

sophically attractive, the live sessions in the past proved disproportionately expensive in relation to their real contribution to the project, and so, in the interests of including the maximum number of reviews, they were abandoned. However, with the re-evaluation of many previous designs, plus improvements in technique, we believe that the accuracy of the reviews has by no means suffered; indeed, much greater effort has gone into other areas, notably the far higher standards of recorded programme now used for the listening sessions. There have been no significant changes to the technical measurement programme this time round; very nearly all the reviews published in this issue include the computed room averaged responses which offer greatly improved consistency compared with the in-room measurements of earlier years.

LISTENING TESTS

In recent listening tests, a considerable proportion of the recorded material used has been of master quality, and by the time this year's listening sessions came round, the available selection of CD software had further improved. A prime virtue of this type of programme is its utter consistency; tests in earlier years unavoidably included disc and analogue tape replay, and even with multiple 'safety' copies, the deterioration during the tests was obvious to listeners. The participation of Tony Faulkner, a recording engineer who had produced two of the musical sections we used, proved to be most helpful, as he was well placed to judge the truthfulness or otherwise of the reproduced sound.

Replay environment

My personal listening room has been analysed for reverb. character and found to be particularly favourable. Above 100Hz the R_t curve aligned closely to 0.3 of a second, indicating an even, balanced and uncoloured characteristic. Inevitable irregularities below 100Hz were recorded but were considered to be well damped; for example the R_t did not exceed 0.51 at 50Hz. R_t data was recorded by two methods using 5 microphone position dispersed throughout the room. Real time high speed pen traces were taken, plus recordings of warble tone bands, which were also analysed. On the basis of the results, and as the room was large enough to accommodate comfortably the 6 panelists with

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TECHNICAL INTRODUCTION

a realistic distance between them and the test speaker (2.5-3m), it was decided once again to use the room for all our listening sessions.

Panel listening sessions.

These sessions proved quite arduous for the panel, as the members were required to provide a considerable amount of information for each loudspeaker. In addition to particular comments on frequency balance and coloration (these mainly drawn from a recommended table of characterisations), in all the panelists needed to give a numerical judgement on a total of five factors: overall accuracy and/or realism; frequency balance or subjective response flatness; clarity and detail; coloration; precision and depth of stereo image.

Concealed behind an acoustically-transparent curtain, each pair of speakers was presented to the panel, care having been taken to observe the optimum mounting conditions (correct height, angle, and also position relative to local reflecting surfaces). A programme lasting approximately twenty five minutes was reproduced at a realistic 93-95dBa maximum sound pressure (measured at 2m), with the average level in the 80-90dBa range.

Choice of source material

A reasonable balance of taste was catered for in the programme excerpts which included solo grand piano, flute, singing voice both male and female, small choir, and popular material possessing excellent bass and transient quality, as supplied by Dire Straits, Dafos, Phil Collins and Abba. Violin and fully-orchestral pieces were included plus the Sheffield drum record, with both 'purist' simple mic techniques and multimiked recordings represented.

Control repeats

During the stereo listening sessions, a number of repeats were incorporated, both to test and check the validity and consistency of the methods employed, as well as to investigate panel marking variations and possible extraneous influences on results such as session timing, morning or afternoons, etc.

As already mentioned, models from the previous tests were also inserted so that the correlation between the two sets of tests could be determined.

Data analysis

The test sheets were analysed in two ways, firstly for scoring on each programme excerpt,

and secondly for each performance parameter, independent of programme. Possible interactions between particular speaker and programme characteristics were also investigated and duly taken into consideration.

The usual statistical analysis was applied to the numerical data obtained from the panel score sheets, including mean and standard deviation, which allowed the basic ranking order to be established, the error factors to be assessed, and consequently the groupings on the basis of sound quality to be established. A Normal distribution curve was assigned to the data in order to roughly subdivide the group on the grounds of their subjective performance, such groupings being undertaken *prior* to the author being appraised of the name of the model concerned. Furthermore, the general comment on subjective quality is drawn directly from the panel assessments as written on the individual test sheets.

Live-versus-recorded tests

While no new live-versus-recorded tests were carried out for this issue, 'revised and reprinted' reviews contain comments based on the 'live' material used for earlier issues. This type of test was undeniably difficult to set up, and it involved several compromises as well as relying to some degree on the skill of the recording engineer in accurately capturing on tape a satisfactory proportion of the natural character of a live sound. To this end, we used the finest microphones available, chosen on the basis of their minimal coloration, with a sensible spacing between live source and mike, namely 1-2 metres. The recorder was carefully aligned to suit the type of tape we used, and a professional Dolby A noise reduction system was employed in order to preserve the maximum dynamic range. Experience has shown that the benefits accruing in terms of dynamic range extension (80dB wtd. record/replay) are preferable to any minor transient errors which might be introduced.

Even reverse copying was considered, in order to eliminate the usual phase shift accompanying most recordings. The actual recording environment itself is also important; it should be very 'dry', i.e. possess a very short reverberation time, the latter ideally measuring zero, which corresponds to true anechoic conditions. Accordingly we used an anechoic chamber to make the recordings, in this case the large facility at the Building Research Centre, Watford. (Previous trials at smaller

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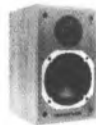
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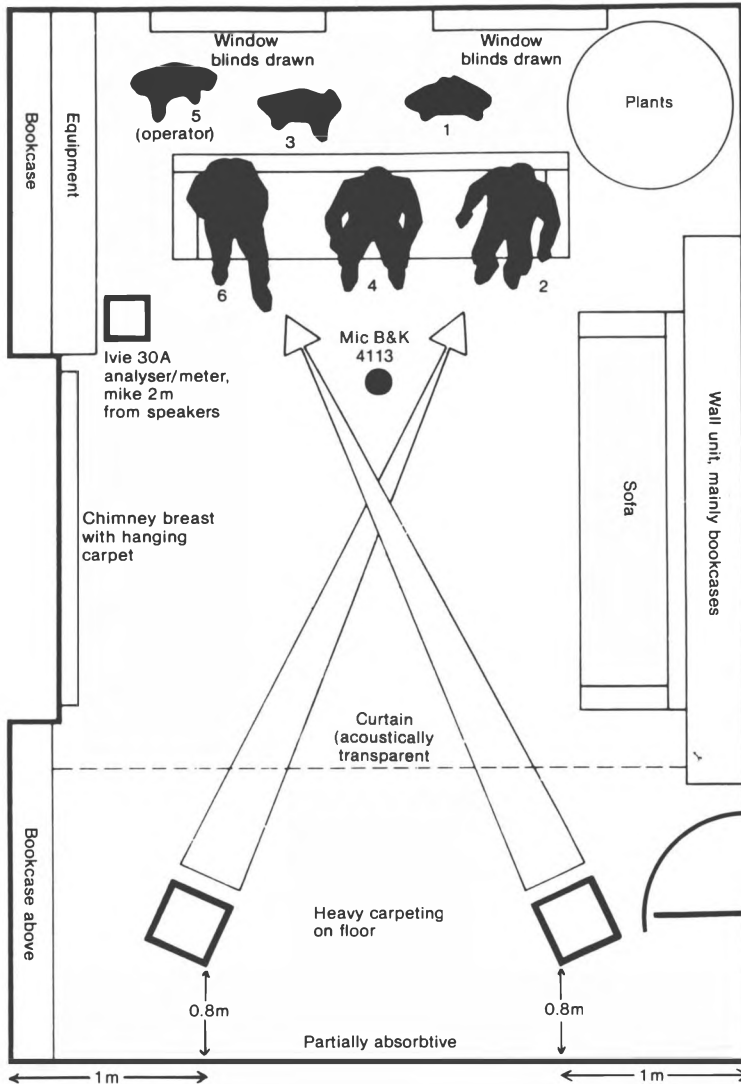
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SPALDING'S

TECHNICAL INTRODUCTION



Listening room data

Actual dimensions: 9' 6" H x 13' 9" W x 18' 4" L.

(IEC mean recommended dimensions:

9' H x 13' 9" W x 22' L).

Actual reverberation time: 0.3 seconds \pm 20%.

100Hz; less than 0.6 seconds at 50Hz.

(IEC recommended reverberation time:
between 0.3 and 0.65 seconds, mean 0.45).

Substantial Victorian house; suspended floor and ceiling (the latter heavily loaded by speaker loan stock above), heavy carpeting (3 ply).

Over 50% of surface area of walls lined with bookshelves; wall adjacent to loudspeakers reflecting, wall behind listening panel mainly absorptive. Dominant absorptive furniture, two large Chesterfield sofas.

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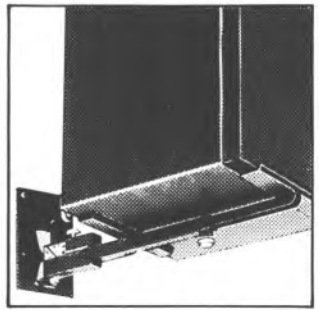
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TECHNICAL INTRODUCTION

anechoic locations had revealed that noticeable colorations were added to male voice recordings).

The test procedure involved continuously running the pre-recorded tape containing short verbal or musical phrases interspersed with blank sections, the latter filled in on test by the live performers. A carefully worked out entry sheet was provided for each panelist so that he or she could mark within an agreed scaling and framework of comments and characterisation. In addition to numerical scaling for accuracy or naturalness-of-reproduction, other factors such as coloration and frequency balance were also assessed.

Live musical passages included acoustic guitar, snare drum, cymbal, xylophone, flute and bass guitar as well as male voice. Test score sheets were analysed in the same way as the data from the recorded-programme listening sessions.

Laboratory Test Programme

For this new edition we again used the now well-established anechoic chamber at Cambridge Electroacoustics, this designed as part of a versatile measurement facility. The measurement procedures were carefully analysed prior to testing the speakers in order to evaluate the necessary corrections were these necessary.

Despite the new chamber's large size it was nonetheless necessary to continue to add a low-frequency correction to the response trace, amounting to a small increase in bass extension below 100Hz in the case of most models. The correction has been drawn in for both 1m and 2m responses, the difference being more pronounced with the latter. Distortion for second and third harmonics was run at 96dB — a decently high level which is capable of stressing many speakers. Distortion was also measured at a new level of 86dB, this being more representative of normal listening levels.

We took the usual care over pair matching, analysing the effects of speaker grilles and also identifying and using the optimum listening axes and control settings where these were provided.

The Characteristic Forward Response

This is considered a primary measurement, and seeks to present visually the forward radiating character of the loudspeaker, over a sensible forward solid angle and throughout the audible frequency range. Normally the fundamental response is that taken nominally on axis, usually

between the mid and HF unit. In certain circumstances however it is measured on the axis corresponding to the level of the listener's ear when the speakers are correctly sited and mounted. The uniformity or agreement of response traces taken off and around the main axis with those measured directly on the prime axis represent a crucial aspect of speaker performance, which determines whether good stereo imaging is possible, and whether the speaker will sound markedly different on- and off-axis.

For the hearing-related $\frac{1}{3}$ -octave noise measurements, the readings are taken at a realistic 2 metres distance from the loudspeakers. The Characteristic Response set comprises: axial; 15° above in the vertical plane (below if relevant, eg in the case of a tall floor standing model); 30° in the lateral plane (both clockwise and anti-clockwise if the speaker is laterally asymmetric); 45° lateral. (Note that in previous issues and reprinted reviews the vertical measurement was 10° above axis, and the 45° lateral measurement was not included.)

Recent research indicates that the perceived spectral balance of a loudspeaker is the result of a complex integration of the first group of sounds arriving within some 10-20mS. This period is in fact long enough to include reflected energy from adjacent boundaries — floor, rear and side walls. The character of these partially attenuated and decayed reflection, which are a product of the off-axis energy, adds to the direct sound from the loudspeaker.

The low frequency portion of the main characteristic response has been derived from an accurate sine wave analysis at 1m, frequencies above 200Hz representing the $\frac{1}{3}$ -octave analysed portion.

The characteristics that need to be satisfied in order to return a good performance on this test are as follows:

1. A wide, even and balanced axial response, fitting comfortably within the major ± 3 dB amplitude limits from 80Hz-15kHz.
2. A 15° vertical off-axis curve deviating by less than 3-4dB from the axial curve up to 15kHz.
3. A 30° lateral off-axis curve deviating less than 3-4dB from the axial response up to 15kHz.
4. Good lateral response symmetry.
5. A 45° lateral off-axis curve showing a smoothly falling characteristic with increasing frequency.

A speaker whose frequency response varies strongly with axis variations is classed as inconsistent, and will give different results for

TECHNICAL INTRODUCTION

each listener position. It therefore cannot be subjectively assessed with any degree of accuracy or reliability.

Reference curve

All loudspeakers (both left- and right-hand models) were measured on sine wave at 1 metre. This provided an accurate representation of the low frequency response. Furthermore by overlaying the curves of left- and right-handed speakers, the pair matching could be checked, and finally this measurement set a reference level against which the distortion reading could be scaled (see *distortion*), and the quoted lab sensitivity established.

A one watt level was the standard input, and established by a voltage of 2.83V rms on the speaker terminals. For this purpose the impedance was assumed to be a nominal 8 ohms.

Listening room responses

As part of our long term aim of improving the correlation between subjective and objective results, we have again included response traces measured in the listening room. Experiments with a storage spectrum analyser showed that it might be possible to chart a picture of the average forward sound energy arriving at the listening area. Due to the 'comb filter' effect, this test cannot be conducted with a stereo pair of speakers energised simultaneously; instead, taking a sensible number of averages, the speakers were evaluated one at a time for responses corresponding to three listener positions (centre, left and right) for the two speaker positions, left and right channels. Pink noise excitation was used, and each of the six responses is the result of four averages. The whole was algebraically summed and averaged using a powerful computing $\frac{1}{2}$ -octave spectrum analyser, this driving a suitable plotter recorder to produce the published responses.

These curves should *not* be expected to give perfectly flat responses. At low frequencies there are some inevitable irregularities corresponding to resonances peculiar to my particular room; the characteristic hump at 60Hz is the main feature here. It was however fascinating to see how different sizes and positions of speakers changed the apparent severity of this room response effect. One could expect the near ideal speaker to run more or less flat up to 5kHz; beyond this the response should gradually fall away. Since the final curve is an average of the response over a range of lateral

angles, approximately $\pm 30^\circ$, some of the higher frequency off-axis loss typical of current high frequency drivers will be reflected by the characteristic. Sharper changes in slope will correspond to irregularities in a speaker's response or directivity, and are therefore suspicious.

Taken at about two metres with the speakers mounted on stands well into the room (unless stated otherwise), the averaged response will contain a reasonable proportion of direct to reverberant or reflected sound, and is a fairly good indication of the tonal and spectral balance perceived by the listening panel.

Certain more directional speakers change the direct-to-reverberant ratio considerably and complicate the interpretation of these graphs. For example, the Quad 63 shows apparently severe room interactions at low frequencies, more so than theory would predict, but the subjective bass quality was nonetheless comparatively uniform and extended.

Two issues ago, a new HP computing analyser was put into service. Its room plots are reproduced by a digital plotter and some measurement data is automatically included, the scale factors being marginally different from the earlier responses. In particular, readers should note the new vertical scale of 5dB per major division, making the response irregularities look larger than before.

Distortion

The availability of a swept tracking filter allowed continuous recordings to be made on both the 2nd and 3rd harmonic distortions at standard levels: 96dB was used for all the speakers excepting the very smallest bookshelf enclosures, where a reduction to 86dB was deemed appropriate. With an average sensitivity of 86dB/watt, typically just 1 watt was required for the standard level; since most HF units in such systems are attenuated, blown drivers are nowadays a rare occurrence. However, at a level of 96dB miniature speakers are generally in gross overload at low frequencies, and a 86dB test level is thus fairer in view of their more limited application.

It is generally accepted that 3rd harmonic distortion is more aurally obtrusive than 2nd, so we paid particular attention to the level of 3rd order effects in the midband, where the value should be significantly below 1%. Higher figure arc permissible below 100Hz — say 2%, with up to 5% satisfactory at levels under 50Hz. 3rd harmonic distortion is an indicator of magnetic

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non-linearity — for example in crossover inductors — and is also related to the incidence of intermodulation distortion products. Accordingly, 2nd order values of perhaps double may be considered acceptable. A decibel (—dB) scale is given on the graphs, referenced to midband 0dB only, so this will require rescaling if a chosen frequency is materially different from that reference level.

Peak power distortion

While 96dB is 'loud' for continuous tones, speakers these days are rated for momentary power peaks, up to and beyond 100W. Swept continuous tone measurements at this level risks destroying most speakers. Accordingly short tone bursts at peak levels of up to 100W equivalent continuous power were used, using two selected frequencies. These were respectively 500Hz (near a crossover point for a three-way system and in the middle of the main frequency range for a two-way design), and 5kHz (in the HF range and close to a crossover point for most systems). Some 16 cycles were applied on a 2Hz repetition rate, a low enough level not to damage driver coils; or produce more than a few degrees centigrade temperature rise.

The burst length was sufficient for an FFT analyser (*HP3582A*) to capture and perform distortion harmonic analysis down to 0.3%, and to read the toneburst dynamic compression down to 0.1dB by transfer ratio techniques.

Impedance

For the earlier reviews, using a form of constant current drive from a sweep oscillator (2kohm feed resistance), the modulus of impedance was plotted on a 25dB logarithmic scale, with the zero dB baseline set at 4 ohms. The +20dB line was then scaled at 40 ohms. The imaginary or reactive impedance component was assessed by continuously monitoring the phase, and 'worst case' combinations of phase and impedance were specifically recorded.

For the new reviews in the 1983 issue the marked baseline was 0, with a linear 0.5 ohm per division scaling. Note that the reviews revised and reprinted from the last edition have a different scaling, as a linear potentiometer was employed with 0.5 ohm per division and a 2.5 ohm baseline. This means that the first major division '10dB' from the baseline is 7.5 ohms.

In the 1984 issue, I was obliged to make yet another change in the impedance scaling. At the last minute the recorder I use developed a fault

and a conventional 50dB log scale had to be used instead. Here the 20dB line represents 10 ohms, and the 10dB line 3.3 ohms, below which few speakers should fall. Due to this change in scale, impedance variations look smaller than previously.

Constructional quality

The enclosures were inspected both inside and out to assess the quality of their construction, the grade of components used, and the general standard of their engineering. During all tests, any buzzes or rattles were noted and where possible their source identified.

Sensitivity and power rating

From the reference curve, a mean mid-band sensitivity figure was recorded, this corresponding to the sound pressure at 1 metre from the enclosure, while energised by 2.83V (sine). A nominal 8 ohms draws 1 watt from the voltage, and lower impedance draws more power, on a pro rata basis. Since amplifiers (within their limits) are theoretically voltage sources, this method of specifying voltage sensitivity is a sensible one. Likewise, as no loudspeaker presents a constant impedance value, a power input sensitivity rating is rather a pointless one.

From the power handling, sensitivity and impedance data, a recommendation can thus be made concerning the loudspeaker's minimum and maximum amplifier power rating (per channel, 8 ohms). It should be appreciated that this is only a recommendation, and will be modified in practice by individual taste; *ie* a requirement for low or high listening levels as well as by the size and acoustics of the particular listening room involved. The minimum amplifier power that is quoted relates to a typical maximum sound pressure level of 96dB(A (2 metres) from a stereo pair of speakers in an average room of volume 80 cubic metres.

It is almost impossible to specify a maximum power rating, as a complex relationship exists between the type of programme, the maximum power input (peak and average) and how long this maximum level is maintained. In this test we found most of even the smallest speakers could sustain a 500W peak, 250W mean power input on solo instruments in the midband, provided that its duration did not exceed 15 to 20 seconds. On highly transient signals a 500W peak could apparently be indefinitely tolerated if the mean power was low — in the case of the levels required to reproduce the live instruments, the *average* power was often below 5

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3/DA

TECHNICAL INTRODUCTION

watts.

A strange contradiction was apparent in terms of amplifier size, with the larger models appearing to be safer than smaller ones! Take for example the case of the Spondor BC1. It incorporates a Celestion HF 1300 treble driver which is rated at not more than a few watts, and yet the system as a whole survived the high level test at a full 250 watts for over a minute, and easily tolerated 500W peaks. However, partner this system with a smaller 35-50W amp, and drive the latter beyond its limits into clipping, and there is a good chance that the treble unit will blow, as many BC1 owners will testify, having tried to use the speakers at a party! This example clearly illustrates the difficulty of defining speaker power ratings.

Notes on frequency response testing

The repeatability of response measurements from one test facility to another is surprisingly poor. This obviously matters little for models whose response profiles resemble mountain ranges, but when a carefully calibrated model with tightly specified response limits is in-

involved, it is only too easy for an unfortunate combination of circumstances to result in a measured response that is apparently 'out of spec.'

Careful consideration of the factors involved does however enable sources of error to be identified and accounted for. They include the following:

1. Slight but significant differences in microphone frequency response, particularly if 500Hz is chosen as a reference point with which to correlate subjective spectral balance judgements. This is unfortunately true of even the best 'lab reference' condenser microphones.
2. Proximity effects, whereby the range below 500Hz is elevated by 0.5dB or so at 1 m relative to the speaker's previously calibrated response at 2 m.
3. Non-anechoic environment effects.
4. Choice of axis is also critical, since the response naturally varies somewhat with mike position on the frontal axis.
5. Whether or not the grille is in position during measurement can also affect the results; some manufacturers quote specs. with the grill

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<p>B&W DM110</p> 	<p>CASTLE CLYDE</p> 	<p>ROGERS LS6</p> 	<p>TANNOY MERCURY</p> 

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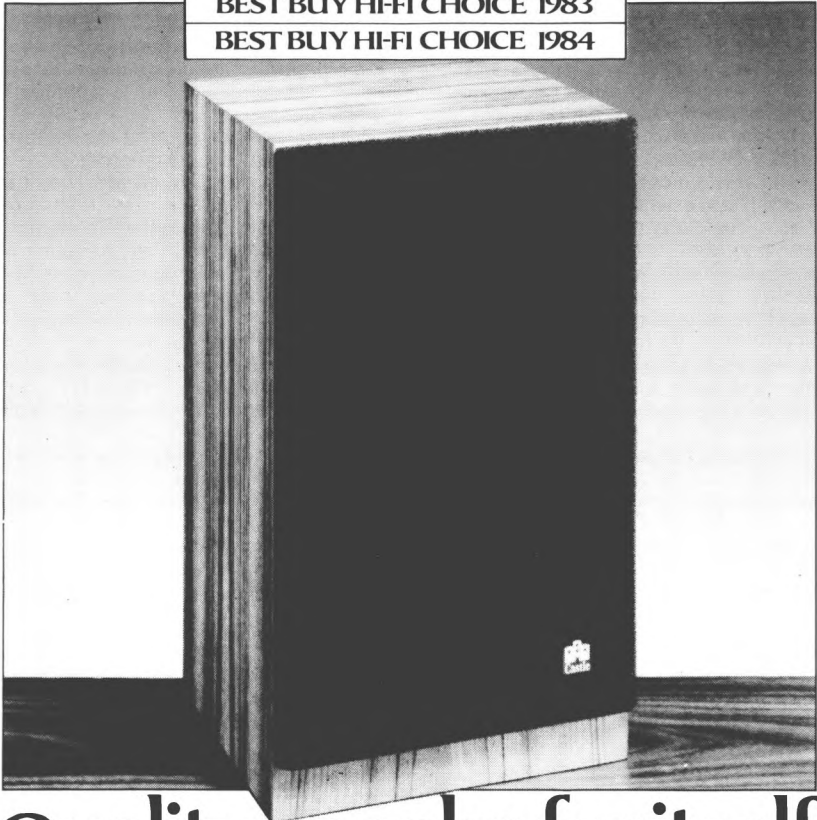
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TECHNICAL INTRODUCTION

removed.

In one case a combination of these factors resulted in a response curve that differed in balance and character from the manufacturer's own claimed tight limits, although it still met a $\pm 2.0\text{dB}$ spec. (but only just) right up to 17kHz. This example illustrates that the tester must be aware of such effects in order to maintain a good level of accuracy in published responses and the interpretation thereof.

Listening panel

For the latest tests the listening panel included the author, John Atkinson, Dave Collingwood, Paul Crook, *HFC* Editor Steve Harris, David Prkel and Neil Whiteley-Bolton. Panellists who took part in the listening test sessions for the previous issue also included Tony Faulkner, Ivor Humphreys, Ken Kessler and Noel Keywood.

Location

Measurements were conducted at the Cambridge Electroacoustics Laboratory, while listening tests were carried out in the author's calibrated and near-IEC Standard room. Note that this room is appreciably 'dry', with an unusually even reverberation over the frequency range; in practice, domestic rooms are likely to be more reverberant as well as noticeably 'livelier' and brighter in the upper frequency range.

Equipment used in listening tests

Burmester 828, Krell KSA100, Magnum A100 power amplifiers

Sugden C128, Audiolab 8000C pre-amplifiers
Monster Reference interconnects, Absolute Wire speaker cable, Michell and Monster terminations

Cliff Stone, Stand and Deliver mineral-filled floor-keyed speaker stands

Yamaha CDX1 Compact Disc player

Lux PD300 turntable (modified, see *Turntables* issue No 35), Alphason HR100S arm, van den Hul MC1B cartridge

Bruel & Kjaer 2203 sound level meter

Revox B77 High Speed IEC open-reel recorder
Dolby A361 'A' processors

For earlier tests:

Linn LP12 Valhalla turntable, Ittok arm, Linn Asak, Koetsu Black and Technics EPC205 IIII cartridges

Sony CDP101 Compact Disc player

Lucas ILV and QED C38 speaker cables

A&R SA200 power amplifier
Quad 34 and Sony Espirit 901 pre-amplifiers
Sony PCMF1 digital encoder.

Programme material

For the latest series of tests, the programme was taken from the following:

Schumann: Fantasy Op 12, Brendel (PH411 042-2, CD)

Debussy: Quartet in G Minor, Orlando quartet (PH411 050-2, CD)

Feste Romana: Respighi, Dutoit (PH410 145-2, CD)

'Flesh and Blood' by Roxy Music (800 019-2, CD)

'Hello, I must be Going' by Phil Collins (V2252, CD)

'Walk Across the Rooftops' by Blue Nile (Linn LHK 1)

'Easy Money' by Ricki Lee Jones (03296-2, CD)

'This is Makewicz' with Phil Woods (Sheffield Lab 21, direct cut)

Lab test equipment

B&K 2010 generator/analyser

B&K 1901 harmonic controller

Nicolet 100kHz FET analyser

B&K 4133, 4165 precision 12.5mm condenser microphones

B&K 1623 tracking $\frac{1}{3}$ octave analyser

B&K 2307 high speed level recorder

B&K phase meter

Ivie 30A real time $\frac{1}{3}$ octave analyser

Rion LR04 level recorder

Hitachi 550 oscilloscope

Baxendall sweep oscillator

Shackman scope camera

Hewlett-Packard HP8703 audio analyser

Hewlett-Packard HP3561A and HP3582A

Fourier analysers

Hewlett-Packard HP200 and 89826A computers

A&R Cambridge SA200 and Mission 777BU power amplifiers

Acknowledgements

Special thanks are due to Marianne Colloms for typing and correcting the manuscript; to Paul Crook, listener, technical assistant, main sequence operator and general dogsboddy; to Tony Faulkner for loan of digital master tape programme; and to Mrs M. Barker for putting up with the noise.

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a selection of the models tested.

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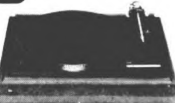
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Acoustic Research AR18BX

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Tel (0582) 603151



Aimed at the '£100 a pair' market, this speaker is the successor to an established line of *AR18* models. A budget two-way enclosure, this compact loudspeaker employs a new 200mm steel framed bass unit equipped with a flared pulp cone. The crossover is set at approximately 3.5Hz to the small plastic cone high frequency unit.

Measuring 44cm high and 21cm deep, this model can be used on stands or shelf mounted; certainly a position near to a wall is to be recommended. Internal volume measures 14.5 litres, and the sealed box enclosure is lined with acoustic absorption material. The exterior is finished in a walnut effect veneer, but the push-on grille was unpromising in acoustic terms, as it had an unrebated edge that is likely to impair performance in the treble range.

Sound quality

While the *18EX* scored a little higher than the *8BX*,

the panel results still showed a rather below average performance. A 'boxy', 'hollow' coloration was noted which appeared to mask ambience as well as the replay of recorded acoustics. On occasion the mid sounded hard and forward, while the stereo image portrayed little depth.

Bass seemed to be of below average definition, while the treble sounded fierce and forward. Tonally the system lacked balance and richness, though it was not particularly bright. Dynamics were compressed while stereo images lacked full focus and clarity. Bass extension was average for the size. Taken overall, the sound could have been both cleaner and clearer.

Lab report

At 1 metre, the *18BX* showed a good sensitivity at 90.5dB/watt. In conjunction with a 75W peak programme power capacity, this allowed the speaker to produce fairly high sound levels of up to 104dBA in a typical room. Amplifiers as low as 10W per channel will still give satisfactory sound levels of up to 96dBA.

Referenced to the sensitivity figure, the -6dB bass rolloff was about average at 60Hz. The grille exerted a relatively mild effect, as the dotted curve, (grille off) showed. On axis the response rose from 80Hz to 2kHz with a small glitch at this point. Beyond, the treble looked notably uniform, if set slightly high in absolute level.

At 2 metres, with response smoothing, the forward response was fairly uniform while it showed evidence of a double humped output at approximately 2kHz and 10kHz. Measured vertically off-axis (dotted), the uniformity was good, while the 45° lateral off axis loss was greater than usual.

Impedance measured slightly below the 8ohm standard, this speaker still remained an easy amplifier load.

At 96dB sound pressure level, 1 metre, distortion was poorer than average, particularly in the upper frequency range. At the lower 86dB level, third harmonic remained satisfactory, while a considerable improvement in second harmonic had resulted, with a general average of 0.3%.

In the listening room, the computer analysis revealed a tidy result at low frequencies, with a decent balance, but the two-humped upper range output was quite clear, giving a 'lumpier' sound than the axial reference response might otherwise suggest.

Summary

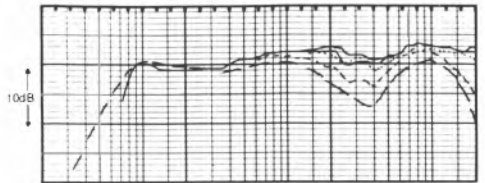
In objective terms, this speaker's performance was satisfactory despite some sound power lumpiness in the mid and treble ranges. However,

when assessed subjectively, these aspects were allied to a fairly high level of cone and box coloration and the scores were unimpressive. No recommendation is appropriate.

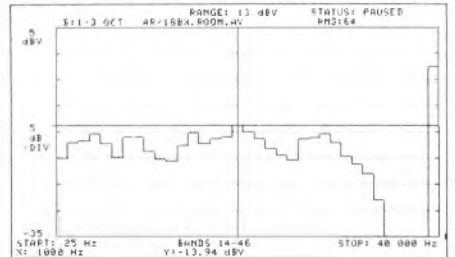
(Note: A new range of AR models was in preparation at the time of going to press.)

GENERAL DATA

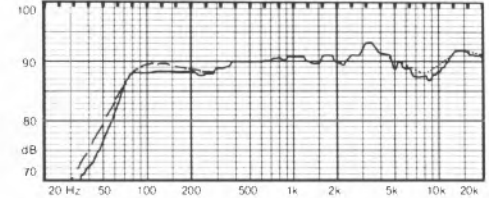
Size (height x width x depth).....44 x 28 x 21cm
 Recommended amplifier power per channel.....(10) - 75W
 Recommended placement.....on stand near wall
 Frequency response, within $\pm 3\text{dB}$, at 2 metres...65Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....60Hz
 Voltage sensitivity (ref 2.83V, or 1W into 8ohms at 1 metre).....90.5dB/W
 Approximate maximum sound level (pair) at 2 metres.103.5dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£100



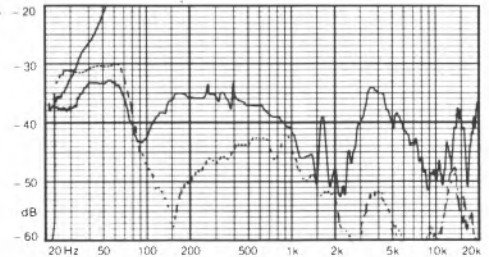
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



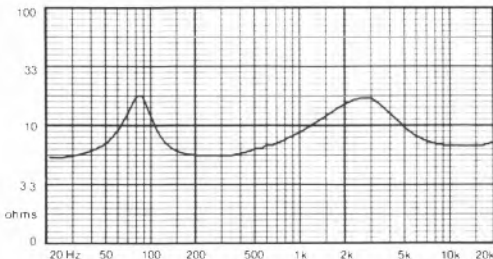
Averaged forward characteristic response in room.



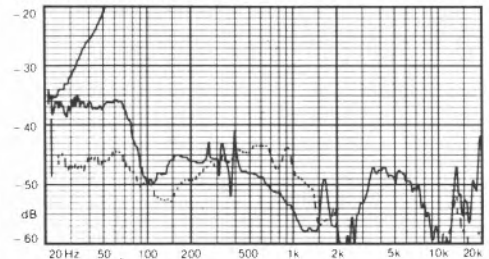
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

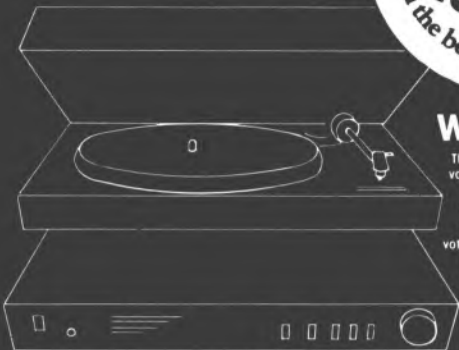


Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

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Arcam Two

A&R Cambridge Ltd, Denny End Industrial Estate, Waterbeach, Cambridge CB6 9PB
Tel (0223) 861550



A&R's first Arcam loudspeaker model, appropriately called the *One*, scored a hit two issues ago and has now been joined by a smaller brother called the *Two*. Like the *One*, this compact design is a two-unit system, bass reflex loaded, and carries the same unusual feature of an open-cell porous plug in the reflex port, which can be left in or removed to alter the response at the low-frequency extreme.

The two drive units are mounted vertically-in-line and comprise a 19mm soft plastic dome by Vifa and a 170mm Cobex pvc coned bass mid unit, built for A&R by Elac. The latter driver has a steel frame, with an appropriate magnet. Using high quality components the crossover is nominally 12dB/octave, 2nd order. Inside, the chipboard panels are damped by a bituminous lining, the interior air volume damped by a small amount of foam and fibre wadding while the thick MDF front panel is braced in the area between the drivers.

The overall construction is very good, and the exterior is finished in real wood veneer, with a foam grille of good acoustic properties.

With a 13 litre internal volume, the enclosure is tuned by the large 57 diameter port, 15.5cm long, fitted on the rear panel. Electrical connection is via projecting 4mm socket binding posts.

Matching platform stands were provided, but the general recommendation is for near-to-wall positioning, adjusted to suit the room acoustics and taste.

Sound quality

The *Two* scored a direct hit at the 'average' mark in the listening tests for this edition. Its price is also virtually at the group average and so the listening result is considered worthy, but unexceptional. The panel agreed closely on marks, suggesting a consistent, well balanced output with good forward distribution.

Stereo focus was to a good standard, with fair representation of depth though with some central concentration, reducing soundstage width.

Tonally it tended to be a little 'thin' and bright, with a hint of mid hardness, but violin tone was rated well. Piano lacked 'body' however. The bass was average in definition while low bass was muted; with the port open, more low bass was available at the expense of mild boominess. Coloration was judged a little better than average overall, with a reasonable power handling on heavy rock programme.

Lab report

The reference sensitivity measured 87dB/W which was about average, suggesting a minimum amplifier power of 15 watts per channel. It coped with up to 75W peak programme (undistorted) and could thus provide up to 101dBa sound levels in a typical room. The distortion results at a continuous sound level of 96dB at one metre gave decent average readings of 1%, through the bass-mid region. At the lower 86dB sound level, distortion improved with typical mid band results of 0.3% (-50dB), falling still further at high frequencies.

The axial reference curve showed a rising trend up to 500Hz, confirming its optimum position in close proximity to the back wall. Port open, the -6dB rolloff was average at 52Hz, and with the port plugged this rose to 65Hz, though with a slower rate of bass rolloff. From 400Hz to 20kHz, the output met close limits.

Turning to the forward response set, the output can be seen to be well integrated in the lateral plane but showed a mild trough at 15° above axis,

this suggesting use of fairly high stands such as Arcam's own.

In the room the speaker response showed some mid forwardness, together with excess treble and a shy bass at the lowest extreme.

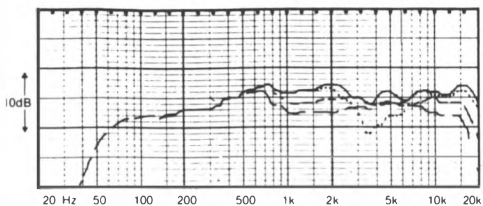
Summary

The Arcam Two is a nicely finished, well engineered compact system, suited to near wall mounting on stands. Its competent performance in both subjective and objective terms has ensured that it has not fallen behind, but its achievement was too close to the average for recommendation. Conversely, it has sufficient merit to be well worth consideration, particularly as part of a complete A&R system.

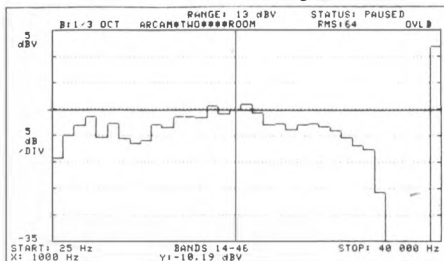
GENERAL DATA

Size (height x width x depth).....38x22.5x28cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(15) - 75W
 Recommended placement.....on stand near wall
 Frequency response, within ±3dB, at 2 metres...70Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....52*/65Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....87dB/W
 Approximate maximum sound level (pair) at 2 metres....101dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£200

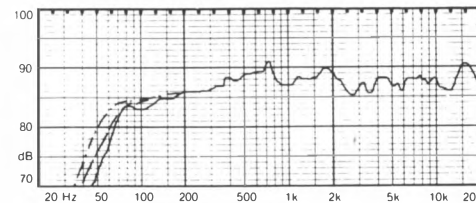
* port open



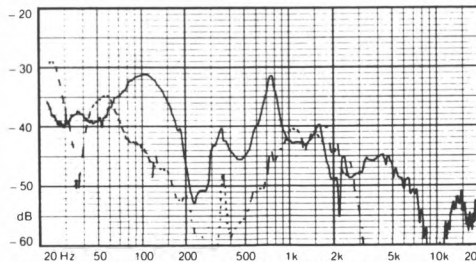
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



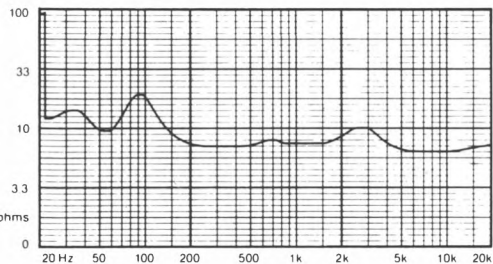
Averaged forward characteristic response in room.



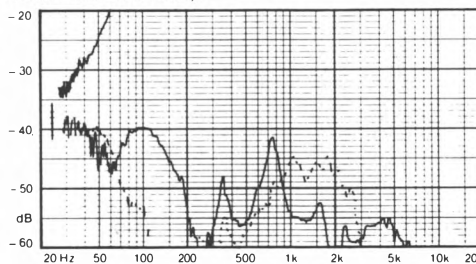
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

RECOMMENDED

Arcam One

A&R Cambridge Ltd, Denny End Industrial Centre, Waterbeach, Cambridge CB6 9PB
Tel (0223) 861550



A&R's first venture into the field of loudspeakers, the Arcam One is a medium-sized, two-way bass reflex system aimed at the higher quality end of the market. The recipe is straightforward enough – a 200mm bass/mid unit plus 25mm soft fabric dome tweeter, but A&R's approach shows considerable care and attention to detail.

The tweeter is a modified Peerless design, mounted above an A&R-designed, Elac-built bass/mid unit. Constructed on a strong damped steel frame, the latter uses a generous motor system driving a synthetic flared cone formed from Cobex (a pvc material). The crossover is a high-quality, high power design, with 12dB/octave slopes and may be disconnected by the user via a terminal patch panel on the enclosure rear. Direct active connection to the two drivers is then possible, using matching A&R electronics.

Built from 19mm chipboard, the substantial enclosure is internally braced and loaded by a thin bituminous cladding. A 120mm deep ducted port is located on the rear and is fitted with a user-removable damping plug to allow fine adjustment of the lower bass output.

Externally, the system was well finished in a high-quality walnut veneer on all surfaces. The 12mm-thick grille panel has a step effect, although this is partially ameliorated by a foam strip around the tweeter. Against A&R's recommendation, we felt the grille was better removed, and it could do with some modification.

Sound quality

A strong consensus of opinion favoured the Arcam One. Its numerical rating was high, backed by complimentary judgements and few criticisms. Bass was a trace boomy with the port plug removed (as suggested by A&R), while some mild boxiness was heard in the lower mid, and the upper treble occasionally hinted at fizziness.

Conversely, this speaker produced lively, open, balanced and transparent stereo images. Ambience, air and depth were well portrayed while natural perspectives and musical detail were also evident over the whole frequency range. Stereo images were stable and well focused, and transients were convincingly reproduced.

Lab results

The reference 1metre response showed the mild improvement with the grille removed (dotted), and illustrated a smooth overall result. Sensitivity was above average at 88dB/W with a typical bass rolloff at 55Hz (porous plug in). Pair matching was good for these early samples. A minimum amplifier power of 15W per channel is suggested, and the general performance indicated a capacity of up to 150W of unclipped music programme, generating respectable 104dBA maximum sound levels.

At 2metres a well ordered and integrated forward response output was demonstrated. 15° above and below axis, responses dipped mildly at the 2.7kHz crossover frequency and the speaker median axis should aim accurately at the listener for the best results. The lateral responses were particularly good.

At a 96dB sound level, one metre, the second and third harmonic distortion levels were typically around 0.8% to 1.5%, which was a good result. At 86dB the second harmonic

Improved but third did not, and here the system is possibly somewhat worse than average, the cause probably being magnet pole linearity.

The impedance curve showed an easy, well controlled 8ohm amplifier load, and for interest's sake the result with and without the port plugged is shown.

Room averaged, (port open) the Arcam a fine result. The response showed a slight bass excess with quite good integration and depth, while the middle register was surprisingly smooth, with textbook rolloff at higher frequencies.

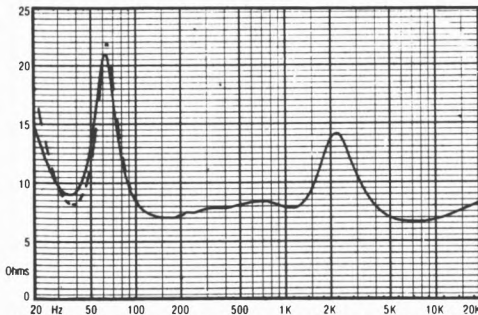
Summary

A&R have a convincing performer in this fine loudspeaker. The subjective scores, the quality of construction and finish justify a strong recommendation (we have not given 'Best Buys' to speakers over £275 a pair). The sound was clear and open, with fine musical detail and accurate stereo presentation. Distortion was satisfactory to good, power handling and maximum sound level fine and the system easy to drive.

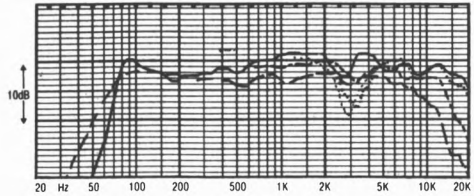
With A&R's acknowledged electronic expertise the active version could sound even better. To conclude, the Arcam *One* happily justifies its price tag.

GENERAL DATA

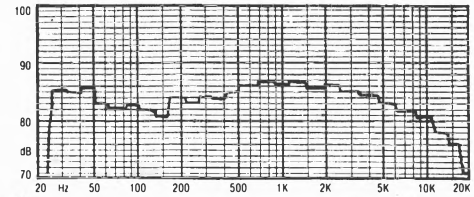
Size (height x width x depth).....	47 x 27 x 33cm
Recommended amplifier power per channel (for 96dBa minimum per pair at 2 metres)	(15)—150W
Recommended placement.....	open stands
Frequency response, within ± 3 dB, at 2 metres	60Hz to 20kHz
Low frequency rolloff (-6dB point) at 1 metre.....	55Hz
Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre	88dB/W
Approximate maximum sound level (pair) at 2 metres.....	104dBa
Impedance characteristic (ease of drive)	very good
Forward response uniformity	good
Typical price per pair, inc VAT.....	£299



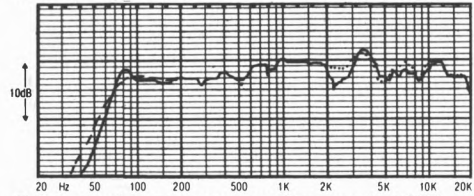
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



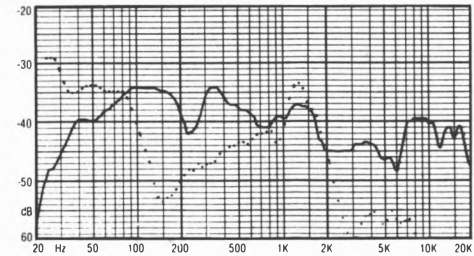
Forward characteristic response ($\frac{1}{2}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



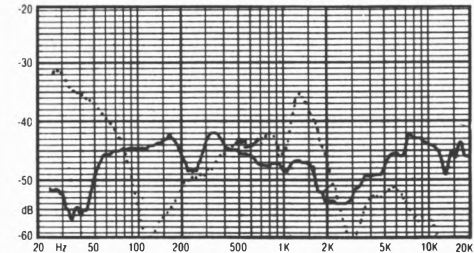
Averaged forward characteristic response in room at listening position.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

B&W DM100

B&W Loudspeakers Ltd, Marlborough Road, Churchill Industrial Estate, Lancing, West Sussex
Tel (0903) 750750



The '100 is the smaller brother to the successfully established *DM110*, and follows many of its larger brother's good engineering features. For example, the 190mm bass driver chassis is a die casting, its 145mm flared pulp cone having surface damping treatment, the whole energised by a generous magnet.

Our samples were finished in a good quality 'black ash' vinyl. The enclosures are built from plain 15mm thick chipboard, with an internal volume of 11 litres. A sealed-box design, system resonance was rather high at 100Hz.

Crossing over at around 3kHz, the network is essentially third order, 18dB/octave and uses five elements plus an attenuating resistor. The 25mm soft plastic dome tweeter (made by B&W) is protected by a user replaceable fuse.

The grille baffle is made from 15mm stock, unrebrated, and it is best to detach it (as we did) for serious listening. Free space or shelf mount-

ing is possible. Electrical connection is made via 4mm socket/binding posts.

Sound quality

The '100 romped through the listening tests with a substantially 'good' score, which is very good for the class. Sounding a trifle 'loud' and lightweight in tonal balance, it provided an even, well-integrated sound, with consistently good levels of both detail and clarity.

Stereo focus was good, with quite a good representation of depth as well as recorded ambience. Perspectives were nicely handled, while the coloration was fairly low throughout the range. It proved a bit shy in the low bass but the upper bass was both clean and tuneful. Good power handling was shown up to 75W above which point some detail was lost.

Lab report

On axis at the reference 1 metre distance, this speaker proved its pedigree by providing a ± 2 dB output from 80Hz to 20kHz. The grille was acoustically poor, as the solid line (grille on) showed. The reference sensitivity was 89dB/W, above average, and the -6dB rolloff occurred at 75Hz, a higher than usual frequency.

Pair matching was very good. Maximum sound levels of 103dBA are possible with a minimum of 10 watts per channel indicated.

At 2 metres microphone distance, a well integrated set of curves resulted with only minor variations over the various axes. The overall balance was pretty good.

The fine sensitivity was not compromised by the impedance curve which did not fall below 6 ohms and averaged 8 ohms. Driven to a 96dB sound level the distortion results were good, averaging 0.3% above 300Hz and well balanced below that frequency. By 86dB, a general improvement has occurred with second harmonic falling to negligible levels above 300Hz.

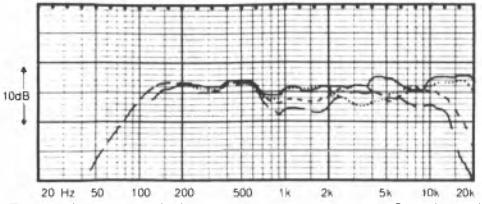
While the low frequency range showed some attenuation, the room response illustrated the finely balanced mid range and the well integrated treble range of this well engineered performer.

Summary

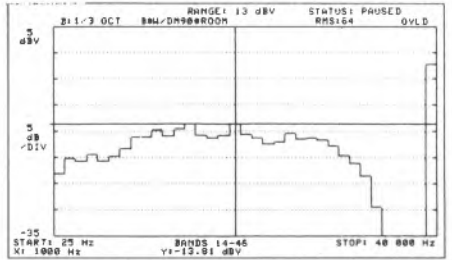
A fitting companion to the '110, and despite its competitive pricing, the '100 managed to establish a fine performance in its own right. It sailed through both the lab and the listening tests, proving to be sensitive, clean sounding, and offering good stereo. It suits shelf or stand mounting and offered very good value. A Best Buy classification is mandatory.

GENERAL DATA

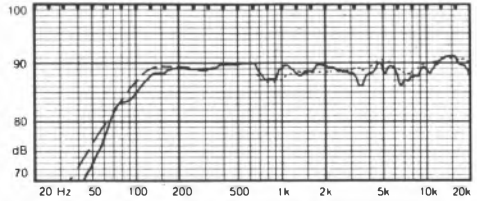
Size (height x width x depth).....37 x 22 x 22cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(10) - 75W
 Recommended placement.....open stands (near wall?)
 Frequency response, within ± 3 dB, at 2 metres...85Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....75Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....89dB/W
 Approximate maximum sound level (pair) at 2 metres...103dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....excellent
 Typical price per pair, inc VAT.....£100



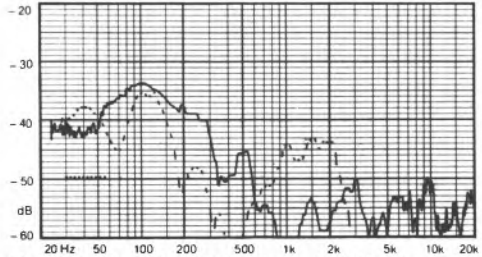
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



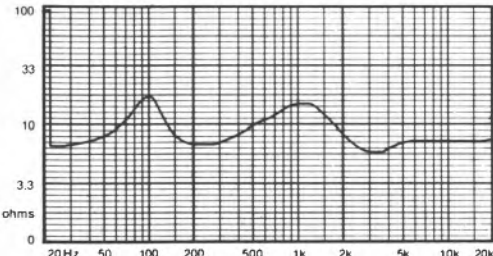
Averaged forward characteristic response in room.



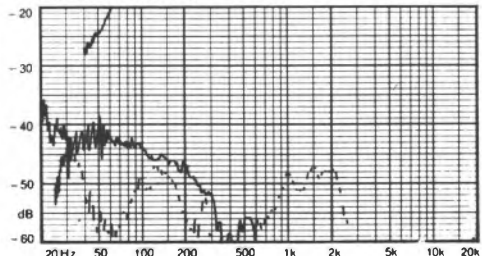
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

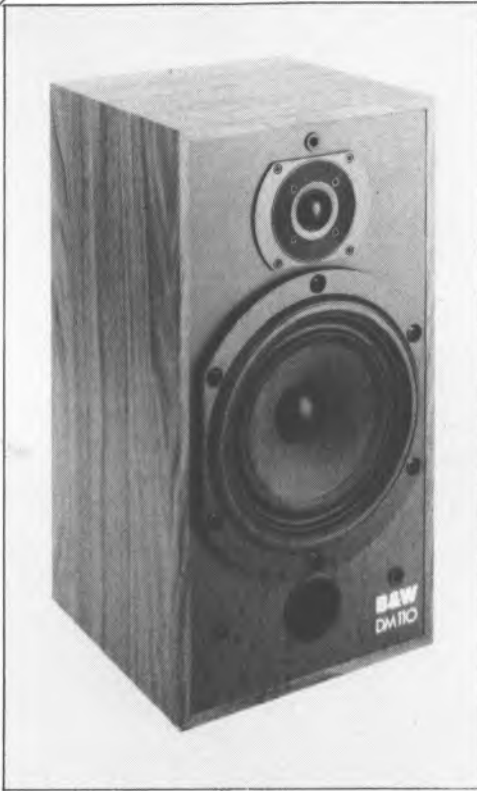


Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

B&W DM110B&W Loudspeakers Ltd, Marlborough Rd, Lancing, West Sussex BN15 8TR
Tel (0903) 750750

Unchanged since the publication of the last *Loudspeakers* issue, the 110 has been highly successful and was therefore an essential entry this time round. Built to a tried and tested formula, its success would seem due to a skilful balance of performance, engineering and fine value. A two-way model of some 22 litres internal volume, it is reflex loaded by a fair-sized (5cm diameter) port, backed by a 7cm tube.

Bass and midrange frequencies are handled by a flared pulp cone 220mm unit, this built on a substantial diecast frame with six hole fixing. A B&W-built unit is also used for the treble, this a new series plastic foil unit with a 25mm soft dome and cast plate.

The enclosure is well finished in a 'walnut' vinyl material, while the grille and its thick non-rotated frame can be detached. 4mm socket/binding posts are fitted at the rear. The

crossover is said to be 4th order acoustic Butterworth, this achieved by a good quality 2nd order internal network, in conjunction with the driver's acoustic responses. Acoustic foam is used to provide internal absorption.

Sound quality

Despite its budget price the 110 scored 'above average' — and remember that the average price among all speakers tested is double that of this model. A good midrange was solidly backed by a lively, articulate quality and the speaker showed a pleasing transparency with good rendition of fine detail. Tonally it was well balanced, with just a hint of untidiness at the response extremes; in the extreme treble, a touch of tizz was evident while the bass extreme sounded a little underdamped. Some box coloration was present despite the fine overall effect, and this occasionally made itself apparent. Stereo images, particularly with the grille detached, were well focused, and the 11C made a surprisingly good attempt to recreate depth of image. High powers were also handled very well.

Lab report

An excellent pair match was shown, certainly within $\pm 0.5\text{dB}$ limits over the whole range. The 'grille on' reference response was very good indeed, marred by a ripple at 5kHz to 8kHz, this removed by the simple expedient of detaching the grille. Sensitivity was a high 89.5dB/W with a response of $\pm 2\text{dB}$, 65Hz to 19kHz — remarkable. The -6dB LF point was typical for the type at 56Hz, and the system is well tuned.

A 350W peak programme signal was handled without damage but 100W peak would be a fairer rating, allowing a generous maximum sound level of around 104dB for a stereo pair, near disco levels! Out at 2m the forward response family of curves was very good, bar the 15° vertical off-axis response. This suggests that fairly high stands should be used, with the treble units close to ear level. Good driver integration was shown here particularly in the lateral axis.

Even at 96dB sound pressure level, the speaker produced only moderate distortion levels of under 0.3% midband, and generally more of the less harmful 2nd than the 3rd harmonic. At 86dB and above 200Hz 3rd averaged 0.2%, and 2nd still less. These are very fine results.

The impedance curve gave no cause for concern and essentially represents an 8 ohm

system of typically good behaviour; no decent amplifier should find this speaker a problem.

In the listening room, the computer averaged response was impressive too. Good output can be seen down to 40Hz with a notably even and well matched midband, while the treble rolloff also conformed to an even axial output.

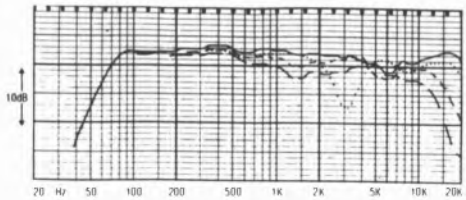
Summary

This well engineered loudspeaker provides a good sensitivity with low distortion. The amplifier load is good, the responses even and the tonal balance most presentable. The sound quality is most competitive and the power handling exceptional, while its lively, transparent quality consistently pleases. Overall this is a clear candidate for Best Buy status.

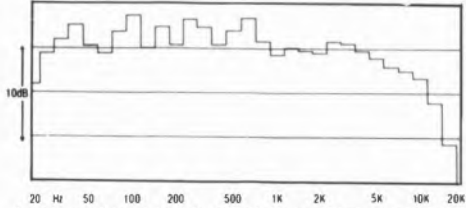
GENERAL DATA

- Size (height x width x depth).....49 x 26 x 25cm
- Recommended amplifier power per channel (for 96dBA per pair at 2 metres).....(10)—200W
- Recommended placement.....open stands
- Frequency response, within ±3dB at 2 metres.....59Hz-20kHz
- Low frequency rolloff (-6dB point) at 1 metre.....56Hz
- Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre).....89.5dB/W
- Approximate maximum sound level (pair) at 2 metres....107dBA
- Impedance characteristic (ease of drive).....very good
- Forward response uniformity.....good
- Typical price per pair, including VAT.....£125

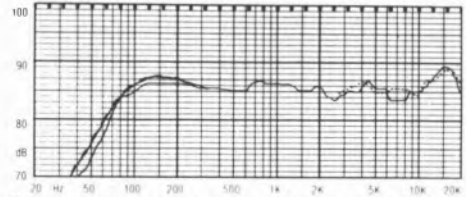
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



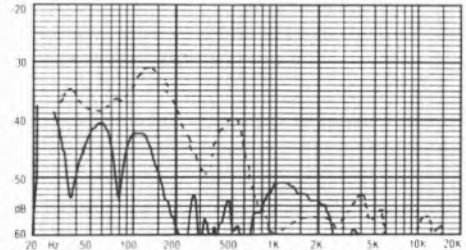
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



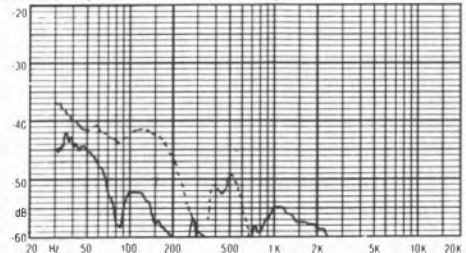
Averaged forward characteristic response in room



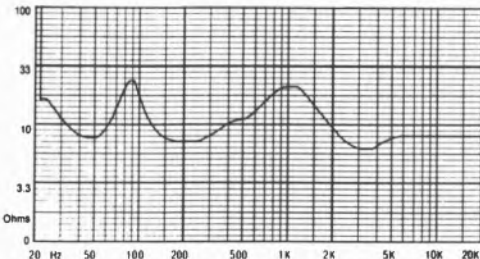
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

BBC LS3/5a

Goodmans Loudspeakers Ltd; Swisstone Ltd (Rogers); Spondor Audio Systems Ltd

RECOMMENDED



Three manufacturers are now making this BBC design, as always keeping to a strict recipe – all manufacturers licensed by the BBC to produce LS3/5As must stick to the Corporation's tight specifications. Goodmans and Spondor are newcomers to the craft, although Spondor's founder, Spencer Hughes, played a major part in the 3/5a development when he was at the BBC many years ago. Designed as a miniature broadcast monitor for cramped spaces, it has stood up to much larger competition for more than 10 years now, by offering a fine sound quality in its own right. It suits mounting on high stands well clear of room walls at approximately ear level.

A sealed plywood box of 5½ litres volume, the 3/5a is a two way system employing selected KEF drivers, which comprise a 110mm Bextrene cone bass/mid range and a 19mm plastic dome treble unit. An elaborate and

costly crossover is employed to equalise the drivers to a strict specification, this including sensitivity matching, while an absorbent felt ledge surrounding the treble unit minimises reflections from the closely fitting grille.

The boxes from all three companies were excellently finished in natural veneer, the multiply enclosures fully battened internally and lined with bituminous damping and foam.

Sound quality

The LS3/5a has consistently done well in previous live-versus-recorded sessions and fairly well on analogue programme sources. However, this time around it did not fare so well with the new digital master material.

Problems which were only hinted at when using stereo analogue material were now clearly apparent, making the design sound more dated than we had expected. Several areas attracted criticism – the bass lacked extension and sounded boomy in the upper bass register, while the mid had a noticeably hard, nasal quality and the treble seemed forward with a grainy, 'zitty' effect at the extreme top end. Some tubby, wooden and boxy colorations were also evident, while its only moderate rendition of stereo depth was apparent, as in the past, by comparison with certain less expensive designs.

It continued however to provide good voice detail and articulation, with a reasonably accurate tonal balance. Comparison between the Goodmans and Spondor versions showed great similarity while an original model from Audiomaster (no longer in production) used in previous tests sounded slightly dimmer by comparison, with less mid nasality. However the difference was small by speaker standards.

Lab results

Sensitivity was low with this design, here measuring 81.5dB/W, necessitating a minimum of 30W per channel. A 50W maximum is suggested although with care 100W amps may be used. The bass rolloff –6dB point measured 57Hz, quite good for the size while pair matching was very good (all three current makes) and the impedance curve never dipped below 7.5 ohms, qualifying it as an easy 10 ohm load.

Modest 96dBA maximum sound levels are possible from a pair, but taking a 96dBA distortion plot was not thought advisable. At 86dB, however, moderate 2% levels were seen at low frequencies improving to around 0.8% in the mid and treble, a satisfactory result.

Reference curves were taken for the Goodmans and Spendor samples and showed good agreement with the reference unit, though the 1.2kHz prominence seems to have become more pronounced over the years. This perhaps reflects a change in the B110, although it is still within specification. By modern standards the response looks a trifle lumpy, though in its time the system was regarded as a very smooth performer.

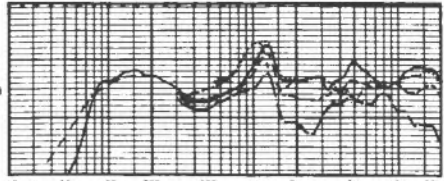
At 2metres the 1.2kHz prominence was rather obvious, and while the responses were clearly well integrated the speaker's 'lumpy' nature was evident. Computer averaged in the listening room, the low frequencies integrated well, but the mid prominence remained, and the upper treble was excessive. Measured in the room, a gentle rolloff is to be expected above 8kHz rather than the uniform results shown here.

Summary

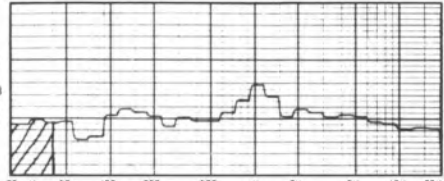
At risk of offending the BBC, I feel that the 3/5a is due for a revision; as a working broadcast tool it no doubt does its job, but as a piece of value engineering it is beginning to fall behind. Other speakers have shown a progressive reduction in price as well as an improvement in sound quality, but the LS3/5a has steadily increased in price more or less in line with inflation. But this time, inconsistently perhaps, the LS3/5a's scores just regained it a recommendation!

GENERAL DATA

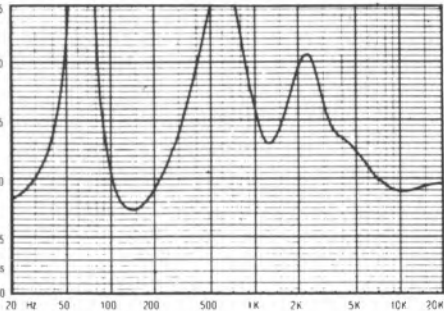
Size (height x width x depth) 30 x 18.5 x 16cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres) (30)—50W
 Recommended placement open stands
 Frequency response, within ± 3 dB, a 2 metres see text
 Low frequency rolloff (-6dB point) at 1 metre 57Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre) 81.5dB/W
 Approximate maximum sound level (pair) at 2 metres 93dBA
 Impedance characteristic (ease of drive) excellent
 Forward response uniformity good
 Typical price per pair, inc VAT £180-£240



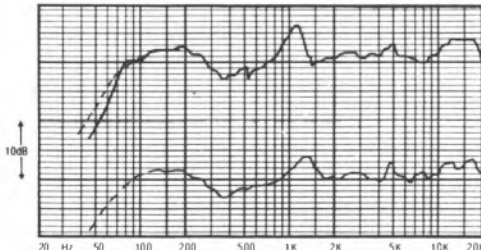
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



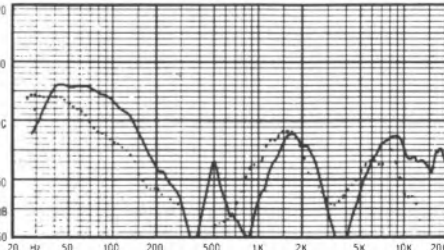
Averaged forward characteristic response in room at listening position.



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Boston A40 II

Hi-Fi Markets, Cousteau House, Greycaine Road, Watford WD2 4SB
Tel (0923) 27737



This compact speaker from Boston Acoustics of Massachusetts, USA, was first reviewed in the 1983 edition, but the current version tested here incorporates several improvements. Highly successful on the US home market, these speakers suffer the usual currency disadvantage when imported and sold in the UK; as a result, they need to be highly competitive designs from the outset.

A two way design, this sealed box miniature has an internal volume of just 8 litres, and is driven by a 160mm frame size bass unit with a 120mm diameter radiating surface. Its paper/pulp cone is mounted on a steel pressed chassis, with a moderate-sized magnet. The high frequency driver is the 19mm Audax plastic cone/dome with ferrofluid damping.

Finished in vinyl, the enclosure is made of plain chipboard, with a loose polyester fibre lagging inside. The simple crossover is 6dB/octave first

order type, using a two element network plus attenuating resistor. Connection is made via spring clip terminals.

Sound quality

While scoring below average, the A40 did reasonably well for the price. The results showed some conflict between a lively fairly articulate nature with fair detail, and conversely a tendency to coarseness and brittleness in the upper mid/lower treble. Bass showed a muted effect at low frequencies, though the upper-range bass scored satisfactorily. In the mid it sounded a touch thin in balance, with some boxy and cone type colorations. Mid/treble integration was not its strong point, with some panellists finding it variable and phasey in the crossover region.

Stereo depth was not well portrayed, though the speaker sounded reasonably clear.

Lab report

This new sample supplied by the UK agents actually performed very similarly to the original model. Reference sensitivity was 88.5dB/W which if taken in conjunction with the 50 watt maximum power handling, will allow maximum sound levels of 101dBA in room from a stereo pair.

Low frequency rolloff was noted at 63Hz for -6dB, this agreeing with the measured system box resonance at 80Hz. Pair matching was poorer than average with imbalances of up to 2.5dB in the crossover range. The grille had only a small effect on the response, which rose up to 1kHz and then levelled out. At 2 metres, a general rising trend was apparent, with good uniformity in the lateral plane, but signs of a crossover dip at 4kHz when measured 15° vertically above axis.

At a 96dB sound level the distortion averaged 2% second, and 0.4% third harmonic, while at the lower 86dB test both harmonics were well controlled, settling at the 0.3% level over most of the range. With the simple crossover, the impedance curve was very smooth, but fell below 5 ohms at 200Hz, an 'average' load rating.

In room the speaker was promising in the bass mid range but peaked a little too much at 1.5kHz, before rolling off in the approved manner.

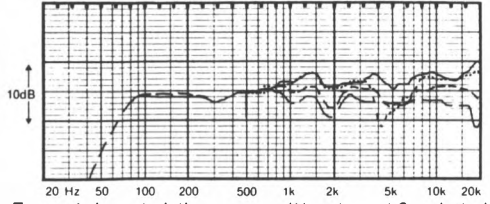
Summary

Quite honestly, I cannot see much change in the results for the latest Boston A40 and those for the original. Then as now, the performance was competent for the size and price, but generally in below average relative to its UK competitors. Comparatively speaking its price is a little more competitive than before and our present rating is

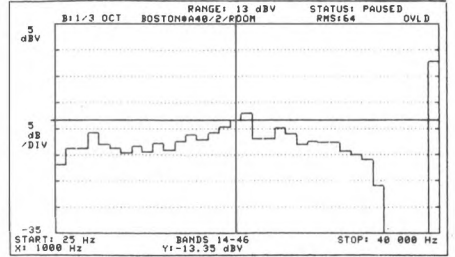
therefore 'worth considering':

GENERAL DATA

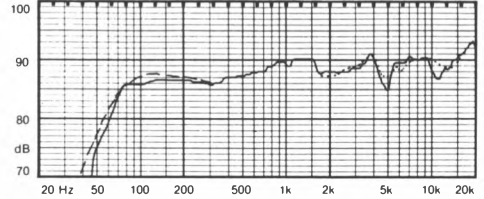
Size (height x width x depth).....34 x 21 x 20cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(12) -50W
 Recommended placement.....On stands, near wall
 Frequency response, within ± 3 dB, at 2 metres....70Hz to 15kHz
 Low frequency rolloff (-6dB point) at 1 metre.....63Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....88.5dB/W
 Approximate maximum sound level (pair) at 2 metres....101dB
 Impedance characteristic (ease of drive).....average
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£100



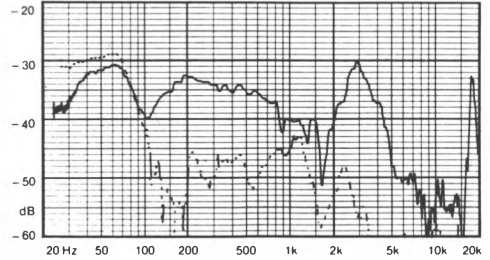
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



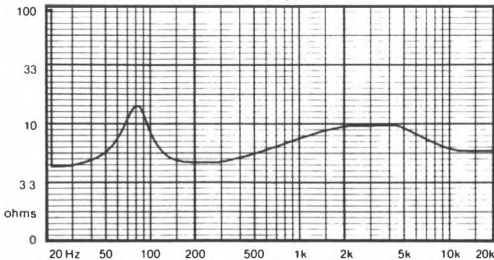
Averaged forward characteristic response in room.



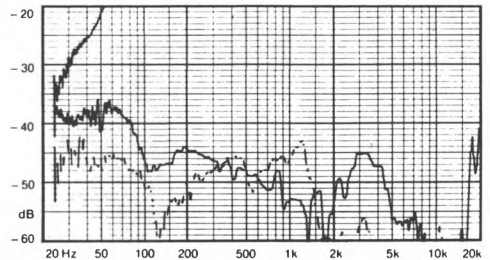
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

RECOMMENDED

Castle Clyde

Castle Acoustics Ltd, Shortbank Road, Skipton, N. Yorks BD23 2TT
Tel (0756) 5333



This diminutive speaker has a *Richmond*-like specification, and at £105 a pair, the price is even comparable with that of a *Richmond* some five years ago! Castle take a pride in building the majority of the components for their systems themselves, the *Clyde* being no exception, and the Castle designer has shown great skill in tailoring his speakers to give relatively uniform frequency responses irrespective of size or cost.

Possessing a 9.8 litres internal volume, the system is reflex-loaded by a small ducted port, 28mm long by 37mm in diameter, which does more for the power handling than the bass extension. Both drivers are made by Castle; the lightweight pulp-cone bass/mid unit is built on a 130mm frame, and is partnered by a unique 30mm plastic cone/dome tweeter using a phase-corrected diaphragm. The undamped chipboard cabinet is also made by Castle themselves, having a fully finished teak veneered exterior with a well-designed, acoustically favourable

foam grille. A 4-element crossover is fitted with fuses for each driver, accessible through the bass unit aperture.

Flush-mounted spring clip terminals are used for electrical connection, and an acoustic foam lining provides absorption within the enclosure. If Castle are true to form, the system should be fairly sensitive as well as capable of decent sound levels for its size.

Lab performance

The test samples showed a good pair match, measuring typically ± 1 dB: a fine result for a speaker in this price category. Sensitivity was indeed high at 89.5dB/W, and was uncompromised by the impedance/amplifier loading, the latter rated as 'good' and averaging 9 ohms. As expected the low frequency range was somewhat curtailed with a -6 dB point at 64 Hz, but the axial reference response was inspiring, meeting fine ± 2.5 dB limits overall, and showing a promisingly even balance.

Under $\frac{1}{3}$ -octave analysis at a 2m measuring distance the output was excellently uniform and integrated; in this respect the system illustrated almost a textbook performance. However the tonal balance showed a gentle rise in output with increasing frequency, with a mild but discernible hump in the treble region centred on 15kHz.

The high sensitivity allowed steady state distortion measurements to be carried out over the whole range at both 90 and 96dB. Above 150Hz, aside from isolated peaks at 1.8kHz and above 10kHz, distortion held to below 0.3%. While a 100W pulse at 500 Hz was approaching overload, with 4% 2nd and 8.0% 3rd harmonics; this in fact represents some 108dB, which is a very high sound level. At 5kHz the 100W pulse gave no trouble at all, with a typical value of 1% for both 2nd and 3rd harmonic.

The averaged room response in energy terms did suggest some mid prominence between 600Hz and 1.5kHz, but the overall trend above 1.5kHz was very good, and close to the theoretically ideal characteristic. While the low frequency range had some depression coupled with an early rolloff below 50 Hz, it was otherwise fairly uniform.

With comfortable sound levels achieved on as little as 10W per channel, this speaker will happily accept 50W unclipped programme without blowing fuses, thus allowing up to 102dBA sound levels, which is quite loud considering the box size. At some penalty to the stereo imaging, it will also in fact perform quite well on an open shelf or bookcase, and does not become too 'rich' or 'boomy' in such a location.

Sound quality

The *Clyde* achieved good scores on the live comparisons. Although it was felt to sound a little 'small' with a degree of 'forwardness' in the midband, negligible accompanying 'loudness' or 'shout' was apparent, and the general effect was smooth and well integrated with good detail and natural tone colour. On occasion the treble could sound a little 'sibilant' and 'edgy', while some coloration was also identified, mainly of the 'boxy' kind.

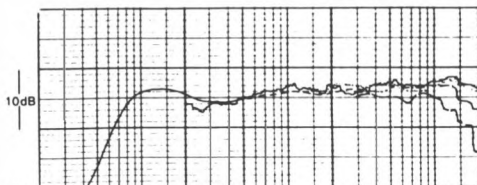
Promising scores were also obtained on the stereo tests, where the imaging was found to be clearly defined with some depth and good lateral precision over a wide listening angle. Low bass notes were lacking in power, but the balance was surprisingly good if tending to be slightly 'light' and 'middy' in character, and the overall effect was almost as smooth as the remarkable responses indicate. Note however that the latter are of course unable to show the mild 'boxy' coloration and slight upper treble 'tizziness' that we experienced.

Summary

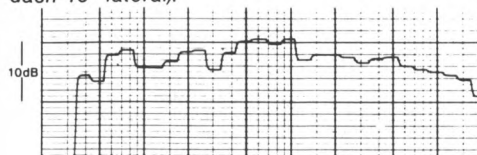
Now a well-established model, the *Clyde* is a tidy little performer which packs a surprising punch in terms of a clear, even and lively sound. It offers a high sensitivity and is an easy amplifier load, giving good dynamic range with moderate distortion, plus good finish and engineering. Recently re-auditioned, its sound quality has held up well since the original review, and despite some increased competition, it carries a confident recommendation.

GENERAL DATA

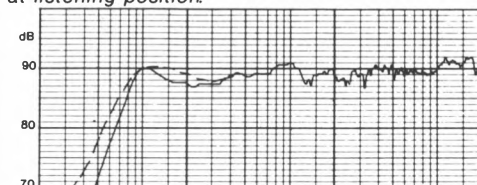
Size (h x w x d)	37 x 21.5 x 22cm
Recommended amplifier power per channel (for 96dBA per pair at 2 metres minimum)	(10)–50W
Recommended placement	open stand
Frequency response within ± 3 dB (2m)	75Hz to 20kHz
Low frequency rolloff (-6 dB) at 1m	64Hz
Voltage sensitivity (ref 2.83V, ie: 1 watt in 8 ohms) at 1m	89.5dB/W
Approximate maximum sound level (pair at 2m)	102dBA
Impedance characteristic (ease of drive)	good
Forward response uniformity	excellent
Typical price per pair, inc VAT	£105.



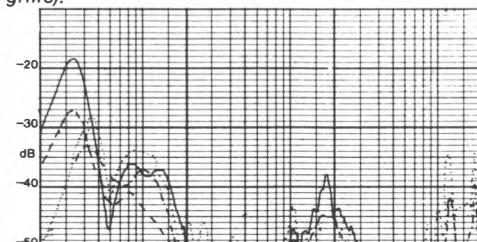
Forward characteristic response (1/3-octave @ 2m, dotted 15° vert, small dash 30° lateral, long dash 45° lateral).



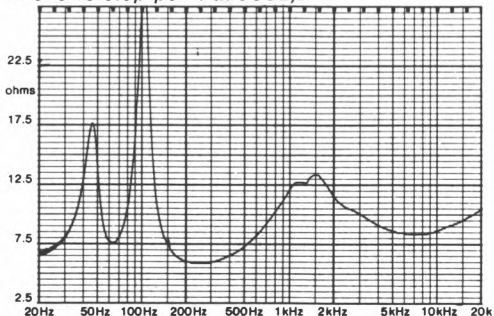
Averaged forward characteristic response in room at listening position.



Reference sinewave response (1m on axis, 2.83V input shows sensitivity) (dashing corrects for chamber LF, dotting shows response without grille).



Harmonic distortions: solid 3rd 96dB, dotted 2nd 96dB, dashed 3rd 90dB, chain-dashed 2nd 90dB, ○ shows stop point at 96dB).

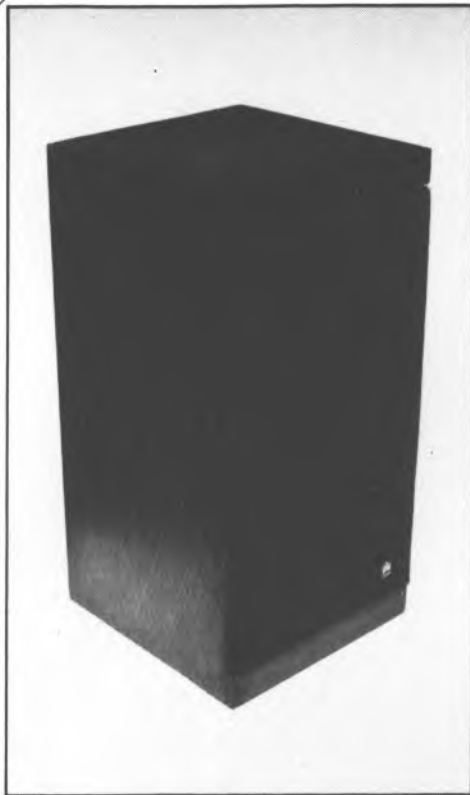


Impedance (mod Z).

Castle Pembroke

Castle Acoustics Ltd, Shortbank Road, Skipton, N. Yorks BD23 2TT
Tel (0756) 5333

RECOMMENDED



Although basically a compact design the *Pembroke* nonetheless encompasses a bass-reflex-loaded volume of some 32litres. Its design recipe is in fact derived from an earlier model, the successful *Kendal*, but with the application of Castle's continuing refinements plus a new style of cabinet. The enclosure has a shaded stain/varnish finish with the black foam grille flanked by horizontal veneered bars at the top and bottom of the cabinet.

A 200mm bass/mid unit is married in a vertical in-line arrangement to a 30mm plastic cone tweeter, both drivers being of Castle's own manufacture. The bass unit is constructed on an aluminium cast frame, with a substantial magnet. The good quality crossover operates at approximately 3kHz and is of 12dB/octave basic order, although this is adjusted to 'fine tune' the driver responses.

The heavy enclosure is braced and damped,

the interior lined with an acoustic absorbent. A conventional moulded rear connector panel is fitted with plain 4mm sockets – as opposed to the preferred 4mm socket/binding posts more suited to 'special' cables. Internal fuses, accessible behind the bass driver, protect against sustained amplifier overload – a system used on previous Castle models.

Sound quality

As we have come to expect from Castle, this speaker gave a good account of itself during the listening tests. Favoured by all the panelists it produced a consistently smooth sound, free from fatiguing effects. Tending to mild richness tonally, it was felt that the bass could have been a little drier while some boxiness and plumminess in the lower midrange was also noted, although this was not serious. The treble could also demonstrate a little 'breathiness' in the upper range.

Overall the sound was 'big', with good bass power and extension. Stereo images were quite well focused although they showed some loss of depth and transparency. Frontal detail was however good with a pretty natural tonal balance. In fact, it sounded as smooth as the remarkable lab test results would indicate!

Lab results

Pair matching was good except around the 14kHz area where significant 2dB errors were observed. The grille had no deleterious effect on the sound however. Sensitivity was rated as above average at 88dB/W, providing maximum sound levels of up to 103dBA, and a 10-100W amplifier power range is considered appropriate.

Bass was quite extended – to 44Hz, –6dB – and quite uniform in anechoic terms. Overall the response in the 70Hz to 12kHz range was quite remarkably smooth with only ± 1 dB ripples apparent.

Out at 2metres, a very good forward output was demonstrated showing great consistency, phase control and integration. Can you believe a ± 1.5 dB response from 60Hz to 20kHz here? John Collinson, Castle's designer improves his mastery of the response curve year by year!

At 96dB, second harmonic distortion typically measured 1-1.5%, with third rather lower than that except at 2kHz. Third harmonic was little altered at the lower 86dB level, but second was much improved to 0.3% and better. With third harmonic often at the 0.15% level, the *Pembroke* essentially gave good results for

distortion.

Impedance never fell below 6.4ohms, making it very easy to drive by any amp of good repute. The computer-averaged room response also looking very promising, with the low frequencies integrating well with the room, down to 40Hz. The mid register was also very smooth and while the lower treble seemed slightly depressed, the upper treble was in fact marginally too well extended, hinting at the upper 'edge' heard on audition – a fine result however.

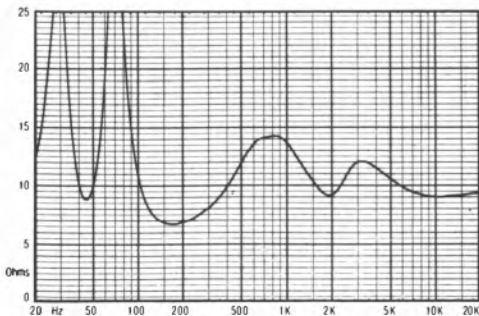
Summary

Comfortably 'recommended', this traditional-looking speaker offers a sweet, smooth sound with an excellent overall balance of engineering-based performance. For the size the bass is good, and the system will also play loud when required, being easy to drive. In fact some purchasers may prefer this speaker to others which come more highly recommended by the panel as a whole – this will depend on taste and to some extent the choice of programme as the *Pembroke* suited classical works slightly more than it did rock.

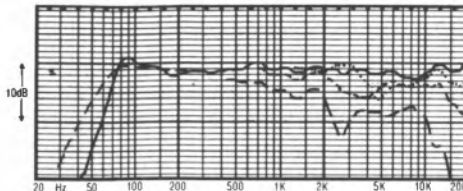
GENERAL DATA

Size (height x width x depth)	55 x 27.5 x 30.5cm
Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres)	(10)–100W
Recommended placement	open stands
Frequency response, within ±3dB, at 2 metres	50Hz to 20kHz
Low frequency rolloff (– 6dB point) at 1 metre	46Hz
Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre)	88dB/W
Approximate maximum sound level (pair) at 2 metres	103dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical price per pair, inc VAT	£230

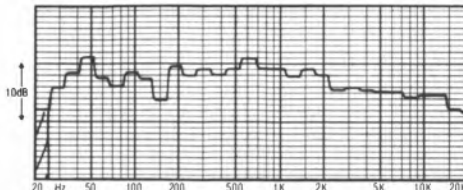
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



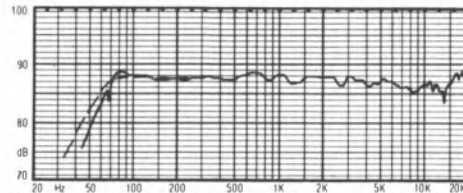
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



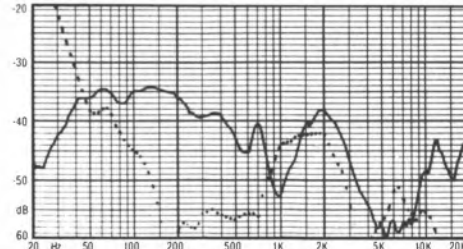
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



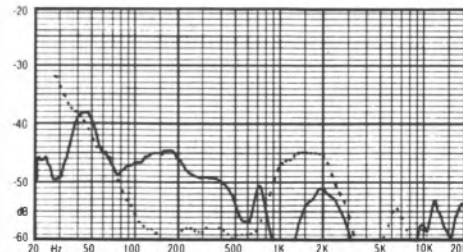
Averaged forward characteristic response in room at listening position.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

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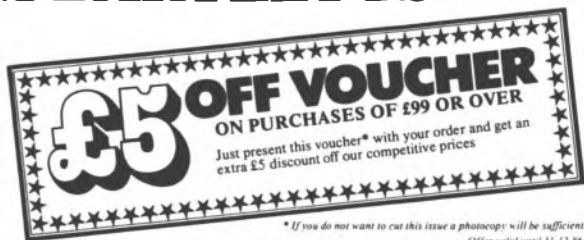
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Yamaha CD3.....	<input type="checkbox"/>

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Audio Technica AT33E.....	<input type="checkbox"/>
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Audio Technica AT33ML.....	<input type="checkbox"/>
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Goldring Epic.....	<input type="checkbox"/>
Grado GT Super.....	<input type="checkbox"/>

Mission 773HC.....	<input type="checkbox"/>
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Ortofon OM10.....	<input type="checkbox"/>
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Ortofon MC10 Super.....	<input type="checkbox"/>
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Shure ML40HE.....	<input type="checkbox"/>

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Celestion SL6/SL600.....	<input type="checkbox"/>
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KEF Cordale III.....	<input type="checkbox"/>

Marantz LD20.....	<input type="checkbox"/>
Marantz LD30 II.....	<input type="checkbox"/>
Marantz LD50.....	<input type="checkbox"/>
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Mission 770 Freedom.....	<input type="checkbox"/>
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Monitor Audio R152.....	<input type="checkbox"/>
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Quad ESL63.....	<input type="checkbox"/>
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When designer Graham Bank initially left Celestion for Wharfedale the company had already embarked on a programme to offer the 'SL6 philosophy to customers in the £100-£200 bracket. To help get the three DL models into the market on schedule, the author of this volume, Martin Colloms, was called in as design consultant; in consequence the measurement and reviewing of the DL range has been left to others.

Smallest of the three is the DL4. This 10 litre box is styled to capitalise on the association with the SL6 while the 25mm soft plastic film tweeter has a front-plate ribbed in the manner of the SL6/SL600 trim plates. The brown painted Medite baffle has been divided with painted feature lines to follow the 'modular' appearance of SL6.

A 165mm paper-coned mid/bass driver has been chosen which, coupled with reflex loading, enables the system to achieve above average sensitivity. The reflex port is let through the back

panel.

The 12mm chipboard carcass has a recessed back panel for stiffness and is neatly chamfered around the front edge to give a smooth transition to the moulded plastic grille frame. Michell gold-plated binding posts have been used — an 'audiophile' touch unusual in a £100 speaker.

An eight-component crossover is hard-wired to the back of the moulded terminal block — the two drivers crossing over just below 3kHz. The highish sensitivity of the finished system allows even modestly powered amplifiers to produce fair levels with these speakers.

Sound quality

There was no disagreement about the considerable strengths and the few compromises in this speaker when presented in 'blind' conditions to the listening panel. All listeners, but particularly those seated on-axis, commented positively on the stereo depth imaging ability. But no one was fooled into thinking this was a large speaker as the deep bass extension simply wasn't there. However the bass was always described as tight and tuneful and the overall performance dynamic, exciting and informative.

The only real criticism of this design came for its top end performance which was variously described as 'shrill' or 'whistly'. Later listening tests confirmed that the speaker sounds best on tall stands with some reinforcement from a back wall, say within 0.5m.

Lab report

The 1m on-axis plot shows a controlled bass rolloff with just a trace of upper bass prominence, the -6dB point comes at a high 85Hz suggesting that the speaker is best used fairly close to a room boundary. Around the crossover region there is some discontinuity seen in this plot and to some extent in the in-room analysis which also shows the limited bass energy of this system. Good dispersion characteristics are seen in the family of 2m curves, suggesting a strong stereo performance. However the 15 degree above axis plot shows a 'treble-strong' balance which indicates that the speakers should be auditioned with the tweeter at least at ear height. Tall stands close to a wall are indicated.

At 96dB sound level, the major distortion peak is a relatively innocuous 2nd harmonic, rising to just over 3% at 200Hz. A tiny tweeter irregularity can be seen around 8-10kHz but the general distortion above the 200Hz centred peak is well below 0.3%.

The impedance plot shows an unremarkable

dip to 6.5ohms between 5k and 10kHz.

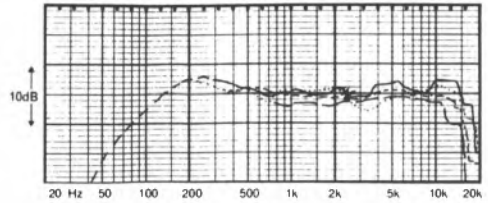
Summary

Taking into account the fact that the DL4 sells for just under £100 its performance in blind listening tests and in later sighted listening tests is a considerable achievement for the price. This is not a cheap 'audiophile' quality speaker but a design which will produce meaningful musical results when partnered with an inexpensive amplifier and a typically dull budget cartridge. Brighter sources may sound spitty and hard however. The strong stereo performance and controlled bass would indicate Best Buy status at this price.

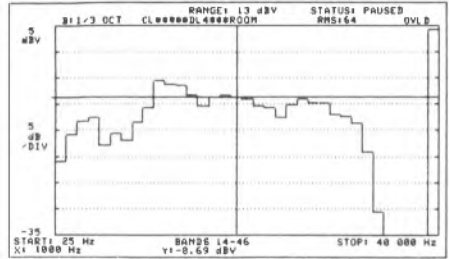
DGP

GENERAL DATA

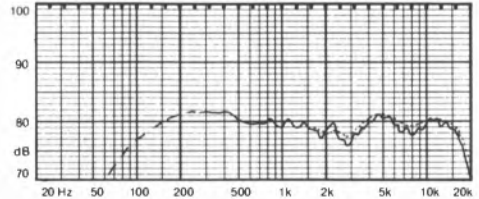
Size (height x width x depth).....38 x 21 x 23cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(10) - 75W
 Recommended placement.....stand or shelf
 Frequency response, within ±3dB, at 2 metres..100Hz to 17kHz
 Low frequency rolloff (-6dB point) at 1 metre.....85Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....89dBW
 Approximate maximum sound level (pair) at 2 metres....102dBA
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£100



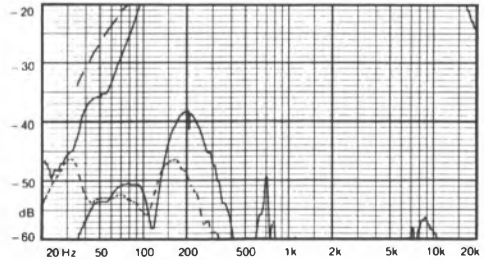
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



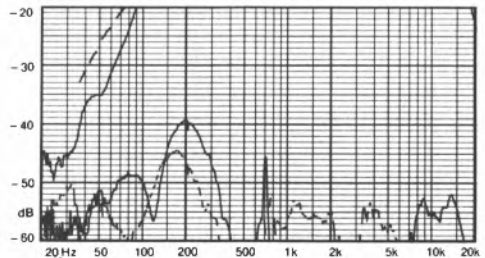
Averaged forward characteristic response in room.



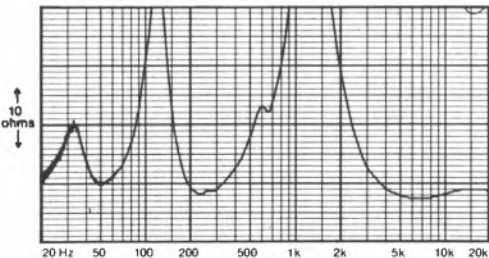
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Celestion DL6

Celestion International Ltd, Ditton Works, Foxhall Road, Ipswich, Suffolk IP3 8JP
Tel (0473) 73131



Though similar in principle to the *DL4*, the *DL6* is a considerably larger box. The same 25mm plastics dome tweeter has been used but this time it is crossed over to a 200mm paper mid/bass unit built in a substantial cast chassis as opposed to the pressed steel basket of the *DL4*'s bass driver. This mid/bass unit has an inverted PVC roll surround. Paper pulp coned drivers with large magnets keep sensitivity of both the models above average — Celestion quote 89dB/W/1m.

The *DL6* is again reflex loaded with the port venting through the back panel of the speaker to maintain the visual consistency of the range. The same chamfered box front and tapered grille frame give the speaker a distinctive appearance and reduce the frontal area of the speaker to some extent. The carcass is produced in 16mm chipboard, again with a Medite baffle and fibre filling.

The eight-component crossover is to the same

layout as the *DL4* (12dB slopes) again hard-wired and with the components glued to the back of the terminal block, which carries gold-plated Michell 4mm binding posts. Heavy gauge internal wiring is used.

Sound quality

In the panel listening tests the *DL6* rapidly shaped up as a more extended and more refined version of the *DL4*. The same strong imagery and lively informative sound was there but the bass was considerably more extended and a degree richer. Treble was slightly 'whiskery', described as being slightly 'gritty' or 'scratchy'. Though on some programmes the speaker could sound a little wispy or thin it was not marked down for this.

The *DL6* gave considerable insight into the scale of music and produced a spacious sound retaining details of the ambience of the recording venue. Off-axis listeners seemed less able to appreciate the speakers' imaging ability though.

Bass was surprisingly controlled and extended for a speaker at this price. The *DL6*'s ability to produce a coherent sense of space with wide dynamic range, plenty of detail and good low end control helped it do well in both 'blind' and later 'sighted' listening tests.

Lab report

The 1m axial plot shows evidence of the 3kHz crossover point and a slightly ragged treble output rising to peak at 10kHz (about 2dB up on the 1kHz level). The -6dB rolloff point in the bass comes at 60Hz and like the treble the upper bass does peak before rolling off into the midband trough. The twin peaks are shown also in the 2m plots. The off-axis curves show well controlled dispersion though again there is a glitch in the 15 degree above-axis plot around the crossover point. As with the *DL4*, the '6' should be used on stands to put the tweeter on the same level as the listener's ear.

The in-room plots show a very even smooth output with some evidence of the crossover notch but a well extended low-end.

Summary

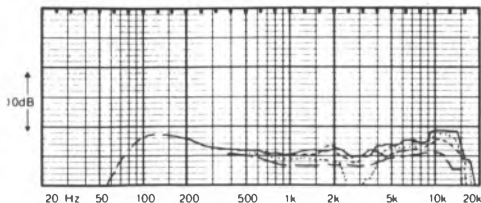
The control and power embodied in this design sets it a way apart from the run-of-the-mill £120 speaker. Particularly good when pushed hard by a large amplifier, the *DL6* produced none of the listener fatigue generated by less-than-good designs at this price. Bass performance, stereo imagery and balance were all above average though the treble performance has been bettered by Wharfedale's *506* in this price bracket. The

balance of performance strengths however enables us confidently to suggest a strong recommendation for the *DL6*.

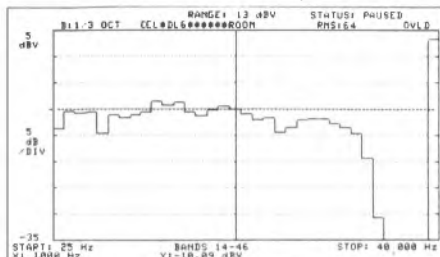
DGP

GENERAL DATA

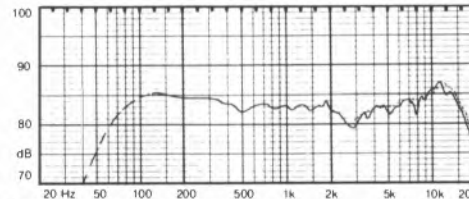
Size (height x width x Jephth).....45 x 25 x 25cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(10) -100W
 Recommended placement.....open stand
 Frequency response, within ± 3 dB, at 2 metres.??Hz to ??kHz
 Low frequency rolloff (-6dB point) at 1 metre.....60Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....88.5dB/W
 Approximate maximum sound level (pair) at 2 metres....105dBA
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£129



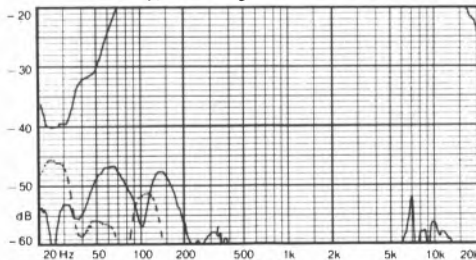
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral)



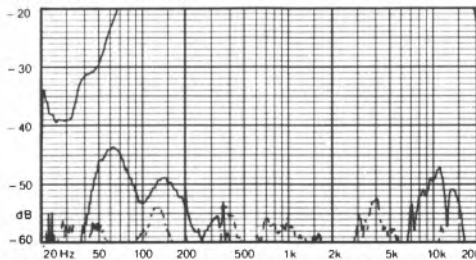
Averaged forward characteristic response in room.



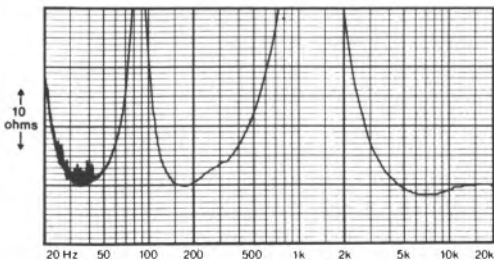
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Celestion DL8

Celestion International Ltd, Ditton Works, Foxhall Road, Ipswich, Suffolk IP3 8PJ
Tel (0473) 73131



Whereas the *DL4* and *DL6* speakers share a common tweeter the *DL6* and *DL8* use the same mid/bass driver. In the *DL8* the 200mm paper pulp coned mid/bass has been used in a sealed box and crossed over to a derivative of the copper-deposition dome tweeter as used in the *SL6*. This 32mm diameter unit achieves the sensitivity necessary to match that of the paper coned mid/bass by using a lightweight fabricated aluminium dome and an enormous magnet. The crossover network integrates the two drivers at around 2.5kHz, comprising 12dB-slope tuned circuits with an additional capacitor in series with the bass driver to free this softly suspended unit from the onslaught of very low frequencies.

The *DL8* carcass is built by wrapping a V-grooved 18mm chipboard plank around a recessed back and an 18mm Medite baffle. As with the other models in the *DL* range, finish is 'walnut' grained vinyl.

The back panel terminal block is fitted with gold-plated Michell binding posts; inside the speaker, this block carries the hard-wired crossover. Fibre wadding is used in the cabinet while the drivers are wired with heavy gauge cable.

As with the two cheaper models Celestion have aimed for and achieved good power handling at the price, with fairly high sensitivity, this again quoted at 89dB/1W/1m. Even 10 watts will be sufficient for average levels in small rooms.

Sound quality

The gentle treble slope was noted by the listening panel but the marks achieved were encouragingly high for a speaker selling at this mid-market price point. The metal dome tweeter gives the *DL8* an immediate ease and a treble clarity rarely heard in conventional tweeter designs. Again there was the hallmark of the *DL* range — a spaciousness and a controlled yet powerful sound.

Bass showed no trace of overhang while the purposeful tailoring of the low frequency was just noted by one or two listeners who marked the speaker down as lacking the very deepest extension — which is not to criticise the precisely damped and tuneful bass of which the *DL8* is capable.

Listening tests outside the blind listening panel showed the *DL8* as lacking some of the sparkle and 'life' of the *DL6* but equally well the treble never 'bit' in the same manner as the *DL6* when pushed too far.

Lab report

The 1m axial plot shows the -6dB point of the system at 55Hz, and below this the slope steepens under the influence of the series capacitor across the mid/bass unit. The extended top end of the *DL8* is clearly seen in both the anechoic and in-room plots, the tweeter resonance coming outside the audio band and being shown up by the rise in distortion above 20kHz. This distortion is 2nd harmonic and reaches 3% on the 96dB sound level distortion graph. General levels of distortion are commendably low, though the reflex-loaded *DL6* shows even lower levels of bass distortion in the area around 100Hz.

The 2m family of curves show an excellent uniformity with a gradual slope falling from the mid through the treble. The 15 degree above-axis trace shows a crossover notch and suggests that positioning with the tweeter on ear level would be appropriate. The in-room 1/3 octave measurements show an excellent smooth trend with a well sustained high end.

The impedance curve shows a 6.5ohm minimum — of no consequence. Sensitivity measured slightly under specification at 88dB/W.

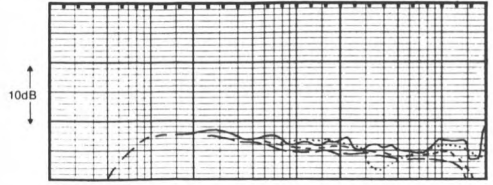
Summary

The *DL8* has an easy relaxed quality with an unperturbable treble sound and a spaciousness and airiness about its sound that sets it apart from other loudspeakers in this price bracket. It offers an unusual blend of high power handling and above average sensitivity — attributes not normally associated with the smooth refined qualities of a metal dome tweeter. It is an easy speaker to live with and will not 'close up' when driven loud. A firm recommendation is obviously in order for a speaker possessing these qualities while selling for £170.

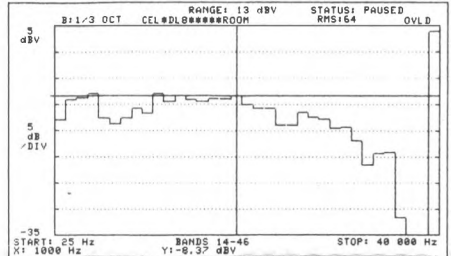
DGP

GENERAL DATA

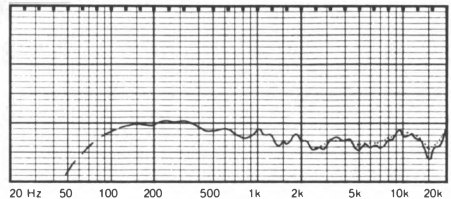
- Size (height x width x depth).....50 x 28 x 27cm
- Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(15) -150W
- Recommended placement.....stand
- Frequency response, within ±3dB, at 2 metres.100Hz to 17kHz
- Low frequency rolloff (-6dB point) at 1 metre.....55Hz
- Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....88dB/W
- Approximate maximum sound level (pair) at 2 metres....104dBA
- Impedance characteristic (ease of drive).....good
- Forward response uniformity.....excellent
- Typical price per pair, inc VAT.....£170



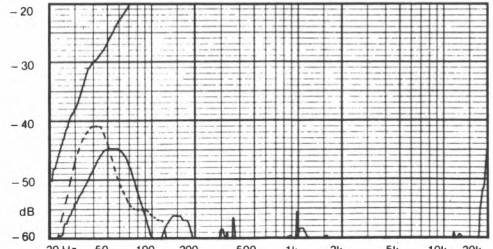
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



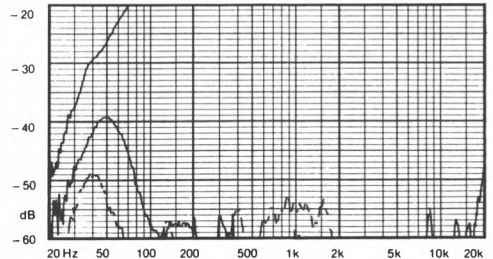
Averaged forward characteristic response in room.



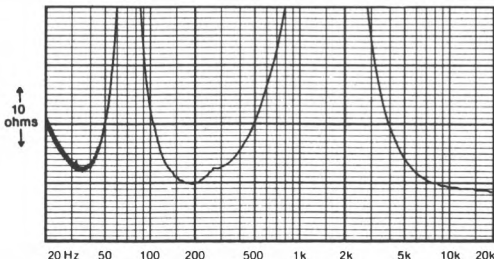
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

RECOMMENDED

Celestion SL6 and SL600

Celestion International Ltd, Ditton Works, Foxhall Road, Ipswich, Suffolk IP3 8JP
Tel (0473) 73131



Along with the established *SL6*, this review covers the subsequently developed *SL600* model, which features a special alloy honeycomb enclosure and selected drivers. Both are of essentially identical performance, but price and sound quality differ greatly due to the advanced cabinet used for the model *600*.

A two-way miniature box sealed box design of 12litres internal volume, the design employs a die-cast, Kobex-coned 165mm bass/mid unit fitted with a generous magnet. The special 37mm copper-dome tweeter has an integral motor coil former and offers a high power capacity. Both units are of excellent quality, having benefited from new design and construction techniques plus laser analysis.

A high power 12dB/octave crossover is fitted, this on separate bass and treble boards in the case of the *SL600*. Each crossover is matched to a specific tweeter to correctly align the 21kHz

compensation network.

The *SL6* cabinet is of heavy 17mm MDF, thick braced and bitumen damped, with 4mm socket binding post connectors and a thick unrebated grille, which in our opinion is best discarded on acoustic grounds. By contrast the *SL600* has an ultra-light, ultra-rigid alloy honeycomb box, with special multilayer graded acoustic absorber within. The very high material cost is in fact the main reason for the higher price. Plain 4mm sockets are provided for connection and the grille is omitted. The *SL6* is covered in real veneer while the *600* is finished in a handsome charcoal colored Nextel with gold legends. Special stands are available, supplied as standard with the *600* and as extras in the case of the cheaper *SL6*.

Sound quality

The *SL6* scored well above average. It provides a rich, slightly dulled sound (in fact our samples were duller than usual), with some boxiness and recession in the presence band. Stereo imaging was very good with fine central focus and fine impression of depth while the treble was outstandingly smooth and natural. The bass did not reach to the very lowest notes but was well balanced, detailed and articulate. It proved unfatiguing with a 'distant' presentation, and conveyed a good musical impression.

The *SL600* (with a correct, brighter balance scored better still, with a remarkable, almost 'holographic' stereo precision maintained over the entire spectrum. Coloration was very low detail abundant, and the overall effect one of airy transparency and subtlety. The bass was reasonably extended, 'quick' and well differentiated, and high scores were awarded - clearly this speaker was an exceptional device.

Lab results

Both speakers' results are shown at 1metre for comparison, the tighter balance and integration of the *600's* selected components appear here. Sensitivity was low at 82-83dB/W with a maximum sound level of 96dBA and a 30-150V power capacity range. The -6dB rolloff point was at 55Hz, good for the size.

At 96dB the *SL6* was working hard, with second harmonic distortion at 2.5% even in the midband, but third harmonic rose quickly below 100Hz. At 86dB the distortion levels were considerably reduced to a satisfactory level, with second and third at similar levels of between 0. and 1.0%.

Forward responses for the *600* show exce

lent integration and good uniformity, with the 15° above-axis result particularly good. A slightly below-ear-level listening position would be ideal. The balance was still slightly rich, with a full midrange.

Generally 8ohms, the impedance fell to 4.5ohms at 15kHz but was still considered to be a fairly good amplifier load – low-resistance cable is recommended.

Room-averaged, the output showed a near perfect interface with the room at low frequencies, having a slight presence droop, a mildly rich treble balance and a smooth rolloff.

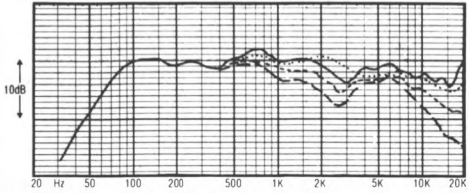
Summary

Reassessed for this edition, the SL6 is still a remarkably musical, if slightly coloured, performer for the price. Tighter response tolerances in manufacture should prevent the appearance of the ‘duller’ examples encountered in the past.

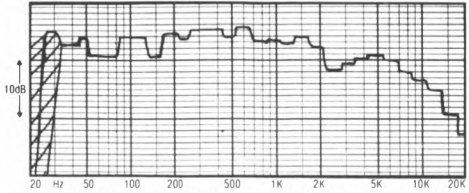
Arguably one of the finest speakers its size ever produced, the SL600 has also undergone manufacturing improvements, and despite a somewhat shaky start, the performance of production samples should now be fully up to standard. Compatible mass-loaded stands (Cliff Stone) are now available, and these enhance the performance, which is fully commensurate with the price!

GENERAL DATA

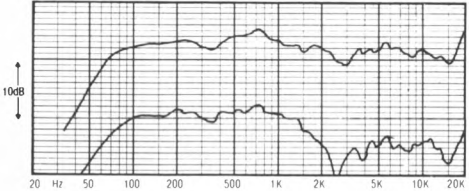
- Size (height x width x depth) 37 x 20 x 25.5cm
 - Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres) (30)—150W
 - Recommended placement open stands (Celestion)
 - Frequency response, within ±3dB, at 2 metres 60Hz to 20kHz
 - Low frequency rolloff (–6dB point) at 1 metre 55Hz
 - Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre) 82.5dBW
 - Approximate maximum sound level (pair) at 2 metres 98dBA
 - Impedance characteristic (ease of drive) fairly good
 - Forward response uniformity very good
 - Typical price per pair, inc VAT SL6, £299 SL600, £699
- stands for both models now extra



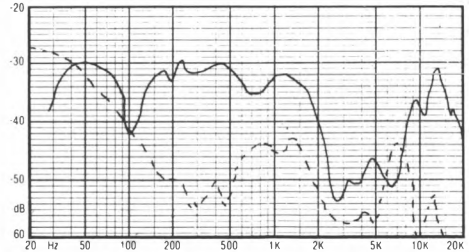
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



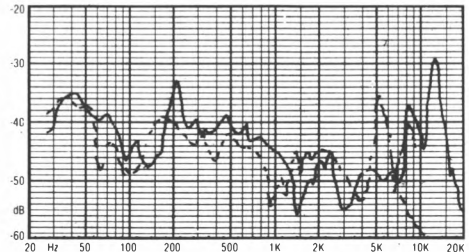
Averaged forward characteristic response in room at listening position.



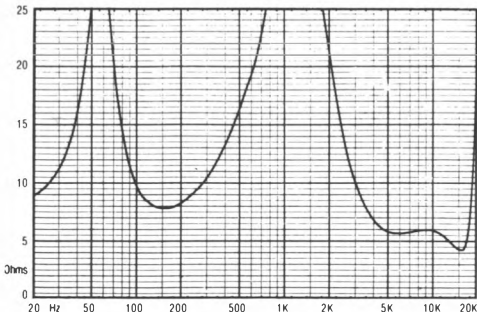
Reference sine wave response (1m on axis, 2.83V input) Upper trace, SL600, lower trace SL6.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

RECOMMENDED

Diesis Solitaire

Diesis Loudspeakers, 5 Glebe Close, Rayleigh, Essex
Tel (0268) 777352



Diesis is a small British company with cabinet making experience, which is reflected in the excellent natural wood finish of this product. A miniature design, the *Solitaire* is virtually hand made, and fits in the upper price territory for the type. Measuring 35 by 20.2 by 26cm deep, the sealed box has an internal volume estimated at 12 litres. In this two way design the treble is handled by an Elac 25mm polyamide dome, while the 165mm bass unit is made by SEAS, with a pulp cone that Diesis treat with a damping compound. The simple three element crossover has three additional resistors for attenuation and electrical damping purposes.

Strongly constructed of double skinned chipboard, the front panel is a thicker grade of 20mm MDF; but the 6mm grille panel is unrebated and stands slightly proud of the panel. The interior is lined with two grades of

foam, and is hard-wired with good cable. Electrical connection is via 4mm socket/binding posts, and although this model is small enough for shelf mounting it will in fact perform best on open stands, probably not too far from a rear wall.

Sound quality

The *Solitaire* did well on test proving to be a tidy and civilised performer. Despite its small size, it coped with the maximum 350W programme input though it did begin to sound a little ragged at this level, and 100W is probably a sensible maximum.

This speaker possessed a clean midrange, if a touch lightweight, producing a well integrated sound with a natural tonal balance. All areas of the range proved unobtrusive and good stereo focus was evident with quite good depth. The only area of criticism, apart from a lack of really low bass, was a loss of the full dynamic impact of the material — at times it sounded just a little dry and over controlled.

Coloration appeared low on most programme, except on solo piano, where some mild boxiness was noted.

Lab report

At 1 metre the reference response described a uniform characteristic with a modest 85dB/W sensitivity. Maximum level was of the order of 100dB for a stereo pair. Pair matching was good, except in the 5-12kHz range where tweeter sample differences amounted to 2dB, more than expected.

The grille was not beneficial to the response, imposing a dip at 3kHz as well as some upper range ripples; grille off was preferable. Bass rolloff was quite average, the -6dB point being at 57Hz.

At 2 metres, the forward response family showed some driver overlap at the crossover region, with the best sound obtained on axis. A mild peak was present above 15kHz while the midrange showed mild forwardness. But ± 3 dB limits sufficed for a 65Hz to 20kHz response.

At 96dB sound pressure level, the *Solitaire* was clearly working hard, with a fair amount of 2nd and 3rd harmonic distortion. At the reduced 86dB spl, distortion fell below 1% over most of the range, which was a more satisfactory result.

It gave good intermodulation figures, with -40dB of side band tone and just under 1dB of mid band compression. System resonance was

82Hz, a bit high for the price. The impedance curve suggested a smooth 8 ohm load, meeting the B.S. standard.

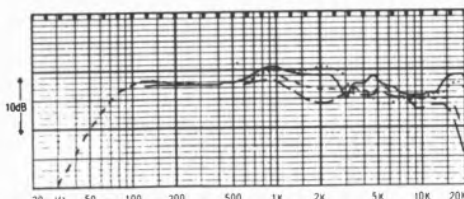
In the room the average response confirmed the lightweight balance, but only just. The mid was slightly prominent but the overall curve was quite well balanced.

Summary

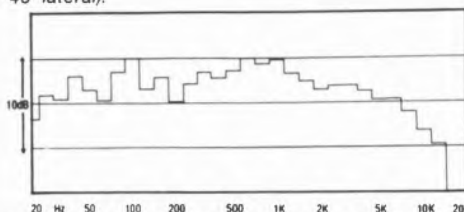
This well-crafted miniature has a modest dynamic range. The sound is pleasantly neutral, with a generally good performance, if slightly lacking in bass power and extension. The quality control on tweeter matching needs watching but otherwise the performance of the *Solitaire*, the first Diesis model to appear in *HFC*, justifies a recommendation.

GENERAL DATA

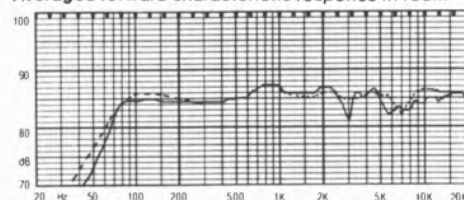
Size (height x width x depth).....35 x 26 x 20cm
 Recommended amplifier power per channel
 (for 96dBa per pair at 2 metres minimum).....(20) — 100W
 Recommended placement.....on stands or shelf
 Frequency response, within ± 3 dB at 2 metres.....65Hz-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....57Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....85dB/W
 Approximate maximum sound level (pair) at 2 metres...100dBa
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good +
 Typical price per pair, including VAT.....£220



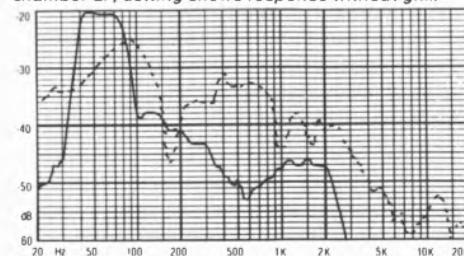
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



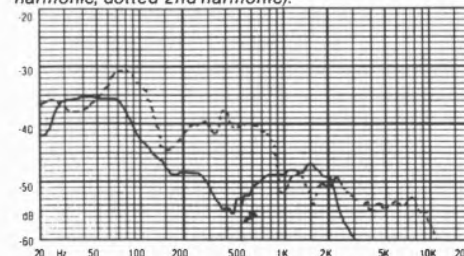
Averaged forward characteristic response in room



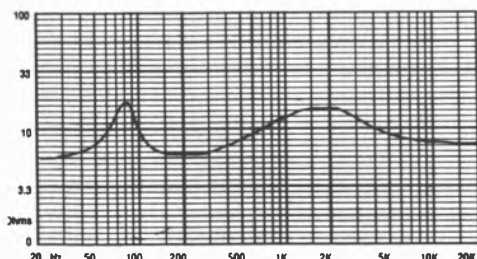
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Goodmans Mezzo

Goodmans Loudspeakers Ltd, Downley Road, Havant, Hants
Tel (0705) 486344

RECOMMENDED



The Mezzo is the middle sized model in the Goodmans 'M' series of moderately priced speakers, and revives the name of a model popular many years ago.

Price may be on the low side, but the specification certainly is not, this model comprising a substantially built 37 litre bass-reflex enclosure with a three-way driver system. The design is striking with a horizontal bar across the upper third of the divided grille carrying level controls for the mid and treble, plus a line of LED lamps for the peak power level indication. The 80mm cone midrange unit and the 25mm soft dome tweeter are mounted side by side in the upper section — neither this arrangement nor the 15mm thick grille baffle edges are conducive to good lateral dispersion, or to low diffraction. A larger-than-usual 250mm pulp cone bass driver occupies the lower section of the enclosure, bass loaded by a small

reflex port.

Externally, the rigid chipboard enclosure is well finished in a synthetic vinyl print. The commercial-quality crossover is basically of 12dB/octave form, employing eight elements plus power resistors. Thick foam blocks provide acoustic absorption for the interior, whose panels are otherwise undamped. Both 4mm sockets and DIN electrical connections are provided on a moulded panel.

Sound quality

In spite of its dispersion handicap, the Mezzo acquitted itself well on the listening tests, comfortably achieving a score worthy of HFC recommendation. It was considered lively and well balanced, with good detail in some regions, while the bass was powerful with quite good extension if a little plummy. The treble was quite pleasant and free of obvious vices, and the mid-range sounded open if trace boxy, while 'cuppy' coloration was also audible.

Opinions about this speaker did however vary a little, mainly due to the somewhat inconsistent stereo. Only moderate depth was portrayed, the central focus seeming rather diffuse by comparison with the group average. Despite this, the Mezzo had a pleasant character not usually encountered at its price level.

Lab results

On the median axis, measured at 1metre, the output looked unpromising, but as we shall see the overall forward response was rather better. The dotted graph shows the effect of removing the upper grille and we in fact preferred the sound in this condition. Mean sensitivity was above average at 88dB/W, with a quite extended -6dB bass rolloff at 46Hz, and in conjunction with a 100W peak power handling, substantial 104dBA sound levels were possible. Pair matching was fairly good.

Fine distortion results were obtained at 96dB; around 1.5% second harmonic at low frequencies and just 0.3% for both second and third above 200Hz. At 86dB both showed a further reduction to very good levels.

At 2metres, the off-axis responses were fairly well grouped apart from the 30° lateral, with the general characteristic slightly 'rich', possessing a gentle suckout at 3kHz.

Assessed by computer room averaging, the output was rather more consistent than anticipated, and correlated well with the smooth impression gained on the subjective

tests. Technically this model produced some confusion, this due to its anomalous dispersion.

Failing to meet the Bohms spec, the *Mezzo* showed an impedance dip to 5ohms, but its modest reactive content and average value of 7ohms meant that it remained quite easy to drive.

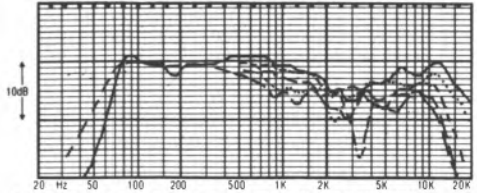
Summary

This larger-than-average speaker is good value for money, offering a pleasant, uncritical 'big' sound. The bass extended deeper than usual while high sound levels with low distortion were possible. If stereo precision is not too important then the *Mezzo* would be a strong contender, and in any case at its realistic price level, it carries a firm *Choice* recommendation.

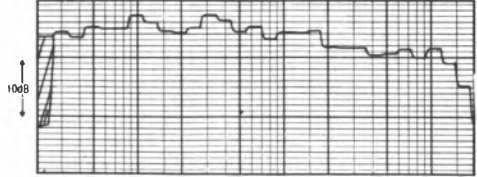
(Note: Though not supplied for re-test the Mezzo has been recently improved while odd details such as the power indicator have been deleted. Provisionally, the recommendation is continued but an audition to confirm this is suggested.)

GENERAL DATA

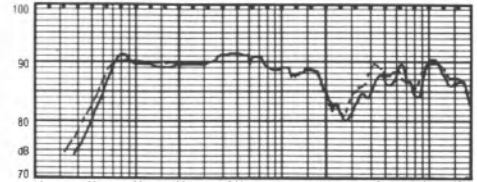
Size (height x width x depth) 60 x 32 x 26cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres) (12)—100W
 Recommended placement open stands
 Frequency response, within ± 3 dB, a 2 metres see text
 Low frequency rolloff (-6dB point) at 1 metre 46Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre) 88dB/W
 Approximate maximum sound level (pair) at 2 metres 104dBA
 Impedance characteristic (ease of drive) good
 Forward response uniformity satisfactory
 Typical price per pair, inc VAT.....£150



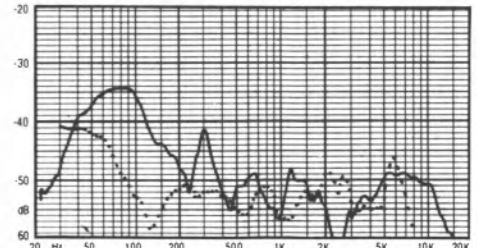
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



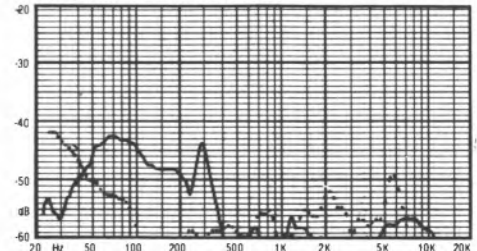
Averaged forward characteristic response in room at listening position.



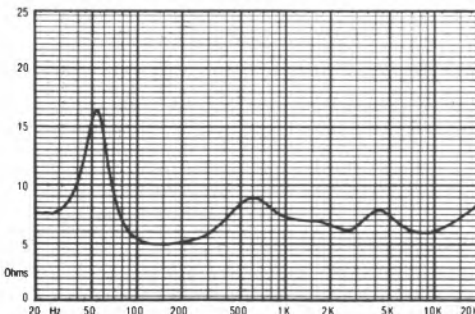
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Harbeth HL1 IV

Harbeth Acoustics, 1a Birchanger Road, South Norwood, London SE25 5BA
Tel 01-654 9549

RECOMMENDED



Since its introduction the *HL1* has been subject to small detailed improvements culminating in the latest Mk IV version reviewed here. We experienced some quality control and consistency problems with earlier models, but happily these now seem to be behind the company, with current review samples showing good matching and agreement with the designer's target specification. In particular, recent improvements have concerned the need for greater low frequency power handling.

A 50 litre enclosure reflex tuned by a large 62mm diameter tunnel port, the cabinet is of thin wall high quality veneered plywood, with bituminous panel damping and extensive seam battening. Front and back panels are well screwed down and a sculptured foam grille improves the cabinet diffraction. An exclusive polypropylene 200mm covers the bass/midrange, and a 25mm Audax soft dome tweeter the high frequencies,

with a good quality crossover dividing the input at approximately 2kHz. Provision has been made for sensible matching of mid and HF using an auto transformer to aid consistent frequency balance.

Lab results

A useful above average sensitivity of 87.5dB was recorded, which is on target and not compromised by the impedance, which was judged to be a good amplifier load. Typically of the order of 8 ohms, a 6.6 minimum was recorded and while some high phase angles were apparent (for example, 70 at 2kHz) the impedance was substantial enough at these points to avoid censure. The -6dB rolloff point was noted at 46Hz, and with a 100W per channel amplifier limit, a good maximum sound level of 102dBA should be possible in a typical room.

The axial response at 1 m was fairly uniform and ignoring the 5kHz notch, met ± 3 dB limits, 55Hz-18kHz. Third harmonic distortion levels were also very well controlled at 96dB, typically measuring 0.5% or better above 150Hz. The less annoying second harmonic content peaked at 8% around 100Hz, and this might be audible on sustained bass notes. The system fared less well on a diet of 100W pulses despite the low 2Hz repetition rate. Although perfect a 500Hz, a +0.3dB expansion occurred at 5kHz generating 5% of second and 1.8% of third harmonic distortion. Crossover saturation is the probable cause at this equivalent 100W programme level.

Examining the forward $\frac{1}{3}$ -octave responses at 2m, distinct trends were apparent. The bass region was mildly humped around 100Hz, above which the output rose gently to 700Hz before a trough 2dB deep appeared to 2kHz, the latter an intended design feature. The treble range was more or less level and matched to the midrange, while the off-axis curves can be seen to be very uniform, indicating excellent forward dispersion.

We were able to carry out the computerised in-room response measurements on the new Mk IV. From the room curve the upper bass showed some excess while the mid balance was good. The slight treble excess noted was also visible on the room curve.

Sound quality

The original *HL1* proved to be of monitor quality, and survived comparison with live sounds very well. On complex recorded programme in stereo it was a little weaker with some sibilant and chesty effects on vocal.

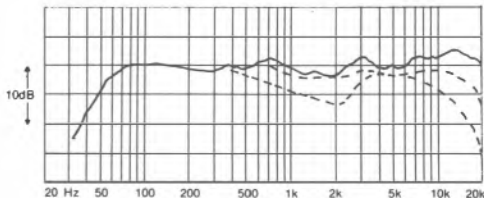
Fully reauditioned for this issue in Mk IV form

(arrived too late for new measurements except a room curve), the *HL1* bettered its earlier result by offering a clearer, more dynamic sound. Improvements in mid clarity were heard leading to still greater transparency as well as more precise transient definition. Our samples were slightly bright (Harbeth knew this). Overall the balance remained very good while the bass was somewhat underdamped in the reflexed area, more suited to classical than rock programme in this respect.

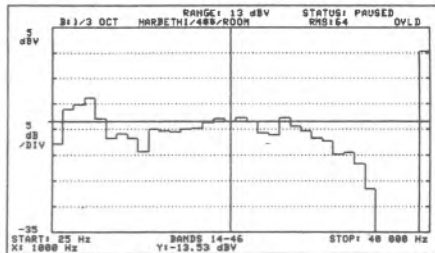
Summary

Reassessed, the *HL1 IV* was technically very similar to the *III*, except for the revised bass mid unit, this custom built by Audax on a cast frame, using the advanced TPX cone polymer. With notably improved midrange the design will continue to stand the test of time, and carries a strong *HFC* recommendation. (The treble level will be reset in production.)

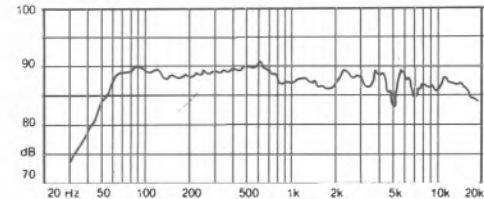
Size.....	63.5(25) H. 32.5(13) W:30.5(12) d. cm(inches)
Weight.....	13.5(30) kg(lbs)
Recommended amplifier power per channel (for 96dBa per pair at 2 metres minimum).....	15-100W
Recommended placement.....	on stands away from walls
Frequency response within ± 3 dB(2m).....	63Hz to 18kHz
Low frequency rolloff (-6 dB) at (1m).....	46Hz
Voltage sensitivity(ref 2.83V. ie: 1 watt in 8 ohms)87dB/W at 1m	
Approximate maximum sound level (pair at 2 metres)....	102dBa
Third harmonic distortion (96dB at 1 metre).....v. good	
	65Hz-2%. 100Hz-1%. 200Hz-0.2%
	500Hz-0.35%, typically 0.3%
Impedance characteristic (ease of drive).....	good
Forward response uniformity.....	v. good
Typical price per pair.....	£345



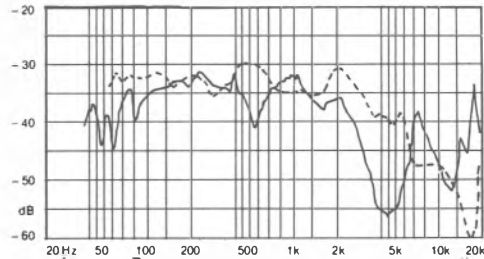
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



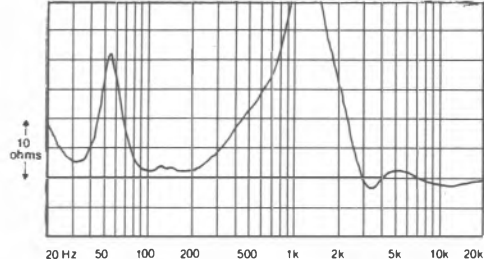
Averaged forward characteristic response in room.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

BEST BUY

Heybrook HB1

Mecom Acoustics Ltd, Knighton Hill, Wembury, Plymouth, Devon
Tel (0752) 863188



This low-cost speaker is rather better made than usual. The exterior of its rigid chipboard cabinet is vinyl 'walnut', while internally it is damped by bituminous cladding plus acoustic foam absorption. A superior reticulated foam grille is fitted and electrical connection is via binding posts/4mm sockets of good quality.

Internal volume is 22litres, and two drivers are used, both of Danish 'VIFA' origin. The 200mm doped pulp cone bass/midrange is fitted with a decent magnet and a superior-frame, and the high frequencies are handled by a 25mm soft plastic dome tweeter, whose chassis is reinforced inside the cabinet, this also serving to brace the front panel. A 12dB/octave crossover of superior quality integrates the two units at 3.7kHz.

Appearances response-wise suggested a character which might suit shelf mounting against the wall, and in fact the *HB1* did work

quite well in this position, but for the listening tests the cleanest results were felt to come from positioning on rigid open stands.

Sound quality

Personally I had some reservations concerning this model's sound quality, these based on the results of an earlier audition, but under blind conditions, the panel (myself included) thought highly of the *HB1*. Consistently good marks were awarded, placing it high in the field irrespective of price.

Good qualities included a highly revealing transparency which was truthful to the programme character. Stereo images showed quite good depth with a realistic acoustic and decent frontal focus; in fact it sounded almost too 'clean' in the 'open' sense, as opposed to 'shut-in' or enclosed. The bass was articulate with fair extension if a mite too 'dry', although this helped on percussion.

On the minus side, the sound showed some boxy colorations plus mild tizz and hiss emphasis in the upper treble. The mid could also appear somewhat hard and forward. Using first-rate programme, these effects were somewhat less serious than when juxtaposed with the more distorted output of a brighter and less expensive analogue disc player. Tonally speaking, the *HB1* was balanced on the bright side.

Lab results

Excellent pair matching was demonstrated with a high 90dB/W sensitivity, and despite this the bass was reasonably extended to 55Hz - 6dB, on the anechoic response, as well as being free of overshoot.

In the view of the 80W maximum power handling, decently loud 104dBA sound levels were possible, while as little as a 10W input raised pretty good levels of around 95dB in a typical room.

Out at 2metres the general trends can be seen and the speaker only just scraped into the nominal ± 3 dB response limits for axial output. The upper mid was indeed forward by 2-3dB while an energy suckout occurred at 7kHz, high enough not to be felt subjectively as a loss or presence or 'air'. The treble recovered soon after, with a broad hump centred on 14kHz. Both plus and minus 15° vertical off-axis responses were run, showing the *HB1* was axis-critical and should be directed straight at the listener in the vertical plane. Crossing the axes in front of the listener for 10°-15° lateral angle also improved

the tonal balance.

Measured at 96dB the distortion was moderate at 0.8% to 1.5%, with a further improvement noted on reducing the signal level to 86dB.

Occasionally the *HB1* impedance almost approached 5ohms, but it represents a simple amplifier load reactively and should prove fairly easy to drive. System resonance was noted as 65Hz.

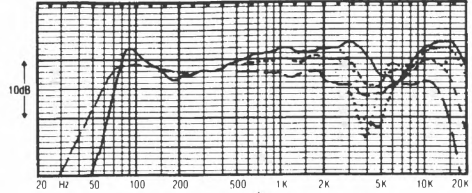
Room averaged, the bass was smooth but somewhat deficient, being a few dB down in the fundamental midrange. Consequently, the mid remained forward although the integrated treble works better than the axial responses might otherwise suggest.

Summary

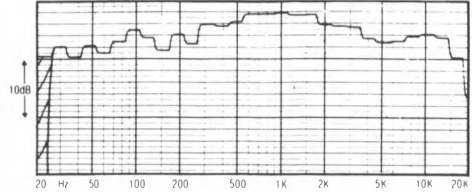
The *HB1* offers a distinctly bright character plus an above average build quality. Moderate distortion levels, high sensitivity as well as good maximum acoustic power are also all apparent, while the sound is strikingly clear with a fine transient performance. This review underwent revision for this issue, and given the increase in competition that has occurred since the original model appeared, we feel the *HB1* is still eligible for a Best Buy rating, particularly where shelf or near wall mounting is envisaged.

GENERAL DATA

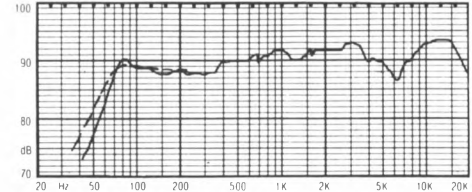
Size (height x width x depth)	47 x 29 x 23cm
Recommended amplifier power per channel (for 96dBa minimum per pair at 2 metres)	(10)—80W
Recommended placement	open stands
Frequency response, within ± 3 dB, a 2 metres	65Hz to 20kHz
Low frequency rolloff (-6 dB point) at 1 metre	55Hz
Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre)	90dB/W
Approximate maximum sound level (pair) at 2 metres	104dBa
Impedance characteristic (ease of drive)	good
Forward response uniformity	fairly good
Typical price per pair, inc VAT	£139



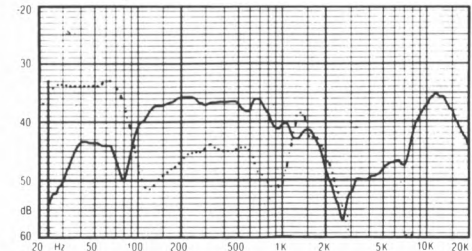
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral)



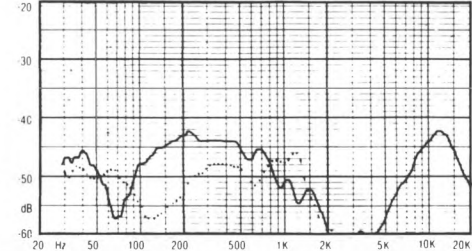
Averaged forward characteristic SPL response in room at listening position.



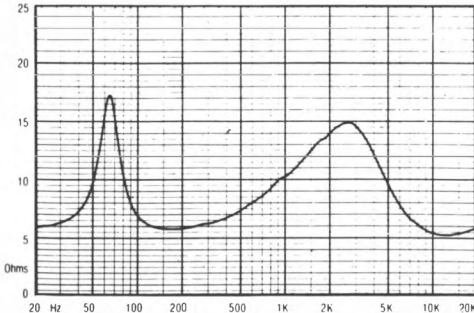
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Heybrook HB2

Mecom Acoustics, Knighton Hill, Wembury, Plymouth, Devon
Tel (0752) 863188



Originally reviewed in *HFC* a number of years ago, the *HB2* has since become well established. Over the years minor revisions have been made, sufficient for us at least to designate it 'improved' and request a new pair for review.

A miniature of some 12 litres internal volume, the two-way *HB2* is most carefully designed with great attention paid to detail and finish. The 160mm Bextrene coned bass unit operates up to 3kHz whereupon a long-established 25mm soft dome tweeter takes over; both units are manufactured by Audax.

Reflex loaded, the small ducted port is rear mounted and is just 28mm in diameter; air flow windage is alleviated by a soft foam ring at the exit. The enclosure is finished in real veneer while the interior is braced, and also damped by bituminous pads. A low-diffraction foam grille is used while the crossover is quite complex, constructed from good quality components. Electrical

connection on the rear panel is via 4mm socket/binding posts.

Supplied with optional rigid stands, the speaker sounds best when well elevated to the listener's height and located about 0.5m from a rear wall, the effects of this varying according to the room acoustics.

Sound quality

In the latest review group, the *HB2* was slightly above average, reflecting the increased level of competition. Panel opinion was somewhat mixed, relating to some unevenness in the performance. It sounded fairly neutral with quite low colouration, also showing surprising bass extension for size, accompanied by a mild bass overhang. The treble could sound a little wiry and sibilant with a 'wispy' effect.

Stereo images were well focused but some depth quality was masked. Several panellists commented that detail was quite good, but that dynamic interest was diluted.

Lab report

Reference sensitivity was low at 85dB/W, requiring a 20 watt minimum input for satisfactory sound levels. Power handling was quite good, up to 75W peak programme, providing maximum sound levels in-room of up to 99dBA for a stereo pair. The low frequency -6dB rolloff was noted at 55Hz, which was quite low for the size. The curve showed a gentle uptilt from 80Hz to 8kHz, with a uniform trend, above which frequency the treble rose excessively by 7dB to peak at 16kHz.

Out at 2 metres, the off-axis responses showed a highly uniform and well integrated output though the lift in the extreme treble remained. The 30° response looked ideal, and it could well be worth experimenting with the speaker toed-in around 35-40°.

At 96dB sound level, distortion levels were about average, except for low frequencies where it was poorer than average, for example 2% at 100Hz, though this is still not serious. Low frequency distortion changed little at the lower 86dB level, while above 200Hz, distortion particularly third harmonic, reduced to low levels.

The impedance curve averaged 10 ohms but just fell below 5 ohms above 14kHz, which is probably not important. Overall it rated as a good amplifier load.

In the listening room the *HB2* gave a quite well balanced result — a touch of bass lumpiness at 50Hz with slight mid dominance, as well as a well extended treble power, but the result is pretty creditable.

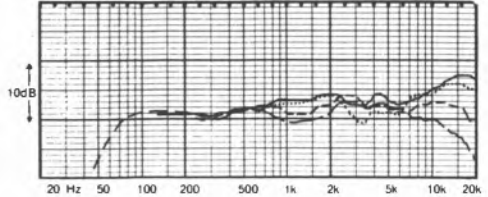
Summary

This well-built and well-established miniature is wearing quite well, and remains a viable concept. It offered its own blend of performance and options for system matching, and is worth trying, but in this edition we feel that a full recommendation is no longer appropriate.

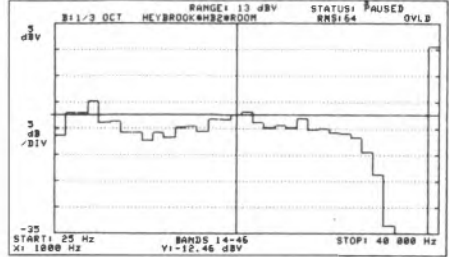
(Note: A revised version of the HB2 offering higher efficiency and low bass distortion, will be introduced towards the end of 1985.)

GENERAL DATA

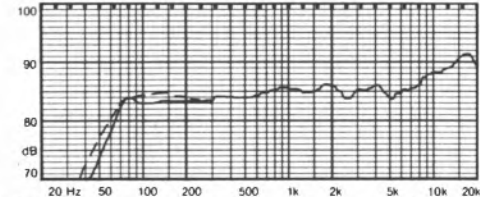
Size (height x width x depth).....41x23x23cm
 Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres).....(20) - 75W
 Recommended placement.....On stand near wall
 Frequency response, within ± 3 dB, at 2 metres....70Hz to 10kHz
 Low frequency rolloff (-6dB point) at 1 metre.....55Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....85dB/W
 Approximate maximum sound level (pair) at 2 metres.....99dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£200



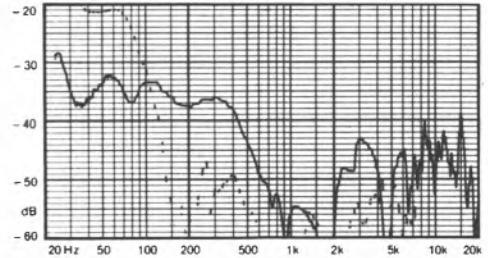
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



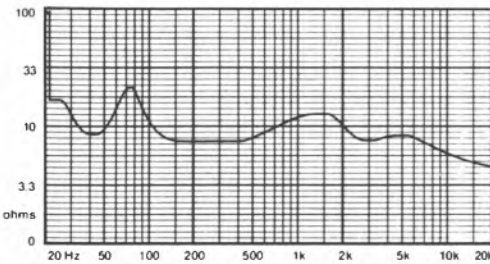
Averaged forward characteristic response in room.



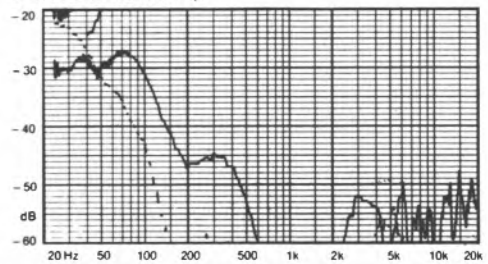
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

JBL TLX2

Harman (Audio) UK Ltd, Mill Street, Slough, Berks SL2 5DD
Tel (0753) 76911



Assembled in Denmark, using JBL drivers, the TLX range comprises budget models designed to meet the needs of the European market, this of course including the UK. These enclosures have vinyl covered cabinets with simple unrebated grilles and are aimed at competitive price areas of the market; for example, at £120, the '2' offers a two way reflexed loudspeaker system of good sensitivity.

Bass is handled by a 165mm diameter pulp cone unit built on a pressed steel frame, with high frequencies handled by a semi-soft 28mm fabric dome tweeter coated with a flexible metallised layer of titanium. A simple three element crossover is used, the internal wiring via push-on connectors, with spring type terminals for rear cable connection.

Internal volume of this miniature design is 13 litres, this tuned to a high 70Hz by the large 48mm diameter by 65mm deep port. The plain chipboard

box has no bracing or damping, and just a minimum of fibreglass wadding on 50% of the internal surface.

Sound quality

Panel opinion was rather mixed for this model, indicating sonic flaws which affected individuals to different degrees. Nonetheless the score was a straight 'average' which was quite fair for the price.

Comments described an uneven sound with nasal boxy 'cupped hands' effect and also tizzy colorations to a noticeable degree. The tonal balance was satisfactory but low bass was missing. Stereo depth was impaired while stereo focus was phasier than usual. However, despite these comments, it sounded fairly lively and articulate, and did not upset some panellists with its oddities.

Lab report

The reference response at 1 metre showed a 90dB sensitivity which was above average and useable with amplifiers down to 10W/channel. The bass rolled off quickly and the -6dB point was noted at 70Hz. The frequency response was uniform to 1.5kHz, but showed some loss from 2 to 10kHz, with an erratic treble output. As the dotted line (grille off) showed, the thick grille exerted a strong influence on the response and ideally should be detached for critical listening.

The speaker handled power inputs up to 75W peak programme resulting in a good sound level maximum of 104dBA in a typical room.

Distortion at 96dB sound level was poorer than average though not excessive. Some loss of detail and tonal balance may be evident when driven to the upper power limit. At 86dB some improvement occurred though third harmonic was still greater than usual in the mid band, reaching 1%.

At 2 metres, a more representative measuring distance, the speakers' lumpy upper-range character was clearly evident and the normal response amplitude limits could not be applied here. Within the allowable variations, the marriage of driver outputs was quite good, while the overall tonal balance was satisfactory.

In the room, with multiple position averaging, this speaker again proved reasonably balanced but with a rapid bass rolloff, and an excess of output at 1.5kHz. Most speakers are more or less level down to 30Hz, but this model, tuned to a high frequency, was 15dB down here.

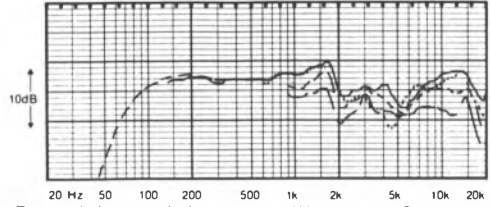
Accurately meeting the 8ohm impedance specification, the TLX2 was rated as a very good amplifier load.

Summary

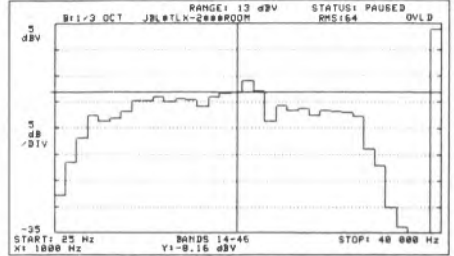
Though this speaker was mildly flawed and lacked low bass, some listeners could find it appealing. It was quite well balanced, lively and sensitive and could provide high sound levels from a compact package. An easy to drive model, it just manages a recommendation, though a personal trial is advised.

GENERAL DATA

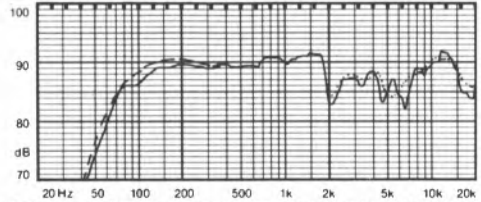
Size (height x width x depth).....37.5 x 25.5 x 21.5cm
 Recommended amplifier power per channel (for 96dBa minimum per pair at 2 metres).....(10) – 75W
 Recommended placement.....Open stands
 Frequency response, within ± 3 dB, at 2 metres.....See text
 Low frequency rolloff (-6 dB point) at 1 metre.....70Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....90dB/W
 Approximate maximum sound level (pair) at 2 metres.....104dBa
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....average
 Typical price per pair, inc VAT.....£120



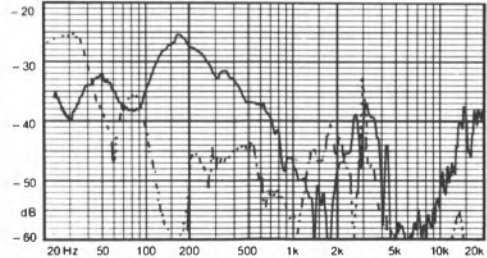
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



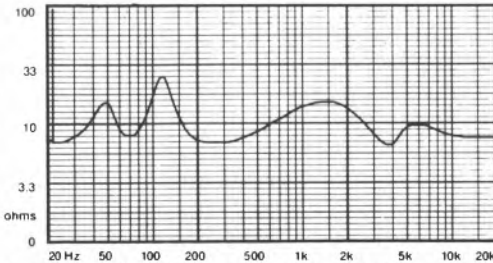
Averaged forward characteristic response in room.



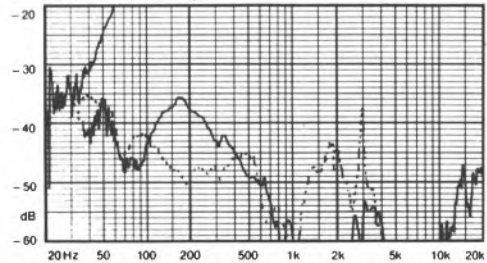
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

JBL TLX4

Harman (Audio) UK Ltd, Mill Street, Slough, Berks SL2 5DD
Tel (0753) 76911



This is the second model in JBL's European built budget *TLX* range, and has a larger enclosure than the 2, with the bass driver also increased to a 210mm frame size. The internal volume is considerably larger (28 litres) and the system is tuned to a more satisfactory 50Hz by a large ducted reflex port, which measures 70mm by 100mm deep.

The bass unit is energised by a generous magnet allied to a 160mm pulp cone with a damping coating. Crossing over at around 3kHz, the treble is handled by a 28mm semi-soft fabric dome unit with a thin vapour deposited titanium metal coating. The crossover is very simple with just two elements, these being an inductor and a capacitor.

Built of plain 20mm thick chipboard, the vinyl coated enclosure lacks bracing or damping, though the interior volume has some absorbent foam filling. Electrical connection is via spring

clip terminals. The speaker's overall characteristics suggest that it is best suited to free space mounting on stands.

Sound quality

The *TLX-4* scored a more consistent rating than its smaller brother and was judged as slightly above average, which was appropriate for the price. Sounding fairly well balanced, the *TLX-4* reproduced most programme quite well, with reasonable stereo focus as well as good frontal detail. Conversely depth was not its strong point, and a degree of boxiness and mid range cone coloration was also present which added some coarseness to the sound thereby amplifying its two dimensional aspects.

One panellist noted its competence but criticised its inelegance. Fair bass extension was present but with a 'boppy' character in the upper bass, while the treble was less smooth than the group average.

Lab report

An above average 89dB/W sensitivity was indicated for this speaker, with the 1 metre reference curve showing good overall balance though with significant irregularities in the upper range beyond 1kHz. The grille clearly upset the smoothness of the response. For a -6dB point the bass rolloff was noted at 55Hz, a typical result. While 10W per channel would provide satisfactorily loud sound levels, the 100W power handling would allow sound levels of up to 104dBA to be achieved with a suitable amplifier.

Out at 2 metres microphone distance, the forward response group was reasonably consistent, meeting 65Hz to 20kHz limits. The uniformity and general integration was also surprisingly good.

At a 96dB sound level, distortion was moderate at an average 0.4% whilst at 86dB third harmonic was mild, and second was almost negligible. Easily meeting the 8 ohm impedance standard, the *TLX-4* was classed as an easy amplifier load.

The speaker's consistent overall balance may also be seen in the computer averaged room response; here the bass was quite uniform to 40Hz and the overall trend was close to the correct result.

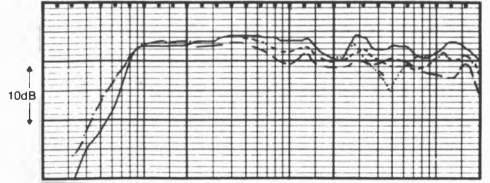
Summary

Offering good sound levels, with low distortion, the 4 had a lively, informative nature which went some way towards balancing its higher than usual level of coloration. The system offered reasonable

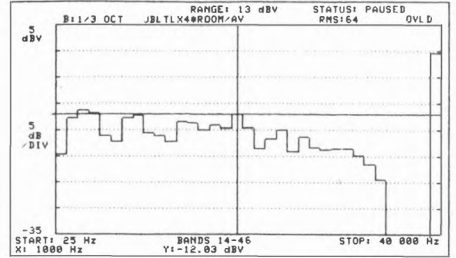
value, and its overall panel score was high enough for recommendation.

GENERAL DATA

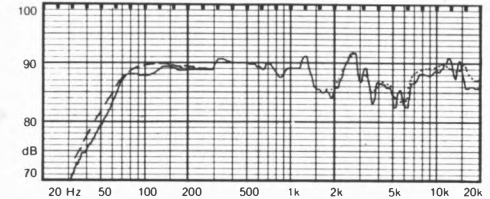
Size (height x width x depth).....56 x 33.5 x 24cm
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(10) – 100W
 Recommended placement.....stands, free space
 Frequency response, within ± 3 dB, at 2 metres....65Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....55Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....89dB/W
 Approximate maximum sound level (pair) at 2 metres....104dBA
 Impedance characteristic (ease of drive).....excellent
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£170



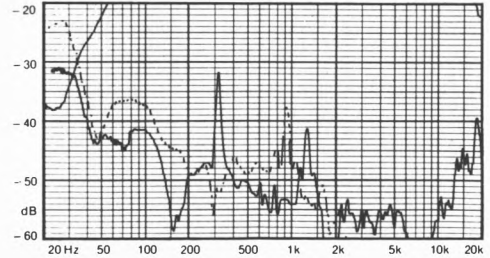
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



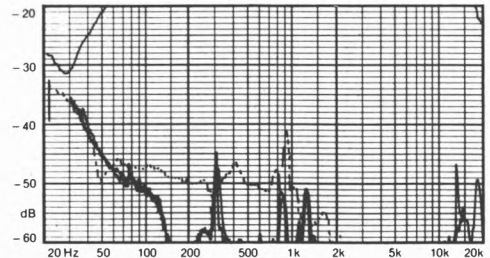
Averaged forward characteristic response in room.



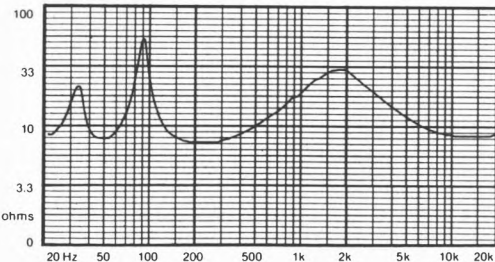
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

JBL 18TI

Harman (Audio) UK Ltd, Mill Street, Slough, Berks SL2 5DD
Tel (0753) 76811



speaker is hardwired internally with Monster Cable and 4mm socket/binding posts are provided for rear connection.

Sound quality

The panel's scores were somewhat disappointing with an 'above average' rating, this not commensurate with the price. Their comments described a generally well balanced system, well integrated and controlled, with good detail as well as attack in the frontal planes. Fair depth was produced, but it lacked full resolution of space and ambience. It did sound smooth, but some colorations were noted; in the mid there was a 'woody' effect, plus some hardness and wiriness in the upper ranges. Ringing tones and woodblock sounds were over emphasised.

Stereo focus remained good while its power handling was quite exceptional. Some loss of low bass was noted.

Lab report

Despite the 18TI's compact size, sound levels of up to 104dB should be possible for a stereo pair, with up to 150W per channel of undistorted peak programme power. The near 86dB/W reference sensitivity indicates a minimum amplifier power requirement of 20W. From the reference response the speaker offered a -6dB rolloff at 53Hz, an average result for the size of speaker while the bass was step tapered to improve room boundary matching.

Out at 2 metres, the set of forward responses was very tidy, with a nicely balanced trend and fine integration. A small notch developed above-axis, indicating the need for decently high stands, perhaps 50cm. Frequency response limits of 55Hz-20kHz were easily met.

Driven to a 96dB sound level, distortion remained low above 300Hz, averaging 0.3%. At 86dB very good results were obtained particularly for the third harmonic, this held to be the more critical factor; the peak at 22kHz probably related to the dome resonance, estimated to be at a high 44kHz. Even at low frequencies, the 86dB distortion averaged 0.5%, a fine result.

Falling to 5.5 ohms at 200Hz, the impedance still suggests a 'good' amplifier load rating the speaker presenting a relatively straightforward load.

In the listening room the bass showed an isolated prominence at 60Hz, suggesting that the tuning is not ideal. Elsewhere the balance was basically good although some excess in the mid treble range was visible, this associated with subjective comments of mild hardness.

This costly loudspeaker comes as a surprise from JBL since it is similarly sized to the L15, reviewed some issues ago, but is double the price! But in fact, the 18TI is a completely new system, incorporating advanced technology drivers.

Rigidly constructed in 20mm thick double veneered chipboard, the 18TI is finished in real wood. Its 10 litre volume is reflex tuned to 59Hz by a generous 45mm diameter ducted port, 100mm long.

Bass and midrange frequencies are allocated to a high power 180mm cast frame driver with a 44mm motor coil and a rigid flared polypropylene cone, this critically terminated by a plastic surround. The treble is covered by the latest JBL tweeter, a profiled titanium dome, with integral diamond pleat surround. Generous magnets energise both devices.

A high quality crossover network divides the input power at 12dB/octave at around 3kHz. The

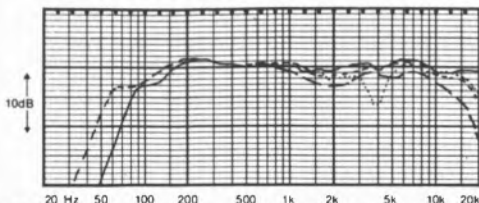
Summary

This well finished miniature was beautifully engineered, and should give a long life. Its power handling was high while distortion was low. Essentially neutral, with sharp stereo focus, it will be hard to beat for high level rock reproduction in confined spaces. Overall the performance was unexceptional for the money, but it is certainly worth considering.

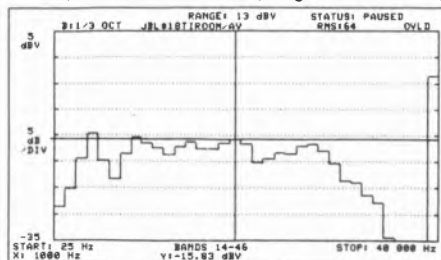
GENERAL DATA

Size (height x width x depth).....39 x 24 x 22.5cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(20) - 150W
 Recommended placement.....rigid stands, 0.5m from wall
 Frequency response, within ± 3 dB, at 2 metres...55Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....53Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....85.5dB/W
 Approximate maximum sound level (pair) at 2 metres...104dB
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....excellent
 Typical price per pair, inc VAT.....£560

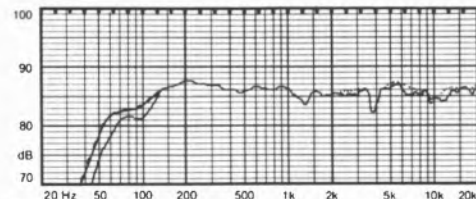
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



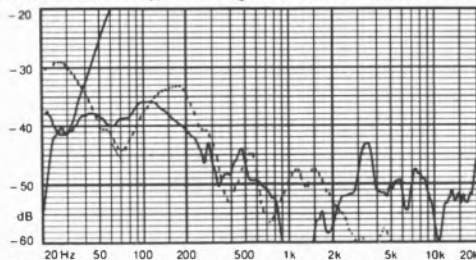
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



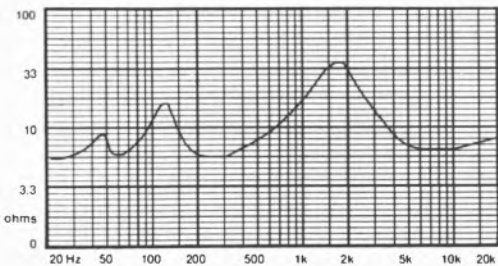
Averaged forward characteristic response in room.



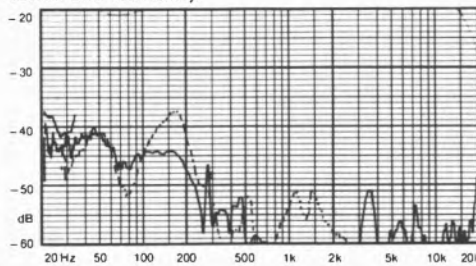
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

JPW JP1

JPW Loudspeakers Ltd, PO Box 31, Plymouth, Devon PL1 1YH
Tel (0752) 784284



Least expensive of a range of speakers designed and produced by a small UK company, the *JP1* is a standard-formula budget two way design. Selling for a modest £90, it is distinguished by a real wood veneer in a price category where most are vinyl coated. The cabinet is a 19 litre sealed-box enclosure, solidly constructed from 19mm chipboard, its interior lined with acoustic fibre. The 9mm thick grille panel is unrebated.

Bass is covered by a 200mm VIFA unit with a modest magnet, this fitted with a straight sided pulp cone. Treble is allotted to a second VIFA unit, this a 19mm polyamide soft dome, and a standard four element 12dB/octave crossover divides the signal electrically.

External finish is very good while the general specification suggests shelf or stand

mounting, the latter arrangement probably giving the best results in practice.

Sound quality

The *JP1* scored below average on the tests but not too seriously so, in view of the modest price. Panel comments were mixed. Overall above a basically satisfactory sound criticisms of a boxy and thickened effect were made, and while the bass was respectable it lacked real extension. The tonal balance was lightweight and the upper range showed some unevenness, varying in effect according to programme. Both a sharpness and a 'wiry' coloration were evident, and the upper treble was sometimes rather prominent. Stereo images were quite well focused but again, the depth effect was variable, with different programme. Sometimes it sounded OK, but on occasion, the sound was best described as more two dimensional.

Lab report

Pair matching was very good, within $\pm 0.3\text{dB}$ over the whole range. Reference sensitivity was high at a mean 90dB/W, and with a 100W power handling, a pair will be capable of 105dB/A; even 15W amps will give quite decent sound levels. The -6dB bass rolloff came in at a typical 60Hz and despite the grille rebating the dotted trace showed the significantly smoother response obtainable with grille removed.

Out at 2 metres, the smoothed output still showed some tendency to lumpiness, with a plateau around 1kHz and minor peaks at 15kHz. Nevertheless $\pm 2\text{dB}$ limits sufficed for an 80Hz to 20kHz response. Driven to the 96dB sound level, requiring only a modest 4W input, the JPW distortion was about average at around 1% over most of the range. At the lower 86dB SPL, third harmonic distortion reduced to the 0.3% level, while second remained much the same. Compression measured -1.4dB , poorer than average, but intermodulation was rather better, at -44dB .

From the impedance graph, the system resonance was seen at 88Hz. The impedance variation was small, averaging 7 ohms, with a small dip to 6 at 15kHz, which is pretty harmless. In view of the high sensitivity, this loudspeaker should not present any problem for any modern amplifiers.

The room-integrated response illustrated the

'lumpy' nature more clearly, with almost a three-humped response present with a forward midrange. The treble 'bites' a little at 5kHz and while the bass was fairly extended, it rolled away a little too soon. Realignment to 88dB would help driver integration at crossover plus help matters a lot here.

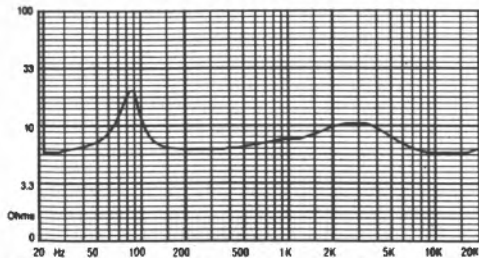
Summary

Despite the above discussion of its various character quirks, the *JP1* remains a well-crafted, well-finished speaker offering a good general performance, and the subjective ratings also suggest good value. It is both sensitive and easy to drive, thus qualifying for recommendation, though a personal audition is advisable, to see whether its tonal quality appeals to you.

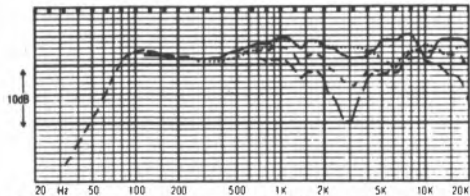
(Note: JPW submitted a recent pair of JP1s for this new edition, which showed a sweeter mid range as well as improved mid-treble integration. It still remained a little bright but has certainly been improved. Our recommendation is thus even more confident so far as this issue is concerned.)

GENERAL DATA

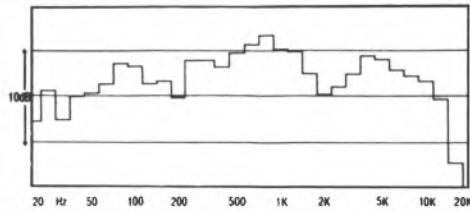
Size (height x width x depth).....44 x 26 x 26.5cm
 Recommended amplifier power per channel
 (for 96dBA per pair at 2 metres minimum).....(10)—100W
 Recommended placement.....on stands or shelf
 Frequency response, within ± 3 dB at 2 metres.....65Hz-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....60Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....90dB/W
 Approximate maximum sound level (pair) at 2 metres....105dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good
 Typical price per pair, including VAT.....£90



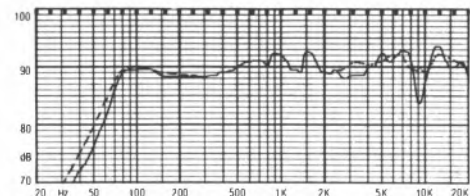
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



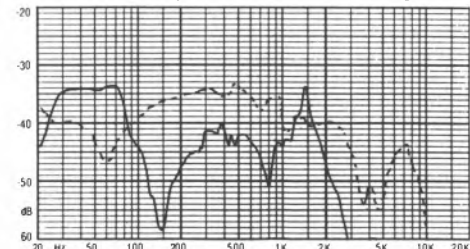
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



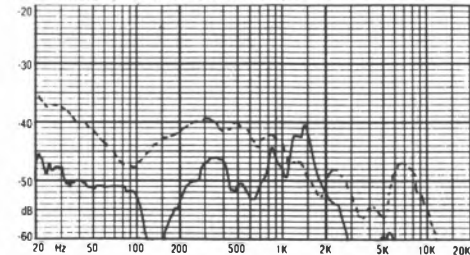
Averaged forward characteristic response in room



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

RECOMMENDED

JPW AP3

JPW Loudspeakers Ltd, PO Box 31, Plymouth, Devon
Tel (0752) 784284



A relative of the AP1, the '3 is a larger version with some refinements including the option for bi-amplified use in conjunction with an active crossover such as the custom packages produced by Nytech or A&R.

Sturdily built from 20mm thick chipboard, this two way design is reflex loaded, the 25 litre internal volume giving a system resonance of 73Hz. The grille baffle is rebated with the aim of improving its acoustic performance, while the external finish was in our case an excellent walnut veneer. The panels are damped internally by a bituminous layer with volume absorption within the enclosure being effected by a polyester fibre wad.

The bass/midrange the main driver is a 200mm frame Vifa, with a diecast chassis and a doped pulp cone. For the treble a 19mm plate dome unit (Vifa again) takes over. A simple 3 element crossover is used to provide nominally 12dB/octave

acoustic rolloff slopes, but in active mode the electronic crossover takes over, these units barely requiring equalisation.

Sound quality

Achieving a 'good' rating on the listening test, the AP3 did well. Interestingly this rating was obtained in spite of noted comments concerning a mild excess in the upper bass as well as a mild tonal thinness in the mid range and additionally a forward, bright treble. Somehow the speaker remained well enough balanced taken overall, as well as sufficiently controlled, to allow its other qualities to show. Stereo was pretty good in terms of both width and focus, with fair depth. The voice band was liked, and sounded articulate and well differentiated. Low bass was muted but was present in the room, and compensated for by an upper bass richness.

Coloration in the general sense was fairly low, but some graininess in the upper treble.

Lab report

Set to a 1 metre measuring distance, in the anechoic chamber, this speaker demonstrated a good sensitivity of 90dB/W, uncompromised by the impedance characteristic. The latter rated as a very good amplifier load with an average value of 9 ohms and a lowest value of 6 ohms.

The reference response showed a slight bass underdamping with a -6dB rolloff at 57Hz. A rising output with increasing frequency was also shown this amounting to 5dB over the 200Hz to 15kHz range. With the grille removed (dotted line) some improvement was seen in the treble smoothness.

A minimum of 10 watts was indicated for satisfactory sound levels, while 100W maximum input was possible on undistorted programme (not continuous tones). Good sound levels of up to 105dBA were possible in a typical room, and for active operation, amplifiers in the 25-50W per driver range will be entirely suitable.

At 2 metres, the forward response set was quite good, particularly in the lateral plane. Vertically the response was less regular, and the speakers should therefore be placed with some care, for example on a stand 40-50cm high and set straight ahead. The rising trend was again noticeable on the smoothed responses.

Low distortion levels were obtained at 96dB, of typically 0.3 to 0.4% which further improved to very good at 86dB, where it averaged 0.2%.

In the listening room the AP3 did show a generally good balance, though with a touch of treble excess and the beginnings of a humped

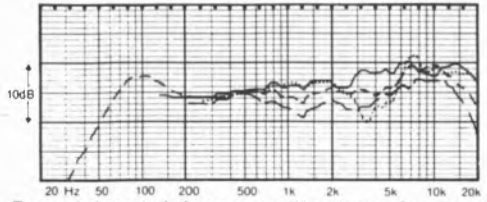
energy response.

Summary

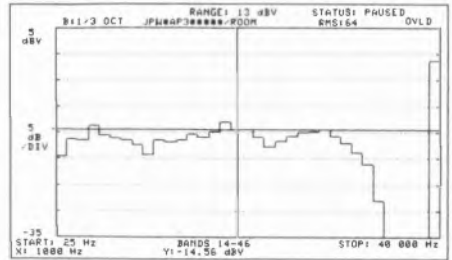
This nicely finished and well built loudspeaker had a touch of its own 'character' but this did not detract from the listening results, which were good for the price. Other aspects were also nicely balanced and the facility for active operation is an interesting option, providing the opportunity for upgrading the performance in power, clarity and balance. Offering good value, the AP3 carries our recommendation.

GENERAL DATA

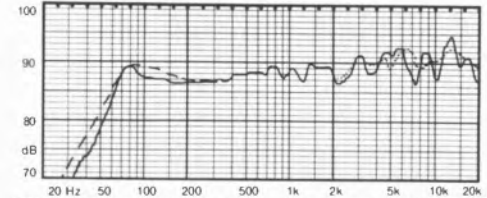
Size (height x width x depth).....52 x 26 x 29.5cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(10) – 100W
 Recommended placement.....On stand, near wall
 Frequency response, within ± 3 dB, at 2 metres...65Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....57Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....90dB/W
 Approximate maximum sound level (pair) at 2 metres...105dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£185



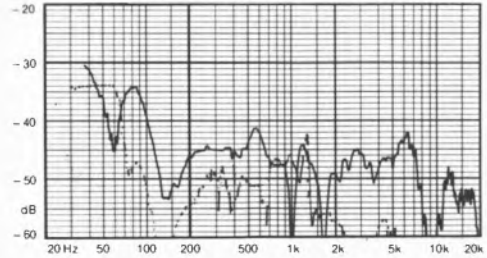
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



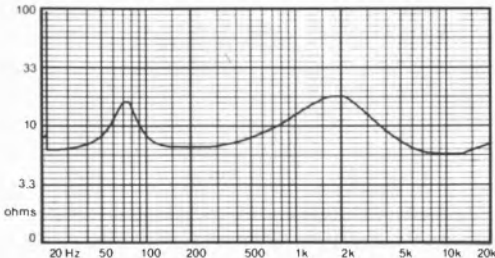
Averaged forward characteristic response in room.



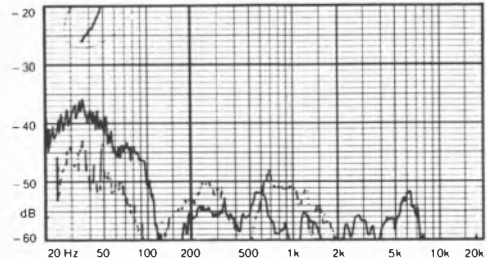
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



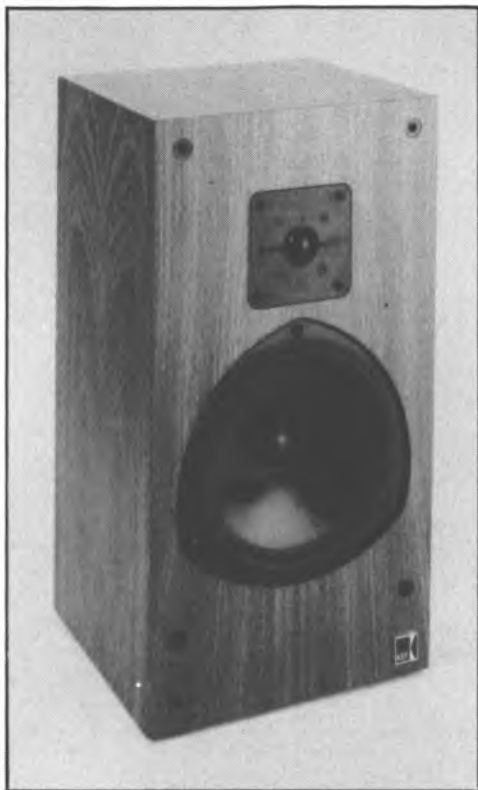
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

KEF 103.2

KEF Electronics Ltd, Tovil, Maidstone, Kent ME15 6QP
Tel (0622) 672261



This compact member of KEF's 'Reference Series', itself developed from the original *103*, was first reviewed in *HFC* as long ago as 1980, when it was rated a 'Best Buy' at around £250; however, the passage of time has since made that earlier review obsolete.

The *R103.2* comprises a 19 litre two way compact, equipped with the S-STOP electronic overload protection system. Bass is handled by a Bextrene-coned KEF driver of 210mm frame size, the latter a pressed steel trochoid, allowing a balanced three point mounting to be used. A decoupling system is employed in the mounting, to reduce driver-induced cabinet resonances. Treble is handled by a KEF 25mm fabric dome, treated with a damping compound.

A complex 14 element crossover is employed, with high quality components, including a series tuning capacitor for the bass

alignment, which is third order sealed box. The enclosure includes treatment to reduce coloration and to some degree this speaker can be seen as occupying the same position in the KEF range as the *SL6* does in Celestion's.

Sound quality

Scoring around the average mark on the panel listening tests, the *103* displayed the hallmarks of a 'reference' model in that the tonal quality was natural and well balanced, proving even-handed on all the programme we tried. The sound was essentially 'open' and free from coloration, and it appeared quite detailed, with pretty good extension at the frequency extremes. It handled high power inputs very gracefully, and a 200W rating is not unreasonable, in view of this.

In the end, though, the speaker did prove a little frustrating, as the panelists struggled to describe verbally certain aspects of the sound. It seemed to blur transient edges and mask fine detail, while the bass lacked true attack and tune-playing ability. The treble was also a touch 'lispy' and 'wispy', lacking a clear sharp ringing on the right instruments. These aspects more than anything else depressed the scoring; its reproduction appeared 'soft' though 'hardness' is not what was required to remedy the problem.

Lab report

Reference sensitivity was much as before at a mean of 86dB/W which is a little below average. Pair matching was pretty good but not as good as previously; in the crossover region, ± 3 dB variations were noted. The grille was a good one, as it only marginally affected the axial response. Interestingly, it had a mild effect down to 500Hz. The bass extreme was fine, -6 dB at 46Hz which is good for the size: The response is a touch 'rich' and was gently downtilted much like the *SL6*. With the *103*, ± 3 dB limits sufficed for a 50Hz to 20kHz range. Out at 2 metres, a tidy set of off-axis traces were obtained. The above axis dip was mild, near the crossover point but suggests that the speaker should aim at the listener, preferably on a high stand.

Driven to 96dB sound level, the distortion was well controlled, typically 0.3% at mid and high frequencies and it was also good in the bass. Bar a little 3rd harmonic at 1kHz, distortion at the 86dB sound level was very

good throughout. The speaker also coped well on compression, with 1.3dB loss while the intermodulation product was fine at -40dB.

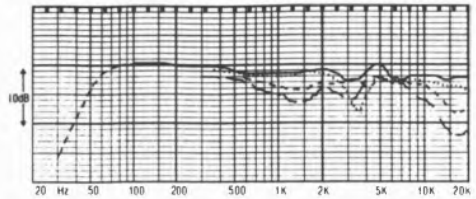
Conforming comfortably to the 8 ohms standard the 103 was considered an easy amplifier load. Sound levels of up to 104dB should be possible from a stereo pair. When room averaged the speaker's output was well extended, if slightly 'rich' at 50Hz, and showed a mild energy peak at 14kHz. However the balance was good and the mid particularly smooth.

Summary

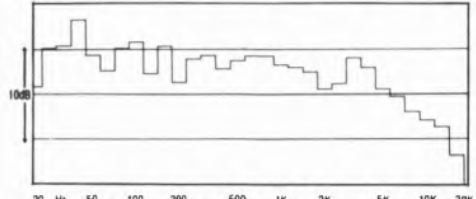
The 103 remains a competent, neutral performer possessing an extended response, low distortion and fine power handling. It works well on all types of programme, and is both well constructed and finished. Newly assessed for this issue, it lacked some of the 'see through' quality, as well as the attack and precision, of more recent speaker designs, and for the majority of the panelists, it proved rather 'bland' and 'uninvolving'. It is certainly one of the better examples in its price category, but this is not enough for recommendation.

GENERAL DATA

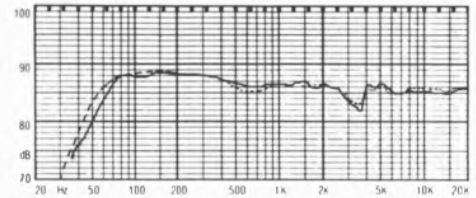
Size (height x width x depth).....	50.5 x 26.5 x 25cm
Recommended amplifier power per channel (for 96dBA per pair at 2 metres minimum).....	(20)—200W
Recommended placement.....	open stands
Frequency response, within ± 3 dB at 2 metres.....	50Hz-20kHz
Low frequency rolloff (-6dB point) at 1 metre.....	46Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre).....	86dB/W
Approximate maximum sound level (pair) at 2 metres....	104dBA
Impedance characteristic (ease of drive).....	very good
Forward response uniformity.....	very good
Typical price per pair, including VAT.....	£300



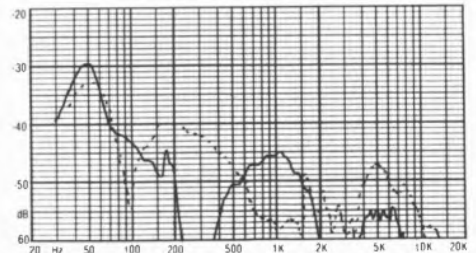
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



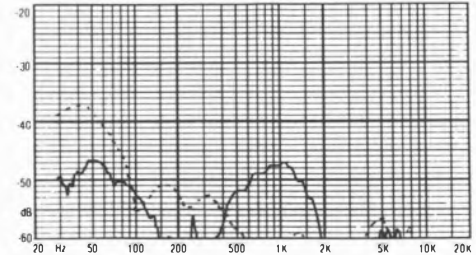
Averaged forward characteristic response in room



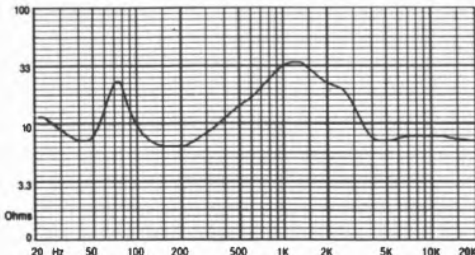
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

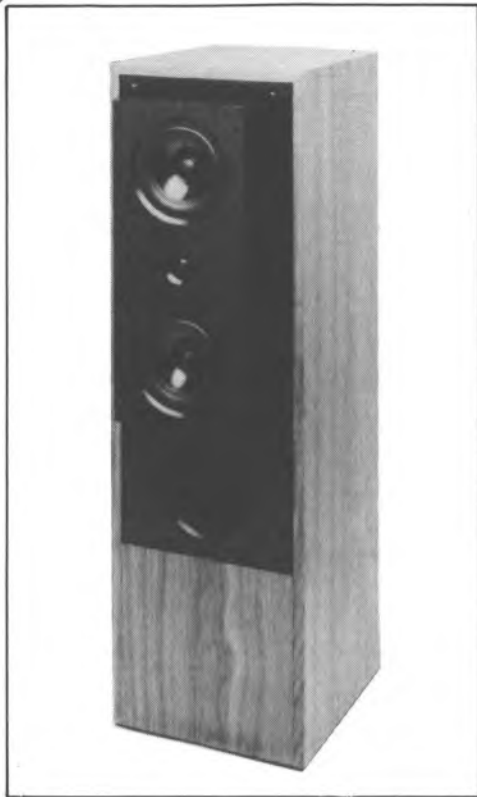


Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

RECOMMENDED

KEF 104.2

KEF Electronics Ltd, Tovil, Maidstone, Kent ME15 6QP
Tel (0622) 672261



About ten years ago, the original KEF *104* was a runaway success, and it was first favourably reviewed in *104 AB* form by *HFC* in 1976. The new *104*, though, is radically different to the old — even if, bearing inflation in mind, the present price of around £650 is not all that different.

A complex new speaker of very advanced design, the *104.2* uses a total of five drivers. Within the enclosure are located two 200mm pulp cone bass units, these back loaded by sealed chambers. Their frontal output feeds a damped central chamber, which is fitted with a large diameter, high velocity port, the effect being that of a second-order resonant circuit with a 12dB/octave rolloff below bass resonance. The port continues to transmit output above resonance, right up to the lower crossover frequency of 150Hz. From 150Hz to 3kHz or so, two 110mm Bextrene cone

midrange units operate in parallel, these mounted above and below the 25mm soft dome treble unit, which is ferro-fluid damped.

The enclosure is extremely rigid and well damped, with a low acoustic output and the system employs a very complex crossover with full compensation for input impedance. The assembly reflects a 4 ohm resistive load, optimally matched to modern amplifiers. Floor mounted, ideally on the piercing spikes provided, the slim Boothroyd styled cabinet is finished in natural veneer.

Sound quality

While the design promised much, the particular exposition and balance offered by the *104* did not seem to appeal to the listening panel. Designed to play loud, it could handle up to 200W programme, beyond which it sounded painfully loud, as well as somewhat hard and aggressive.

It showed many good qualities, among them dry quick transients, very good stereo focus with fairly good depth, much fine instrumental detail and considerable clarity in the midrange. Conversely, it had a slightly odd bass quality which reduced its ability to differentiate between bass sounds, nor was the bass subjectively well extended. The treble was of generally good quality but the mid showed a significant forwardness, which compressed depth and gave a hardened, thinned quality to the tonal balance. Ultimately the panel found this wearing, despite the explicit detail and exciting 'punch' offered overall.

Lab report

Pair matching was very good at better than $\pm 0.75\text{dB}$ while the reference mid band sensitivity met the high specification at 92dB/W, albeit for a 4 ohm system on an 8 ohm 'watt'. The grille is best left on and is properly integrated acoustically. The main mid octave showed a 2dB lift over the lower frequency range while the -6dB point registered a modest 50Hz. Out at 2 metres the forward response family looked very tidy, while the '15° above' response indicated the cabinet axis should be directed at the listener. Tight $\pm 2\text{dB}$ limits sufficed for a 65Hz to 20kHz axial response, though some band to band imbalances were suggested. KEF's distortion specification was a touch optimistic in extending to 20Hz, but actually the *104* did offer low levels of distortion over the entire

range. On compression, we noted an excellent 0.11dB while the intermodulation product was negligible, since the 400Hz signature tone appeared above the crossover point.

The room-averaged curve showed agreement with the panel comments, and suggested a mild 'three humped' characteristic at 50Hz, 500Hz and 4kHz. Overall it was quite well integrated with the room, showing better bass extension than the panel noted, this perhaps due to the tonal balance of the design. The energy output certainly was on the forward side in the upper midrange.

As claimed, the impedance was almost perfectly flat reflecting a uniform 4 ohm resistance, and uncritical of most amplifiers or cable type. For extended high power drive, 4 ohm rated amplifiers are a sensible choice.

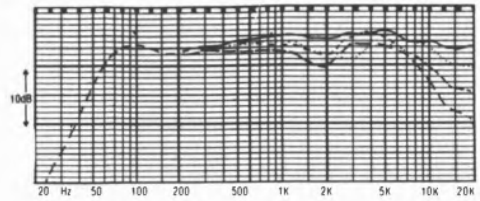
Summary

Our original samples were premature, and revisions made to subsequent UK production have resulted in significant improvements. The bass now sounds more open and better integrated with the midrange, while the latter also has more body. In addition the upper-mid hardness has been ameliorated, all this with barely a noticeable shift in the original response curve. It remains a touch lively and 'up front' with some treble grain, but its merits can now assert themselves, and the speaker now in production form, qualifies for recommended status.

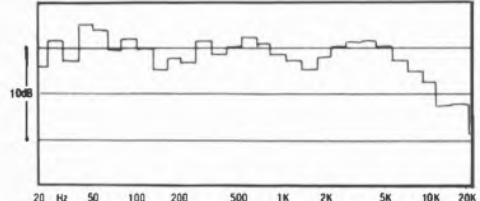
GENERAL DATA

Size (height x width x depth).....90 x 28 x 41.5cm
 Recommended amplifier power per channel
 (for 96dBA per pair at 2 metres minimum).....(10)—200W
 Recommended placement.....floor, away from side walls
 Frequency response, within ± 3 dB at 2 metres.....60Hz-20kHz
 Low frequency rolloff (-6 dB point) at 1 metre.....50Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....92dB/W
 Approximate maximum sound level (pair) at 2 metres....110dBA
 Impedance characteristic (ease of drive).....an easy 4 ohm load
 Forward response uniformity.....very good
 Typical price per pair, including VAT.....£650

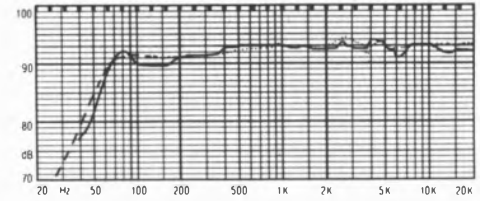
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



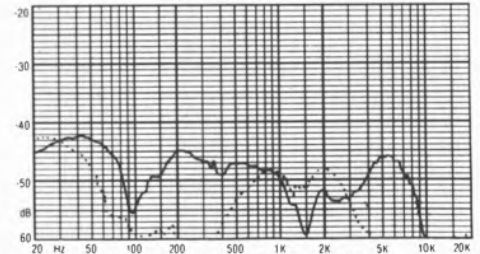
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



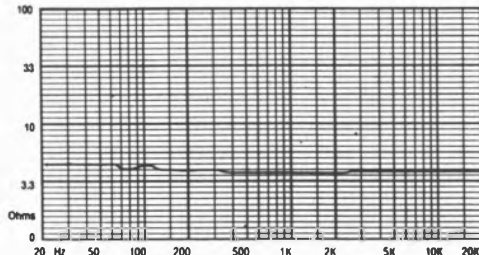
Averaged forward characteristic response in room



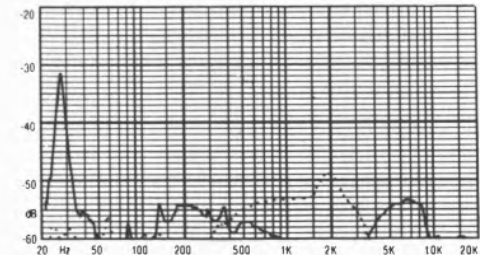
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Kord Vulcan

Kord Loudspeakers, 7 The Green, Nettleham, near Lincoln
Tel (0522) 750702



Although perhaps not widely talked about, Kord have in fact been producing the *Vulcan* for several years now. Development has occurred over the production period and accordingly a very recent pair was submitted for review.

The *Vulcan* is a moderately sized speaker suited to stand mounting. The enclosure is a sealed box of 23 litres, which tunes the 220mm cast frame bass unit to 58Hz. The bass/mid unit is by Volt, and uses a rigid pulp cone energised by a substantial magnet structure. The crossover is essentially 12dB/octave second order, with the treble range above 3kHz handled by a version of the Scan, a 19mm soft dome tweeter of advanced acoustic design.

Constructed from high density chipboard, the panels are not braced or damped but they seem pretty solid nonetheless. Externally, a fine real walnut veneer is used, and the grille is a foam type having good acoustic properties. A high power

handling is promised by the engineering of this model, and its ideal location would be near but not adjacent to a solid rear wall. Electrical connection is via 4mm socket/binding posts.

Sound quality

In the panel listening tests the *Vulcan* scored a straight 'average' which was no disaster, but unpromising for the price. Many of the comments were encouraging, while individual scores also reflected these; for example, it proved quite dynamic and had a good sense of scale. The bass was tidy, articulate and well extended, while the levels of musical detail were generally good. In the lower range colorations were moderate but in the upper range the listeners suffered some confusion. Violins were awry, variable in tone and distinctly phasey, with poor focus. Some 'cuppy' coloration was detected in this range. Power handling was well above average.

Lab report

Turning to the 1 metre reference response first the likely cause of the upper range oddity can be clearly seen. Close to the lower edge of the 'treble' range, the speaker has an unusual peak and dip of over 10dB in overall amplitude. Otherwise the response was fairly even and well balanced. Sensitivity was average at 87dB/W, with low frequency rolloff set at 60Hz for -6dB, accompanied by the desirable slowly falling, overdamped response thereafter.

With a minimum input of 15W suggested, amplifier powers of up to 150W per channel will provide sound levels of up to 103.5dBA in a typical room.

At 2 metres, the forward response grouping was quite tidy, showing good phase integration between drivers. From these curves it was evident that the 1.8kHz anomaly was a feature of the upper range of the mid unit. Both speakers matched well in this respect, and the normal ± 3 dB amplitude limits could not be met here.

Driven to 96dB, the distortion levels were typical except for the third harmonic (dotted) at 1.6kHz, with a peak associated with the noted bass driver resonance. Other areas improved at the lower 86dB level but this feature still remained. The impedance curve handsomely met the 8 ohm standard and the speaker was thus classed as a very good amplifier load.

Examining the computed room response, the general trend was promising in view of its intended use, while the characteristic central peak still remained despite heavy averaging all over the frontal plane. The slow bass rolloff has endowed

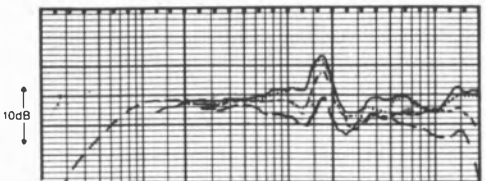
the *Vulcan* with quite good bass extension in-room.

Summary

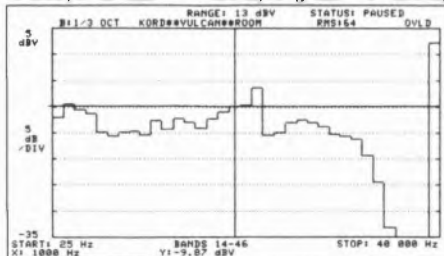
I do not recall the upper-mid peak as a feature of the original *Vulcan*. The speaker has done quite well this time round, despite this anomaly, and I wonder how it would have fared had it not been a factor in the review. As it stands, the ratings suggest that the *Vulcan* is worth considering, and we hope that Kord will get to grips with the response oddity and further refine the product.

GENERAL DATA

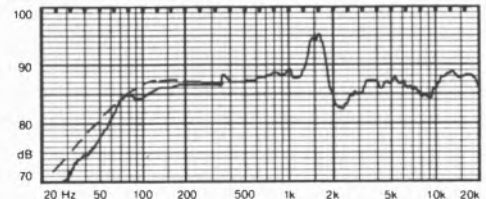
Size (height x width x depth).....51 x 27 x 28.5cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(15) -150W
 Recommended placement.....Open stands
 Frequency response, within ± 3 dB, at 2 metres.....See text
 Low frequency rolloff (-6dB point) at 1 metre.....60Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W Into 8ohms at 1 metre).....87dB/W
 Approximate maximum sound level (pair) at 2 metres.103.5dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....average plus
 Typical price per pair, inc VAT.....£300



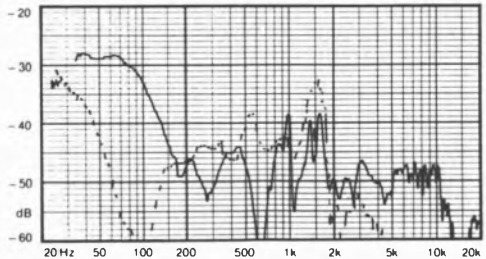
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



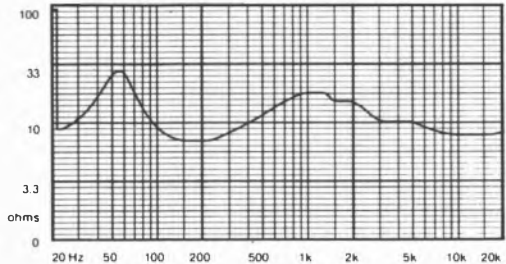
Averaged forward characteristic response in room.



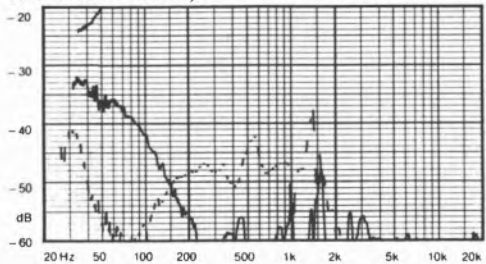
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Linn Index

Linn Products Ltd, 235 Drakemire Drive, Castlemilk, Glasgow G45 9SZ
Tel 041-634 0371



For this review *Hi-Fi choice* was able to use the second production series of Linn's new *Index* budget loudspeaker, the first having suffered adverse reactions from certain of the trade.

The *Index* is a sealed-box two-way system of conventional design. The bass is handled by the decade-and-a-half-old KEF *B200* Bextrene coned driver in standard form, married to a treble range provided by a 25mm soft fabric dome tweeter by Tonegen (Japan). Crossover is by second order low pass, and third order high pass filters, with damping and attenuating resistors. Good quality components are used.

Constructed from plain chipboard, this 15 litre enclosure is acoustically damped by a light polyester filling. Connection is via plain 4mm sockets. The grille is a plain 15mm thick panel, cloth covered and of poor acoustic quality, and as regards the exterior, our samples came with a good grade of 'black ash' vinyl finish.

Linn produce optional budget stands for this model, these medium weight tripod affairs with spikes.

Sound quality

On blind testing the *Index* was found to be wanting, with its rating practically at the 'poor' level, this reflecting a consistent scoring throughout the panel.

Low bass had a 'rolling' power, but the upper bass was not well differentiated, owing to the level of boxy, hollow sounding mid coloration. Furthermore the upper mid was unpleasantly hard and forward, while the treble sounded grainy and exposed.

Stereo focus was unexceptional while depth was but barely reproduced. It proved inconsistent and varied its performance from track to track. Piano sounded thin and clanging, while vocals 'shouted', especially at higher volume settings, and the bass lacked 'speed'. Wood block transients were almost painful to the ears.

Lab report

The axial reference response tells its own story with the rising output into the mid range, the 5dB presence band prominence and the uneven treble. The grille also affected the response, as shown by the dotted line (grille removed).

At 2 metres the situation was little improved. The lumpy trends remained whilst the off axis responses were poorer than average both in the lateral and in the vertical planes. The usual ± 3 dB response limits could not be met.

Assessed at 89dB/W, sensitivity was fairly high, and in conjunction with its 100W peak programme power handling will allow good sound levels of up to 104dBA to be obtained, although in practice it will sound louder still when judged subjectively. Bass rolloff was average at 57Hz, -6dB, and free of excess overhang. A minimum amplifier power of 12W was indicated.

Driven to 96dB sound levels, distortion was about average at 0.3 top 1% mid band, and well controlled in the bass. By the 86dB sound level, good results were obtained.

System resonance occurred at 80Hz and the impedance curve was fairly even, only falling to 5 ohms at 20kHz. The result was pretty harmless so in this case the amplifier load rating was a good one.

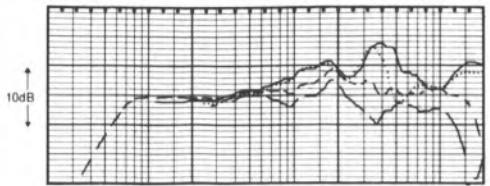
The computed room response told the final story, confirming the extended bass but clearly pointing to the unnecessarily excessive upper mid range output. Linn must like it this way; otherwise I cannot explain it.

Summary

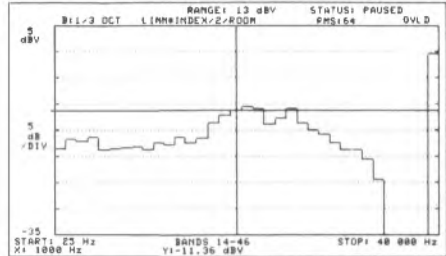
With a poor subjective rating by *HFC* standards, the *Index* is not really what we have come to expect from Linn. Its poor tonal balance and serious coloration levels means that it cannot qualify for any recommendation. Our panel results and lab testing indicates that if Linn is right then all the others must be wrong, and on the basis of the *Index*, this argument will not hold much water.

GENERAL DATA

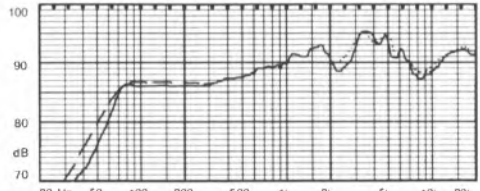
Size (height x width x depth).....43.5 x 28 x 20.5cm
 Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres).....(12) - 100W
 Recommended placement.....near to wall
 Frequency response, within ± 3 dB, at 2 metres.....See text
 Low frequency rolloff (-6dB point) at 1 metre.....57Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....approx 89dB/W
 Approximate maximum sound level (pair) at 2 metres...104dB
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....fair only
 Typical price per pair, inc VAT.....£140



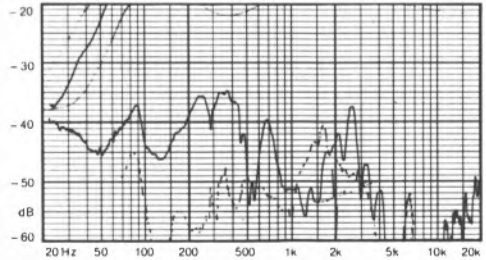
Forward characteristic response ($\frac{1}{2}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



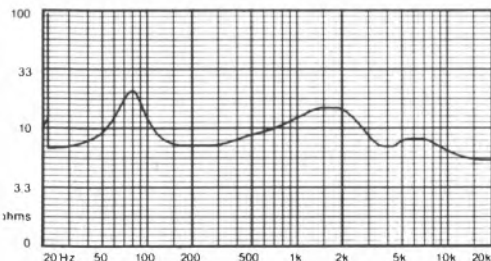
Averaged forward characteristic response in room.



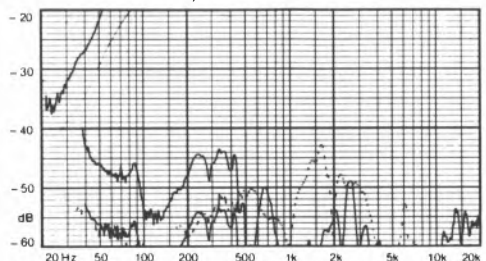
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



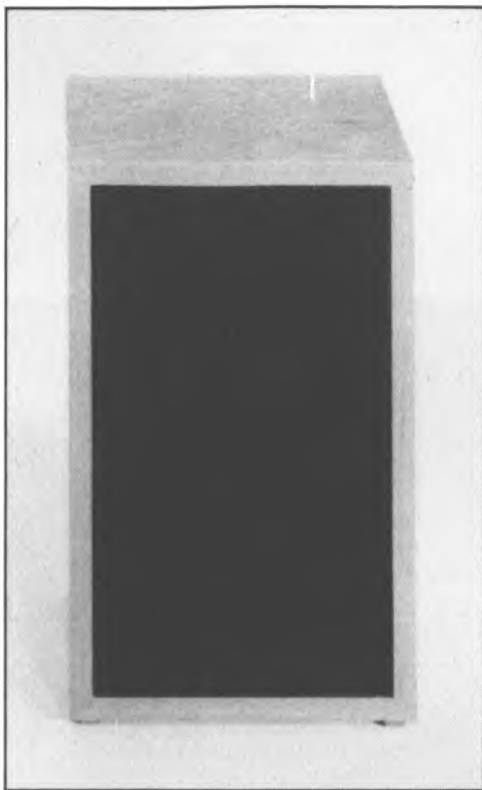
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Linn Kan

Linn Products Ltd, 235 Drakemire Drive, Castlemilk, Glasgow G45 9SZ
Tel 041-634 0371



A few months back Linn dealers were buzzing with news of a new improved series of tweeter to be used in the *Kan* and the other models in the current speaker range. Accordingly we tested fresh samples, said to be improved since our first review back in '83.

Externally similar to an *LS3/5a*, the *Kan* differs by its use of a damped, loaded and fully sealed chipboard enclosure — even the grille is more or less permanently attached. The bass/mid unit is the same KEF *B110* as used in the *3/5a*, loaded here by the 5 litre volume of the sealed box. The driver's steel frame has damping pads, and is finely sealed in situ. It uses an 80mm Bextrene cone with a long throw rubber surround. A complex high quality crossover divides the frequency range at around 5kHz, with the new version of the soft 19mm dome tweeter, now made by Hlquphon of Denmark operating over the higher frequencies. Amplifier connection is via plain 4mm sockets,

and Linn make a pair of top quality stands for the *Kan*. These are an optional extra and were used for our reviews with the speakers backed onto a plane wall.

Sound quality

The *Kan* did not score well in the listening tests. Rated as rather below average, the treble range was not excessive in balance terms but nonetheless drew attention to itself. Tizzy and sibilant effects were heard, which negated depth perspectives. In the mid a forced 'cuppy' quality was noted, with a thin, pinched tonal balance. The speaker did provide open, 'sharp' transient definition with respectable bass but when driven hard we found that it quickly overloaded at low frequencies.

Stereo focus was average but depth rather poorer than average. However musical detail was presented quite well if in a rather 'upfront' manner.

Lab report

On axis at 1 metre the measured response was disappointingly rough. Output climbed steeply to a peak at 1kHz, some 10dB above the 100Hz reference line, before falling some 8dB into the following trough. By 5kHz the output recovered, to follow a moderately ragged treble extension. The response would not meet the usual ± 3 dB limits.

Sensitivity was assessed at 85dB/W which was below average, with a -6dB rolloff at a high 90Hz. A minimum amplifier power of 25 watts was indicated, while a practical 50W per channel maximum restricted the maximum sound level to 98dBA.

At 2 metres, the hoped for improvement in uniformity did not occur with the 1kHz peak still dominant. Broad irregularities were evident in the vertical plane, indicating unwanted driver passband overlap, and the overall trend was rather unbalanced.

At 96dB sound level this little speaker was working hard, and midband second harmonic averaged 2% while third was rather better. At the 86dB sound level the improvement was not as great as usual.

The impedance curve showed the system resonance at 78Hz and the remaining trend was smoother than usual, not falling below 7 ohms and classed as an easy amplifier load.

The *Kan's* true colours were revealed by the computed room response. The bass was quite good but was set at too low a level relative to the forward and peaky mid. The treble balance was fair, but over-extended at the extreme; wall mounting alone cannot sufficiently redeem this.

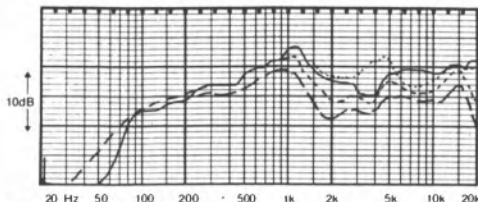
Summary

In latest form the *Kan* remains, in my view, an idiosyncratic, off-beat creation. The build quality and finish were very good, while the sound was sufficiently unusual as to be strongly criticised on blind listening — surely the acid test of any speaker? However, as many Linn owners hold the *Kans* in high esteem, our advice is to try them for yourselves.

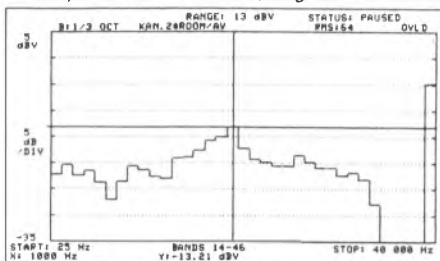
GENERAL DATA

Size (height x width x depth).....30.5 x 19 x 16.5cm
 Recommended amplifier power per channel.....(25) – 50W
 (for 96dB minimum per pair at 2 metres).....
 Recommended placement.....on rigid stand, back to rear wall
 Frequency response, within ± 3 dB, at 2 metres.....See text
 Low frequency rolloff (-6 dB point) at 1 metre.....90Hz*
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....85dB/W
 Approximate maximum sound level (pair) at 2 metres.....98dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformly.....average plus
 Typical price per pair, inc VAT.....£230
 *bass may be augmented by wall mounting

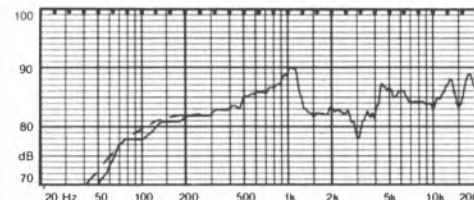
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



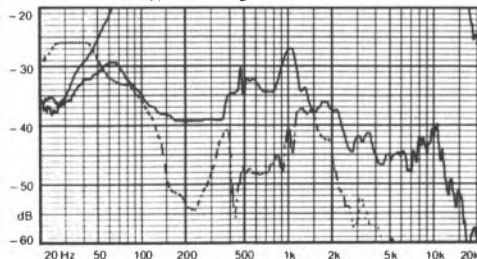
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



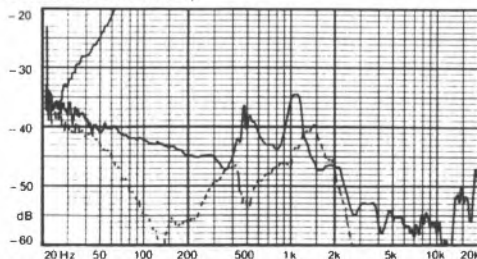
Averaged forward characteristic response in room.



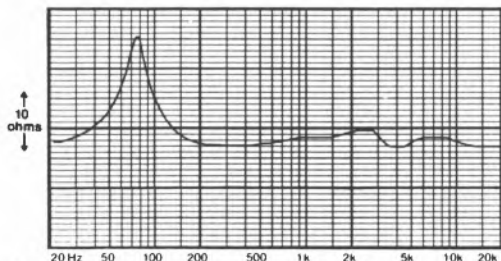
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L F



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



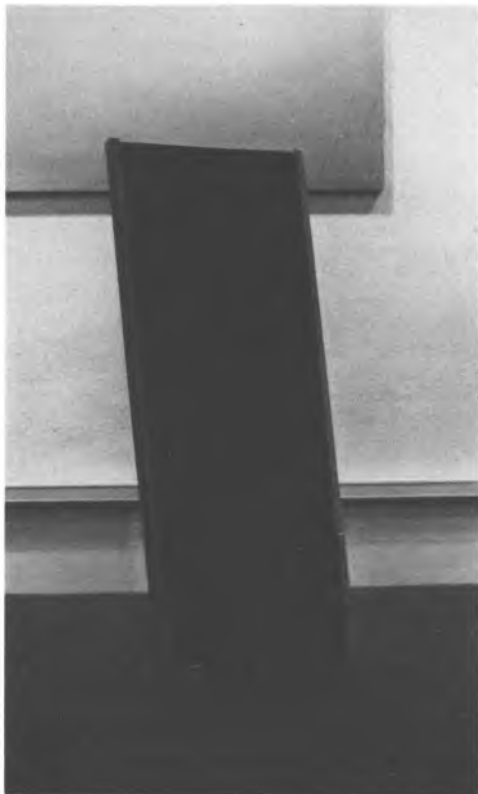
Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Magneplanar SMGa

Absolute Sounds Ltd, 42 Parkside, London SW19
Tel 01-947 5047



This model, the 'small' Magneplanar, sells for £650 in the UK and as such, finds itself in company with models such as the Celestion *SL600* and the Spondor *SP1*. An open panel design, using stretched thin diaphragms, it loosely fits the market position of the old Quad electrostatic; but as the name suggests, the Magneplanar's working principle is magnetic, not electrostatic, and thus no power supplies or matching transformers are required. The motor coil is dispersed over the surface of the diaphragm, energised on one side by an open array of bar magnets — this is a single-sided rather than a push-pull design.

Rated at an almost uniform 40hms impedance, this speaker uses two radiator elements arranged as vertical strips, with the 200mm wide bass section operating to 550Hz, while the 20mm wide mid/treble unit takes the upper range. Element height is 1 metre, so there is still a substantial radiating area.

Designed for floor standing, with rear supports which are adjustable for listening angle, this is a speaker which needs to be very carefully sited to get the best results. Almost by definition the results of the blind listening test will to an extent be compromised by the difficulty of arranging the optimum position for all panellists simultaneously.

Sound quality

Despite the above reservations the *SMGa* performed pretty well on blind auditioning, though the results did vary according to the panellist and his position. The panel commented that the speaker sounded 'big' and effortless and handled power well; low bass was deficient while the upper bass was rather bloated. Tonally, the mid-range was rather dim and with a downtilted character with increasing frequency. The presence range was muted while the treble was uneven in places, almost to the point of 'phasiness'. Coloration in the box or cone sense was delightfully absent and in this area it sounded very natural. It played tunes well in the bass despite its uneven character, and the overall impression was that of an easy forgiving nature, not accurate but nice to live with.

With a solo listener, and the speakers optimally positioned, good but not outstanding levels of stereo focus could be obtained. Width and depth were both good except in the upper treble where some constriction was evident.

Lab report

At 1 metre, the reference sensitivity was quite low at 85dB/W, and compromised to some degree by the low impedance, classed as 'average'. Its almost purely resistive nature does make this a straight-forward load in terms of its non-reactive content. As with other large panel models, the 1 metre sensitivity wasn't that helpful in determining actual loudness, and in practice good sound levels up to 103dB can be obtained, with up to 150W per channel of drive; 25W would be a sensible minimum. The low frequency rolloff was at 56Hz, not very deep, but this can be extended by some optional perspex rear 'wings'.

The response varied with angle, and was optimised for around 15° inwards laterally (speakers are in mirror pairs). Hence the axial reference response looked lumpy but the picture was smoother on the lateral 'off axis' set. As expected from such vertical elements, the vertical response changed rapidly with angle, so the speaker must be angled so the median axis arrives at head

height for the listener.

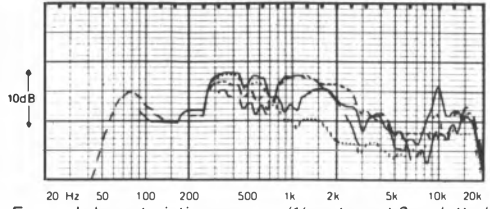
Distortion was generally very low, just a gently rising trend to low frequencies; note the main panel mode at 65Hz. By 86dB the distortion was very good indeed.

Summary

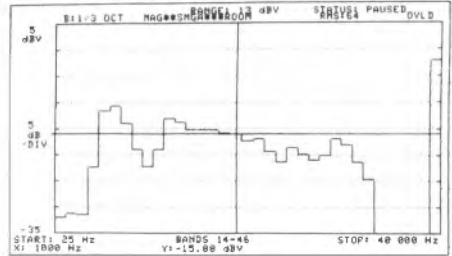
This speaker is an acquired taste. While not accurate in the monitoring sense, it offered high power handling, a true open-backed non-boxy sound, plus low distortion. Tonally rich, in the right room, it provided a satisfactory musical experience, with more than a hint of the audiophile MG3. Purely on test results, this speaker merits a 'worth considering' — though some would give a recommendation on the basis of its other merits. A well set-up home trial is suggested prior to purchase.

GENERAL DATA

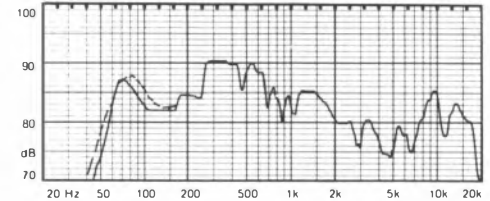
Size (height x width x depth)..... 122 x 48 x 4.5cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(25) – 150W
 Recommended placement.....on floor, clear of rear wall
 Frequency response, within ± 3 dB, at 2 metres.....see text
 Low frequency rolloff (-6dB point) at 1 metre.....56Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....85dB/W
 Approximate maximum sound level (pair) at 2 metres.102.5dBA
 Impedance characteristic (ease of drive).....average*
 Forward response uniformity.....average
 Typical price per pair, inc VAT.....£650
 *see text



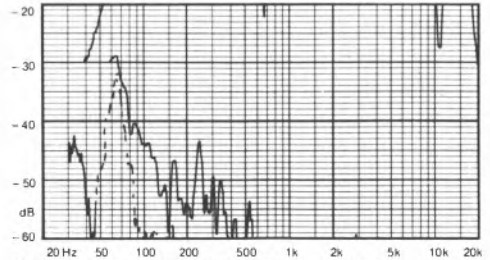
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



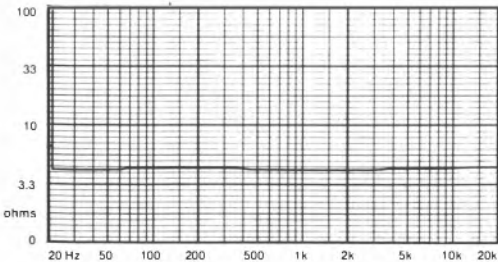
Averaged forward characteristic response in room.



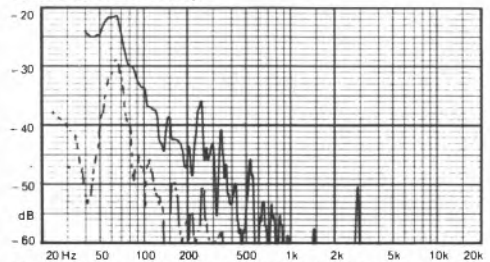
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Magneplanar MG3

Absolute Sounds Ltd, 42 Parkside, London SW19
Tel 01-947 5047

RECOMMENDED



Quite the largest and most expensive model in this survey, the *MG3* is a recent, high level introduction to the US-made Magneplanar range of open-back planar speakers. Its recent claim to distinction is the incorporation of a tweeter forming a line source almost the full height of the speaker, nearly two metres. The tweeter and the other panel elements are 1.5 metres high.

As the name 'Magneplanar' implies, the speakers are magnetically driven (not electrostatic) and have voice coil windings laid out over the entire surface area of the thin plastic film driver diaphragms.

In this three-way model, the mid is handled by a high definition film element covering approximately 30Hz to 6kHz. Below 300Hz, the bass radiator takes over, this more robust film element occupying more than 50% of the considerable radiating area. Being bi-

directional, like the panel electrostatics, it is also very sensitive and will benefit from a large room, standing well clear of the rear wall — 1.5 to 2.0 metres is a starting point.

The mid and treble units are fused separately while the crossover used very high quality components. During tests I found the system a little bright and replaced the treble fuse with a 1.8ohm 10 watt resistor, a alternative now approved by the manufacturers.

Sound quality

Auditioned (using the 1.8 ohm resistors) the *MG3* excelled on our tests. With a fine sense of scale and perspective, it also handled dynamic contrasts well, and was liked on both simple and complex material. Detail was extremely good, the treble clear and open, the mid sweet and natural, while the bass was articulate, informative and almost tactile on percussion. Low bass was pretty good if not really outstanding. Stereo focus was surprisingly good for a large panel and it seemed uncritical of either listening position or vertical axis. It gave a spacious, relaxed impression, free from the usual wooden, horny or other speaker colorations. Tonally it was considered a touch heavy in the upper bass, but remained very tuneful even here. It was consistently faithful to a wide variety of source and made even budget amplifiers sound good!

Lab report

The *MG3*, like other large panel speakers, does not obey the inverse square law and hence the 1 metre sensitivity was not too helpful, here averaging around 85dB. At a 3 metre position it sounds more like 86dB/W, an average sensitivity. Power handling was up to 300W programme allowing levels for a stereo pair of up to 105dB, a substantial if not deafening level. Pair matching was very good, with the -6dB point estimated at 35Hz.

The axial frequency response suggested a gently falling output with rising frequency, though this did not fairly represent the perceived output at the listening distance. ± 2.5 dB sufficed for 80Hz to 18kHz, a pretty smooth result. Out at 2 metres the family of off-axis responses were surprisingly good.

Moderate distortion was evident at low frequencies, but above 150Hz distortion was particularly good, especially third harmonic

and it was quite exceptional at 86dB. Compression measured a very low 0.03dB, with negligible intermodulation, while the impedance was uniformly low. With 1.8 ohms added in place of the treble fuses, it did not fall below 4 ohms, and averaged a 5 ohm load, mainly of a resistive nature.

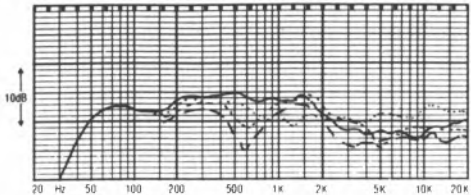
Room averaged, the *MG3* demonstrated a fine overall balance though the bass was not as uniform as some box systems, partly due to room reflection. The treble rolloff was smooth and gradual, as it should be.

Summary

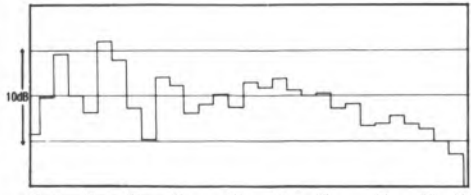
The *MG3* is a true audiophile loudspeaker, of excellent sound quality. It sets new standards for stereo performance, clarity and depth for the price, while its generous acoustic scale and dynamic range helps to convey much of the original character of the recorded performances it reproduced. A purchaser in this elevated price range should seriously investigate the *MG3*, and despite the cost, I am prepared to recommend it on sound quality grounds alone.

GENERAL DATA

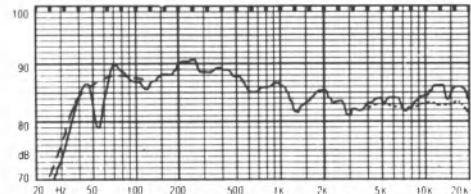
Size (height x width x depth).....180 x 62 x 38cm
 Recommended amplifier power per channel
 (for 96dBA per pair at 2 metres minimum).....(25)—300W
 Recommended placement.....well clear of walls
 Frequency response, within ± 3 dB at 2 metres.....70Hz-19kHz
 Low frequency rolloff (-6dB point) at 1 metre.....35Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....84-86dB/W
 Approximate maximum sound level (pair) at 2 metres....106dBA
 Impedance characteristic (ease of drive).....an easy 4 ohm load
 Forward response uniformity.....very good
 Typical price per pair, including VAT.....£2500



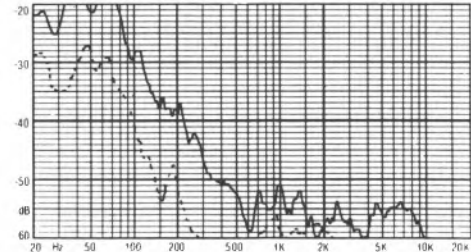
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



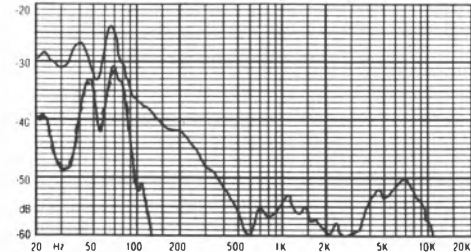
Averaged forward characteristic response in room



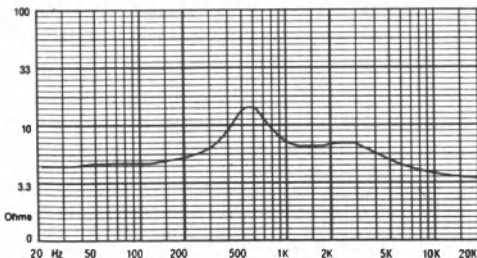
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Marantz LD20

Marantz Audio (UK) Ltd, 15-16 Saxon Way Industrial Estate, Moor Lane, Harmondsworth, Middlesex UB7 0LW
Tel 01-897 6633

BEST BUY



We first covered the Marantz *LD30* in the 1983 issue, and this has since been joined by a smaller model called the *LD20*. Its dimensions nonetheless do encompass a fair 16 litre internal volume, reflex tuned by a usefully-sized 5.4cm diameter port, 16cm long.

In this two way design, bass and midrange are handled by a 170mm steel-framed driver using a fabricated cone made from special paper. A 25mm soft fabric dome tweeter covers the treble range, while the electrical input is divided by a complex six element crossover of above average quality.

Solidly built from 20mm chipboard, the enclosure is well finished in vinyl print 'vener', with satin alloy trim for the drivers, both of which are flush mounted to minimise baffle reflections. However this good work is to some degree undermined by the 15mm thick, plain unrebated grille, which should be left off

to get the best results Spring clip connections are fitted to the rear panel.

Sound quality

Scoring a little below average, the *LD20* nonetheless did well considering its budget price. It delivered a well-focused stereo image together with some of the atmosphere and acoustic of the original recordings. Depth, in the real sense, was moderate and the speaker also showed a touch of tonal balance 'lightness', together with some boxy effects though it was not too bright in the treble — in anything it seemed a trifle depressed here. The bass was of average tunefulness and articulation, but seemed to lack extension. Several panelists indicated that more weight in the bass would be a good thing, and they were not referring here to the extreme bass.

In general it sounded clear and crisp, but a times it hinted at presence loss as well as some upper midrange muddle.

Lab report

Pair matching in the bass-mid was fine, but much of the treble range showed a significant 2dB difference between the two speakers. The grille did affect the measured response as the ripples on the reference curve testify. Sensitivity averaged 85.5dB, which was about the group mean, but the treble range looked depressed by 2dB, leaving the midrange exposed.

The low frequency -6dB point was at 60Hz which was about average, and with a comfortable 100W power handling, this speaker should be capable of 102dB maximum levels in a room. Out at 2 metres, the response showed clearer evidence of a presence-band loss shown by the trend of off-axis response around 2kHz. Limits of ± 3 dB sufficed for 75Hz to 20kHz range. In particular the speaker axis should be directed at the listener to avoid the treble loss above axis. At 96dB sound pressure level, second harmonic approached 3% in the lower mid, but third was 10dB less and by 86dB second harmonic had improved to a similar level both averaging 0.5%, which is not too impressive. On the compression test, significant 2.2dB loss occurred, though the intermodulation product was fine at -43dB.

Then room curve proved revealing, showing a fair bass but shelving gently away relative to the mid band. The energy loss at 1.6kHz was clearly shown, as was the steep nature of the

mid treble transition. The impedance dipped below the 6.4 ohm IEC minimum but not seriously so, and a 6-7 ohm rating is appropriate. This speaker should not pose any problems for an amplifier.

Summary

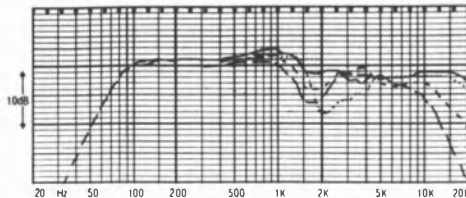
This speaker produced a pleasant relaxed sound with good stereo imaging. The bass, though 'dry', was reasonably extended, and the treble unobtrusive. It was well finished and the engineering was good — as was the overall value for money, at around £80. Best Buy status is appropriate here.

(Note: We have also tested the Marantz LD30 II, a larger two-way design priced at around £100, which is warmly recommended, as is the LD50 at around £140; see 'Summary Reviews'.)

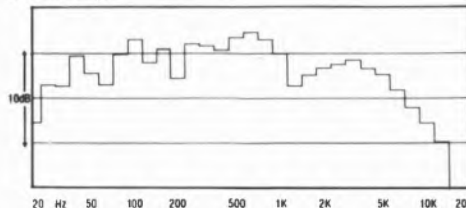
GENERAL DATA

- Size (height x width x depth).....36.5 x 23 x 25.5cm
- Recommended amplifier power per channel (for 96dBa per pair at 2 metres minimum).....(15)—100W
- Recommended placement.....on open stands, possibly shelf
- Frequency response, within ±3dB at 2 metres.....75Hz-20kHz
- Low frequency rolloff (-6dB point) at 1 metre.....60Hz
- Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre).....87.5dB/W
- Approximate maximum sound level (pair) at 2 metres....102dBa
- Impedance characteristic (ease of drive).....good
- Forward response uniformity.....good
- Typical price per pair, including VAT.....£80

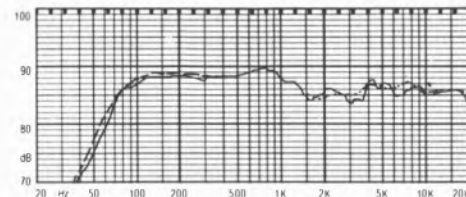
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



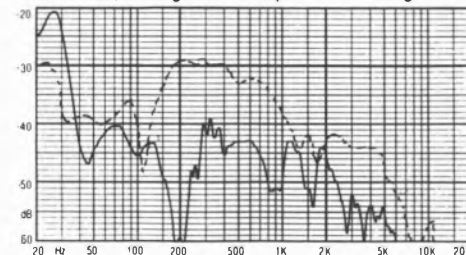
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



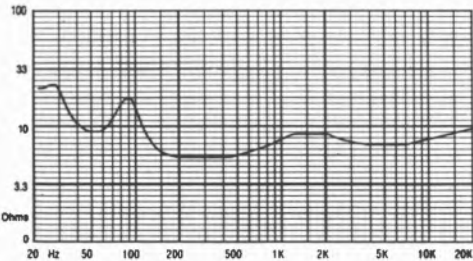
Averaged forward characteristic response in room



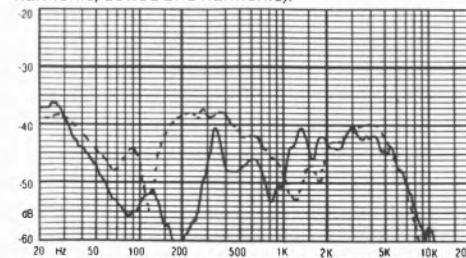
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



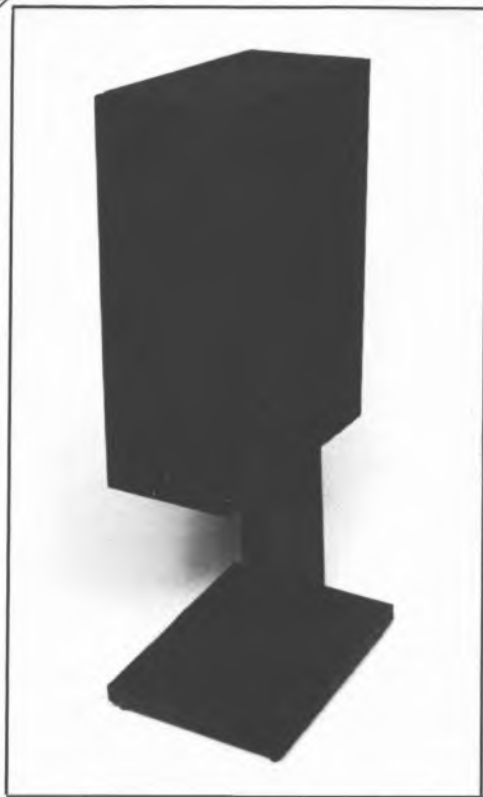
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Meridian M2

Boothroyd-Stuart, 13 Clifton Road, Huntingdon, Cambridgeshire PE18 7EJ
Tel (0480) 57339



Now well established, the M2 from Meridian is perhaps the leading UK active loudspeaker system, consisting of a slim compact enclosure mounted on a new heavyweight (and how!) rigid stand.

The box is well packed with electronics and drivers, the latter all being KEF units — two 110mm Bextrene-cone bass/mid drivers, one mounted above and one below a fairly large 38mm plastic dome tweeter. As a group this array approximates in effect to a 300 x 120mm bass unit with a concentric treble driver. The 17 litre enclosure is reflex tuned by a ducted port, which has a multi-hole aperture to improve air flow linearity as well as enclosure coloration. The box itself is superbly built in 14mm thick top-grade multi-ply and finely veneered, the back panel consisting of a metal plate which acts as a heat dissipator for the electronics. In addition to providing the electrical crossover at

2kHz, the latter realigns the bass system to a sixth order, and extended bass can be expected possibly at the expense of a rapid final rolloff as well as a possible low-frequency hangover.

DIN and phono inputs are provided at nominally 1V sensitivity and the system may be driven by a balanced output preamplifier for optimum performance — for example a Meridian 101B).

The grille components are rather close to the drivers on the narrow front panel, so measurements were taken with the grille removed and in place to assess its effects.

Sound quality

In general the M2 sound was favoured by the panel. It portrayed dynamics well and was felt to have a clean, punchy and controlled character throughout the range. Good stereo images were developed, being well focused and showing reasonable depth. However, its slightly forward, hard and bright tonal balance was felt by some panellists to mildly flatten some stereo images.

Bass was considered well controlled with fine articulation in the upper registers and a very slight extreme low frequency hangover, the latter almost a mild 'thunderous' effect. In presentation the M2 was clear as well as detailed, with a slightly cold and clinical ambience; possibly the presence band was indeed a little too forward.

Lab results

Considering the small size of the box, quite loud 102dBA sound levels were possible and the bass power handling was satisfactory at this level. The axial frequency response was of the 'stepped' variety, which placed the bass rolloff — 6dB at 45Hz referred to the mid band. Conversely if referenced to the upper bass level, the cutoff improved to 38Hz — remarkable for the cabinet volume.

Some pair matching imbalance was apparent (solid and dashed lines above 500Hz), this amounting in places to a significant 2dB or so, and stereo focus could well have been better with a tighter match. The grille was also found to disturb the 2.5 and 8.0kHz range though it is hard to say which response was better.

At 2 metres the trend suggested upper-mid forwardness with the main range shelf-lifted above the 80-300Hz bass range. The 15° above-axis frequency response was poor, flawed by a dip at 2.2kHz, but on axis and 15° below it was perfect. Here the wisdom of Meridian's adjustable-tilt stand can be seen in bringing up

the main radiating area to the listener. The lateral off-axis curves were good except above 10kHz where the falloff was too rapid.

Room-averaged response showed a 'lumpy' bass at 30-50Hz which, however, did not subjectively prove as audible as you might expect. The mid was thin in balance terms, while the treble was sweet, though rolled off somewhat prematurely.

At 96dB distortion was fairly low, in fact surprisingly so at low frequencies. Interestingly the picture did not change at the lower 86dB level where the result was about average.

Summary

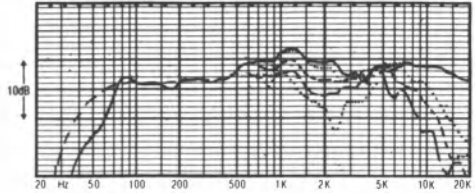
On the basis that the amplifier section of these active speakers is worth about £600, the actual speaker contribution (about £400) is what we have to consider.

While not entirely neutral, the M2 had many likeable qualities, and gave a 'big speaker performance' from a tidy attractive package, including the sturdy integral stand. Personal audition is recommended, preferably in your home, but with its sound quality rated in the 'good plus' category the M2 nonetheless achieves recommended status.

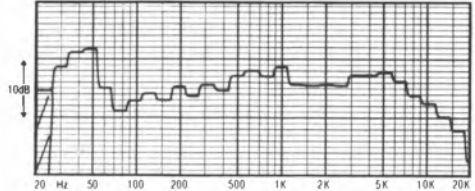
(Note: Meridian have announced some detail improvements to the electronics in this model, which now becomes the M2.2.)

GENERAL DATA

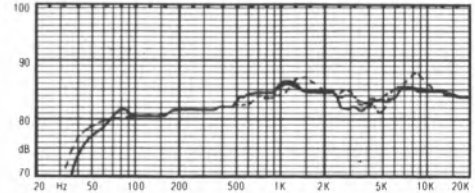
Size (height x width x depth).....50" x 18 x 38cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....active
 Recommended placement.....open space, on integral stand
 Frequency response, within ± 3 dB, at 2 metres60Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....45Hz
 Voltage sensitivity.....active, 1V for full power
 Approximate maximum sound level (pair) at 2 metres102dBA
 Impedance characteristic (ease of drive)active/balanced
 Forward response uniformity.....fairly good
 Typical price per pair, inc VAT.....including stands £1000
 *83cm including stand



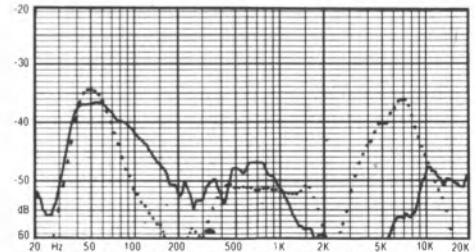
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



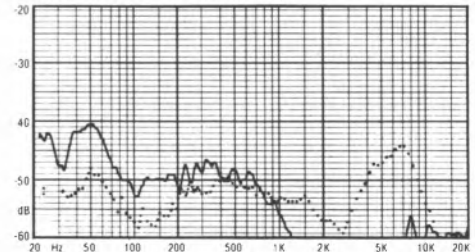
Averaged forward characteristic response in room at listening position.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Mission 70 II

Mission Electronics, Stonehill, Huntingdon PE18 6ED
Tel (0480 57477



Now officially in *Mark II* form, the 70 is Mission's least expensive speaker, but whose performance in several areas nonetheless threatens that of several of its larger brothers in the Mission range.

A two way miniature, the 70 has a sealed box volume of 13 litres, which loads the custom 170mm pulp cone bass mid unit. Both this and the tweeter are Danish, the latter comprising a 19mm polyamide dome, ferro-fluid damped and built by Vifa. The crossover is of good quality, 12dB/octave acoustic, and uses three electrical elements.

The cabinet is nicely finished in vinyl 'black ash', with a deep grille which is integral with the enclosure. In fact the cabinet comes apart as two shells, locked together by four capped screws at the rear. A fibre wad provides for the internal absorption, while electrical connection is made by sturdy 4mm socket/binding

posts. Overall construction quality is good.

Sound quality

While use on a shelf or bookcase is likely, this speaker actually gave a good account of itself on 42cm high stands, not too far from the rear wall. The mark was a strong 'average plus', great for the price.

There are however several criticisms, namely the sound could show some 'sibilance' and 'edge', with a mildly thin tonal balance, some boxiness and a rather dry bass.

Conversely it was favoured for its lively, 'quick' nature, revealing detail throughout the frequency range, and preserving the excitement of the performances. The bass was articulate and tuneful while the stereo focus was good, with a fair reproduction of the natural recorded acoustic around the performer.

Lab report

The axial reference response showed a smooth, slightly uptilted character, on spec at a sensitivity of 89dB/W. The bass -6dB point was a modest 84Hz which is average for the type, with a system resonance at 97Hz. Pair matching was very good, to within ± 0.5 dB, and at 1 metre the speaker met fine ± 2 dB limits from 95Hz to 17kHz.

Out at two metres the forward response family showed an exemplary set of forward responses. The variation over the 15° vertical axis from straight in front was minimal, and the blending was very good in the lateral plane. The forward yet uniform nature of this design was clear enough.

Working hard at 96dB, the speaker nevertheless showed well controlled distortion, generally less than 1%. Down at 86dB, still a fair level, the distortions had improved to the 0.4% level, with the low frequency range rather better than average. Compression measured an average 1.9dB while the bass-mid intermodulation was fine at -42dB.

At low frequencies the impedance dipped to just under 5 ohms, and a fair rating would be 6 ohms, although most amps should have no problems.

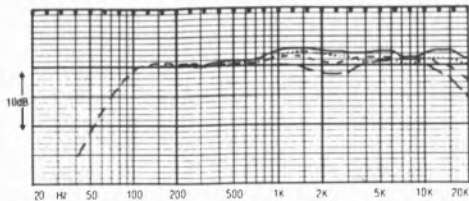
Computer averaged in the listening room, the 70 II response was less even than expected. The mid was clearly forward, (noted on audition) while the bass was rather shy, and the upper treble was a trifle exposed.

Summary

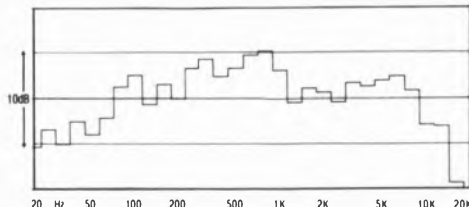
Despite the measured and auditioned tonal imbalance in the energy response, the panel liked the 70 for its lively, transparent quality, and here its subjective appeal served to outweigh its problems. The ratings suggest Best Buy status, but nonetheless, I still feel that it should be carefully auditioned before purchase.

GENERAL DATA

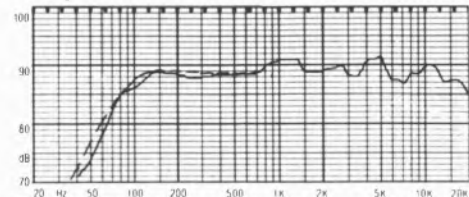
Size (height x width x depth).....35 x 21 x 21cm
 Recommended amplifier power per channel
 (for 96dBa per pair at 2 metres minimum).....(10)–100W
 Recommended placement.....on stands or shelf, near wall
 Frequency response, within ± 3 dB at 2 metres.....85-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....68Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....89dB/W
 Approximate maximum sound level (pair) at 2 metres...104dBa
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....very good
 Typical prices per pair, including VAT.....£100



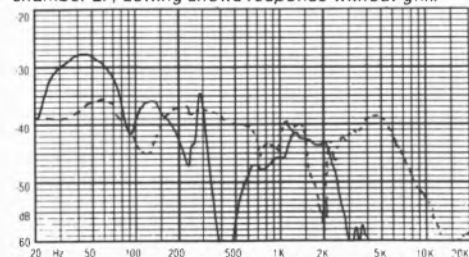
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



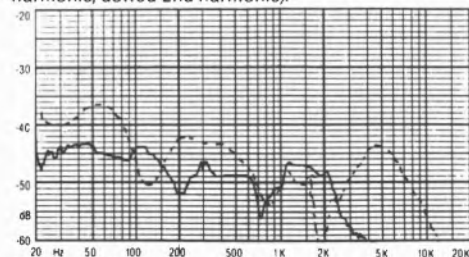
Averaged forward characteristic response in room



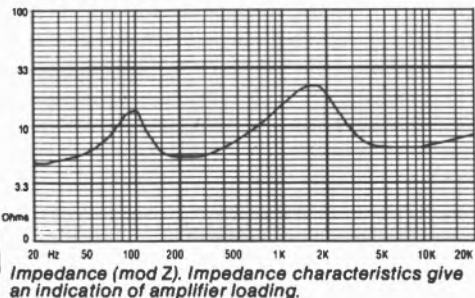
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Mission 737

Mission Electronics, Stonehill, Huntingdon, Cambs PE18 6ED
Tel (0480) 57477



An original 737 model was reviewed two issues ago, and was summarised in the last edition, but the current 737 is a new design, and so merits a complete review to itself.

Similar in superficial design and appearance to its predecessor, the main difference lies in the current use of the translucent coned polypropylene driver originally designed for Mission to use in the 770. It has itself undergone revision and is custom made for Mission by SEAS. The large voice coil provides fine power handling, while the 220mm frame is a magnesium die casting fitted with a generous magnet. The simple crossover employs three elements of modest quality, leading to the 19mm soft plastic dome tweeter, which is again custom made, this time by Vifa. Electrical connection is via 4mm socket binding posts.

The carcass is of chipboard with some flat block bracing, and is externally finished in vinyl.

The heavy front panel is made from 25mm MDF, finished in a silver grey hammer enamel. Reflex tuned by a multi-aperture port of 50mm effective diameter, the duct length is short at around 25mm, tuning the 25 litre enclosure to a damped 55Hz resonance. The cleverly-designed moulded grille frame has a low acoustic profile and fits nicely over the projecting driver baffle. As to location, stand mounting near to the rear wall is advised.

Sound quality

The panel were in good agreement on this one and gave it a fractionally above average mark. It did have some fine qualities, for example, a good level of detail and transparency was fighting to get out of the mix. It was generally articulate and sounded fairly smooth and well integrated.

On the debit side the low bass was muted while the general tonal balance was thin and forward, tending to excessive brightness in the treble. Coloration seemed well controlled, while stereo images failed to properly leave the plane set by the enclosure positions, and depth impressions were curtailed. On occasion it could sound a trifle loud and 'hard'.

Lab report

The reference 1 metre response showed a good characteristic up to 2kHz, attaining a nominal sensitivity of 89.5dB/W. An average low frequency cutoff of 58Hz, -6dB, was obtained.

The response rises gently up the range before reaching a peaky area in the mid treble. As the dotted line shows, the grille had more effect than expected. Having a good power capacity of 100W, good sound levels of 104dBA can be expected, while 10W was actually sufficient for satisfactory loudness.

At the 2 metres measuring distance with smoothing, the set of lateral off-axis curves were well integrated while the general trend confirmed the 'bright' tonal balance. At 15° above axis, the output notched at crossover, 3.5kHz, so the speaker should be placed so that the median vertical axis was directed at seated head height. A straight ahead position providing some lateral angling to the listener is probably ideal. From 70Hz to 20kHz, ±3dB limits were met.

At 96dB sound pressure level distortion was well controlled, averaging 0.3% above 300Hz and around 1.5% at low frequencies. Third harmonic was particularly good. At 86dB, the distortion results were excellent, confirming Mission's known interest in this particular parameter.

The impedance characteristic was generally very good, though it touched 5 ohms at 10kHz.

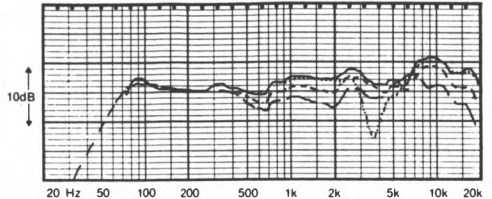
In room, the low bass rolloff noted on audition was evident, as was the smooth but 'lean' energy balance. Reference to other curves will show that the treble level was too high on this room averaged response.

Summary

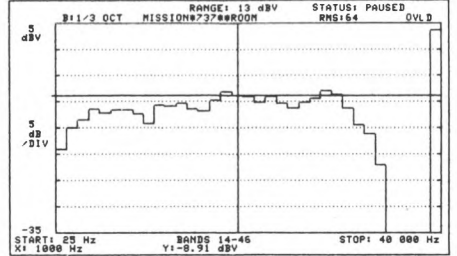
A lively and in some respects exciting design, suited to near-wall positioning, the 737 did not however really inspire the panel on blind listening tests. It is worth considering for those who favour a dry forward balance, with low distortion and it comes into its own when driven hard on rock material.

GENERAL DATA

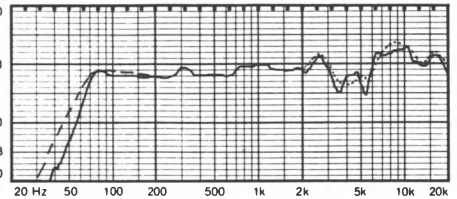
Size (height x width x depth).....54 x 23 x 27.5cm
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(10) – 100W
 Recommended placement.....On low stand, near wall
 Frequency response, within ± 3 dB, at 2 metres....70Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....58Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....89.5dB/W
 Approximate maximum sound level (pair) at 2 metres....104dBA
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....good +
 Typical price per pair, inc VAT.....£210



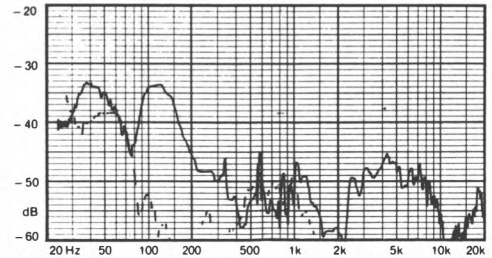
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



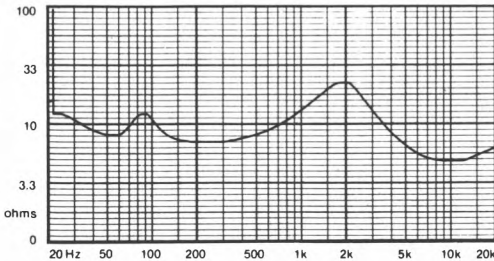
Averaged forward characteristic response in room.



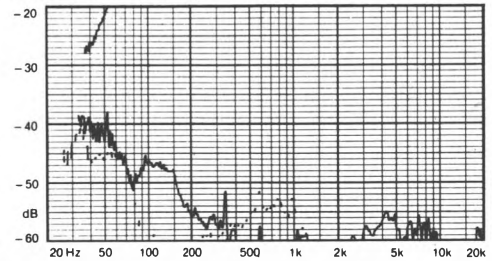
Reference sine wave response (1m on axis, 2.83V input shows sine sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Mission 770 Freedom

Mission Electronics, Stonehill, Huntingdon PE18 6ED
Tel (0480) 57477

RECOMMENDED



Latest in a long line of 770 models, the 'Freedom' uses newly designed drivers. The enclosure volume remains unchanged at 35 litres, bass reflex tuned by a moulded multi-aperture port of 55mm effective diameter and 23mm deep. The custom-built polypropylene bass driver is 210mm in diameter and has a hard centre cap, with a cone flare changing to straight-sided as the perimeter is approached. A die cast frame and generous magnet are used. The treble range is covered by a version of the SEAS 25mm polyamide soft dome which is ferro-fluid damped, and the crossover is a 12dB/octave design, with four good quality elements plus one resistor. The system is hard-wired with good quality cable, and 4mm cookot binding posts are fitted for rear connection.

Excellently finished in walnut veneer, the enclosure is well built, and fitted with a single large foam block for absorption, with bitumen

pads applied to control the panel resonances. 20mm thick medite is used for the front panel, and the grille has a low acoustic profile. The system is designed for use on matching low stands.

Sound quality

We tried the low stands with the speaker backed to the wall but felt the coloration was more severe in the lower midband. Good results were however obtained using our 42cm high stands when the 770 scored average in the auditioning. Mixed reactions were obtained; this speaker appears to have a distinctive character which can appeal. It sounds highly transparent, crisp and clear, revealing much detail and the natural acoustic of recordings, and brings the performers closer to the listeners.

Bass was dry, with the midrange somewhat forward, which produced for example, a 'clangy' piano sound. Treble was just average. Tonally, it was a bit small and 'thin' sounding and when driven really hard above 200W, the sound was 'abrasive' suggestive of crossover saturation. However, at decent levels it suited rock programmes very well, with a punchy beat and as one panelist put it, 'plenty of go'.

Lab report

The axial reference response showed a high 91dB/W sensitivity with a slightly restricted bass, reading -6dB at 55Hz. The grille has little effect, which was good, while the pair matching was also good, at within ± 0.75 dB.

Out at 2 metres the forward response family further helped to classify the output. Here ± 2 dB limits sufficed for a 70Hz to 20kHz frequency range, while the drivers seemed well integrated, with consistent off-axis responses. Both axial traces did indicate an upper mid plateau, 600Hz to 1.6kHz, and the overall balance was a touch 'forward'. Driven to 96dB sound pressure level, third harmonic distortion was excellent while second remained satisfactory — up to 1% at 35Hz and 300Hz, 3% at 100Hz. At 86dB third was even better while second harmonic evened out at a good level. A moderate 1.5dB of compression was recorded with -40dB intermodulation.

In the listening room, the computer analyser confirmed the panel results — for example, the 'dry' bass, the projected 'forward' upper and mid and the 'exposed' but not excessive treble. In absolute terms the room balance was not

too bad.

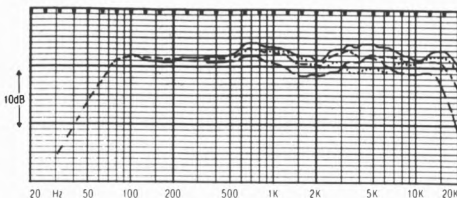
Dipping below 6 ohms in the treble range, the speaker in other respects averaged an 8 ohm impedance, and should not present any load problems to an amplifier. Its 150W power handling means that a pair of 770s will produce upwards of 107dB in a room and they will probably actually sound louder than that!

Summary

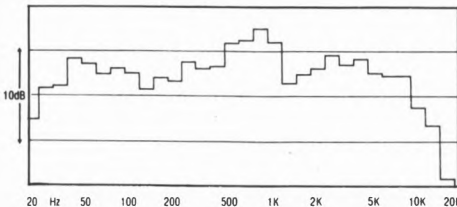
The 770 has its own virtues — dynamic impact, an up-front clarity, and an ability to be used close to the wall. Good engineering plus a fairly good panel rating also apply here. It manages a recommendation with the qualification that it should be carefully auditioned to ensure that it is the 'right one' for you and your system; classical music enthusiasts are likely to favour the 770 less than rock specialists

GENERAL DATA

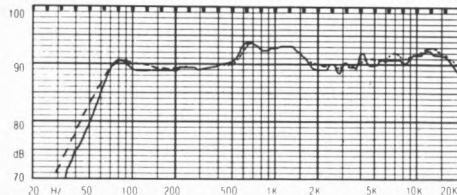
Size (height x width x depth).....61 x 27 x 30cm
 Recommended amplifier power per channel
 (for 96dBa per pair at 2 metres minimum).....(10)—150W
 Recommended placement.....on high stands
 Frequency response, within ± 3 dB at 2 metres.....60Hz—20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....55Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....91dB/W
 Approximate maximum sound level (pair) at 2 metres....107dBa
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....very good
 Typical price per pair, including VAT.....£380



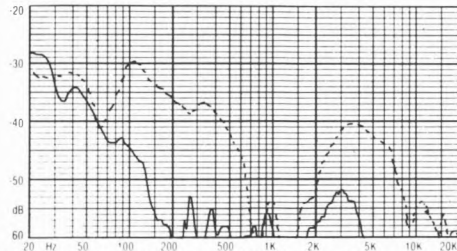
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



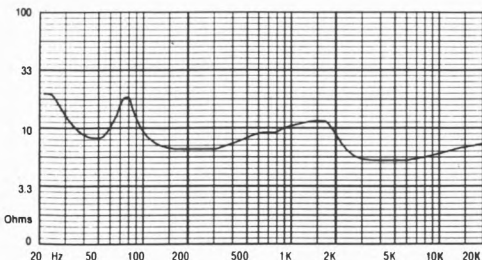
Averaged forward characteristic response in room



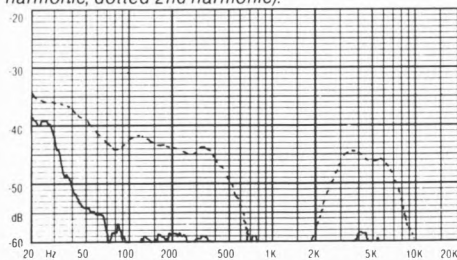
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Monitor Audio R100

Monitor Audio Ltd, 34 Clifton Road, Cambridge CB1 4ZU
Tel (0223) 242878



Monitor's *R100* could be regarded as a smaller version of the *R252*. It is very compact, with an internal volume of 11 litres, and stand or shelf mounting is envisaged. The review samples used a chipboard box, with a real veneer exterior. Internally the sealed volume has a foam absorption pad, while side panel resonances are moderated by thin braces in the vertical axis. The grille baffle is partially rebated to help reduce its acoustic profile.

The 210mm pressed steel framed mid bass unit has a light flared pulp cone which tunes to a high 100Hz system resonance. Treble frequencies are allocated to a 19mm soft plastic dome tweeter, the dividing crossover essentially to 12dB/octave acoustic slopes, using three reactive elements. Good quality components are used and the drivers are hard wired using Monitor Audio cable. Rear connection to the amplifier is via 4mm socket/binding posts.

Sound quality

Scoring a little below average, the *R100* performed satisfactorily at its rather below average price.

Some boxiness and cone coloration was noted but this seemed quite well controlled. Tonally it was quite neutral, while low bass was rather muted. Generally the sound was fairly detailed and articulate with firm upper bass and a crisp if slightly hardened mid range.

Stereo focusing was good over the frontal plane, but depth and ambience effects were weakly reproduced; at times, its 'small box' character was identified by the panel. The power handling was good for the price, with no audible break-up noted on test.

Lab results

At 1 metre, the reference sensitivity was set at 87.5dB/W, an average value. Despite the rebate the grille still exerted a significant effect on the response as the graph showed, (dotted line grille off). Intrinsically close amplitude tolerance limits were met. The -6dB low frequency point was fairly high at 70Hz.

With a nominal 75W power handling, sound levels of up to 103dBA will be possible from a stereo pair while amplifier ratings of down to 15W/channel will give a good basic figure of 96dBA in room.

Out at 2 metres, the general character may be seen, this slightly lumpy but essentially well balanced. Some sensitivity to vertical axis was shown by the dotted line but taken overall, the off-axis responses were very good.

Good results were also obtained for distortion at 96dB averaging 0.3% mid band and a moderate 1% at lower frequencies. Third harmonic was well controlled. By 86dB the reduced input power provided still better results and here the distortion level was classed as very good.

The average impedance was close to 10 ohms and never fell below 6.5 ohms, and thus this speaker was classed as a very good amplifier load.

Computer averaged in the listening room, this speaker's projected power was not very even, with the low bass rather restricted. Although the upper bass balanced with mid range, both were somewhat isolated. Likewise, an energy gap was present between the mid and treble.

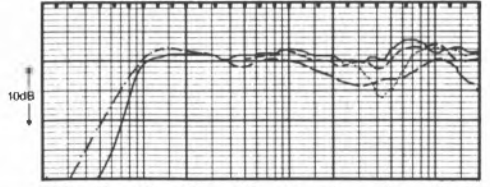
Summary

This presentable, compact system was well finished and basically well built. It also offered low distortion and a reasonable tonal balance, but despite this it remained uneven. Low bass was

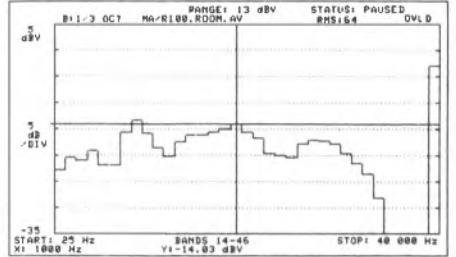
rather deficient. The panel felt it was quite satisfactory although not a front runner, but given the modest price, this system might specifically suit some systems and rooms and can be recommended.

GENERAL DATA

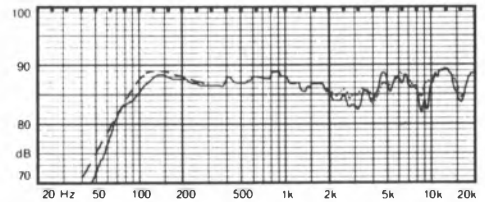
Size (height x width x depth).....40.5 x 25 x 21cm
 Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres).....(15) - 75W
 Recommended placement.....on stands, free space
 Frequency response, within ± 3 dB, at 2 metres.....75Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....70Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....87.5dB/W
 Approximate maximum sound level (pair) at 2 metres.....103dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£110



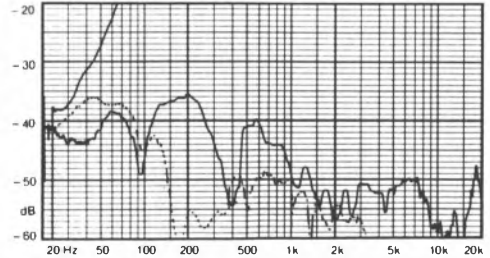
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



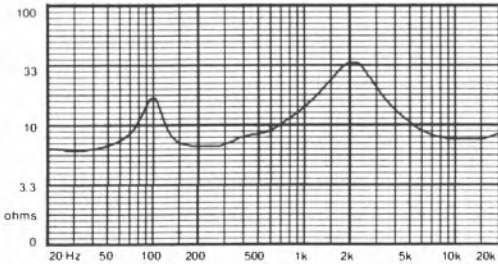
Averaged forward characteristic response in room.



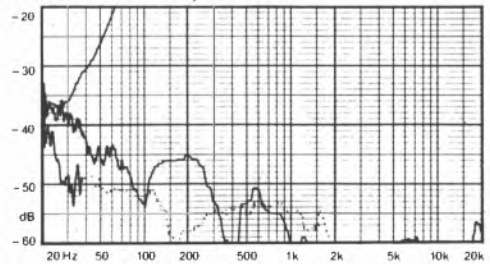
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

RECOMMENDED

Monitor Audio R252

Monitor Audio Ltd, 34 Clifton Road, Cambridge
Tel (0223) 242898



The R252 is an inexpensive, two-way sealed box speaker of 17 litres internal volume, employing a 200mm steel-framed pulp cone bass/midrange driver plus a 19mm soft plastic dome tweeter. It is hard-wired internally including the high-power capacity, good-quality crossover network.

During the course of the 1984 test the bass unit was fitted with an improved chassis which significantly altered the subjective performance, and while these effects have been accounted for on audition, the measurements relate to the unmodified unit, which was otherwise pretty similar.

Unusually for this price level, the solid enclosure is finished in real wood veneer to a high standard, the panels built of 12 and 15mm board. The grille is a low profile component, made from fully-rebated plywood.

No box panel damping is used, but the interior has been lined with acoustic foam to

suppress internal resonances, while electrical connection is by means of 4mm socket binding posts.

Sound quality

Initially the R252 sounded rather below average on audition, appearing aggressively forward as well as brash. However with the bass/mid unit revision, a significant improvement occurred in tonal balance as well as general character, which was sufficient to move it up to an average score, this good for the price.

Some colorations did remain, notably a residual upper mid-hardness, some lower-mid boxiness and a rather dry character to the sound. Low bass was rather curtailed, though upper bass was quite detailed, and the treble was also much better than before, due to the improved balance. However the treble was still felt to be mildly rough and forward.

Stereo images were quite well focused with moderate depth and quite clear spatial effects, and the speaker also showed a good level of instrumental detail

Lab results

Sensitivity was 89dB/W which was well above average, and in conjunction with a 10 to 75W power range, sound levels of up to 102dBA were possible. Pair matching was very good, while the bass register was very uniform and well damped, measuring 62Hz, -6dB, but rolling off quickly below this point. Note that this and other measurements here are for the unmodified speaker.

At 2metres the axial response was fairly smooth meeting ± 3 dB limits from 80Hz to 30kHz, and dispersion was excellent in the lateral, plane. However 15° above-axis a noticeable 4kHz notch appeared and we recommend using this speaker directed at ear level. In fact Monitor Audio's matching stands are designed for exactly that purpose. The forward responses were good for the type.

Room-integrated response evidenced the 'dry' nature of this speaker, with a fairly extended but shallow bass plus a slightly prominent midrange. Overall however the effect was pretty smooth.

Distortion at 96dB sound level was moderate at around 1% second and third harmonic even at low frequencies, while higher in the range third harmonic was particularly good. Further improvement was apparent at an 86dB level, with an average of 0.3% recorded here.

Bar a mild dip to 5.5ohms at 10kHz, the

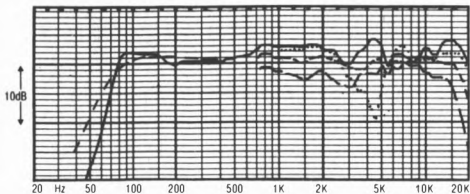
impedance was well behaved over the range, and the R252 was classed as a good amplifier load.

Summary

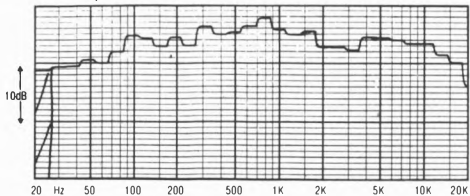
This powerful two-way design is well constructed for the price. Reviewed in its original form a couple of issues back, it comfortably won a recommendation, with low distortion, high sensitivity and a good rating for sound quality. Some minor changes noted in the samples supplied for the 1984 edition were viewed less favourably, the main points of criticism being a hard and bright quality, with insufficient output in the bass. However, a new version was auditioned for the 1985 edition; this has improvements to the cabinet and to the tonal balance. The sound quality now shows less 'boxiness' and a smoother overall effect, and this model can now be recommended once again.

GENERAL DATA

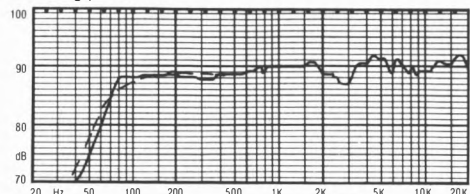
Size (height x width x depth).....	47 x 25 x 24cm
Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....	(10)—75W
Recommended placement	
Frequency response, within ± 3 dB, at 2 metres	80Hz to 20kHz
Low frequency rolloff (-6 dB point) at 1 metre.....	62Hz
Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....	89dB
Approximate maximum sound level (pair) at 2 metres	102dBA
Impedance characteristic (ease of drive)	good
Forward response uniformity.....	good
Typical price per pair, inc VAT	wood veneer, £115 R252, vinyl finish, £130



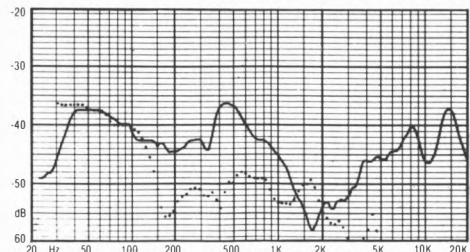
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



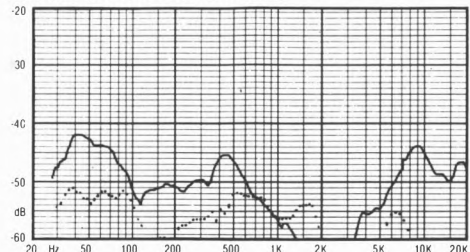
Averaged forward characteristic response in room at listening position.



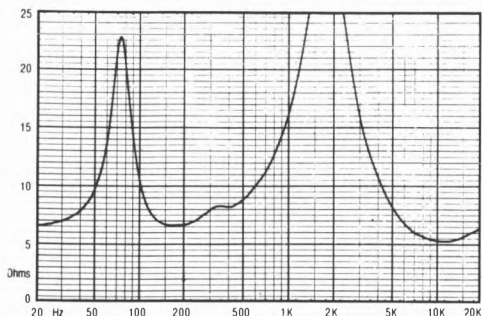
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

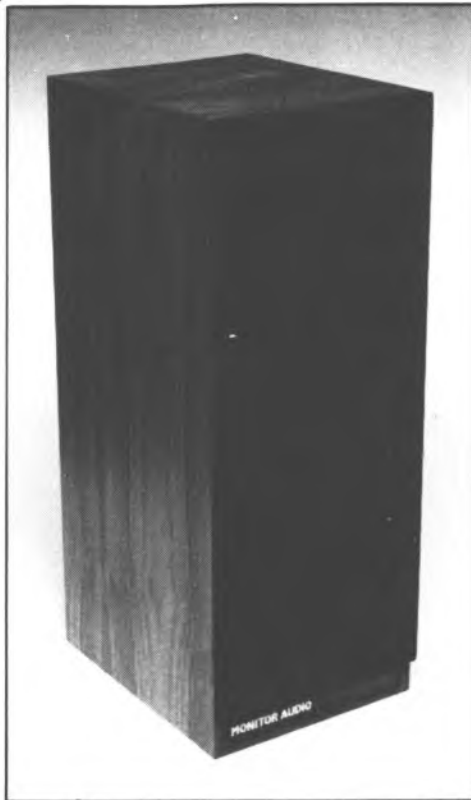


Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Monitor Audio R352

Monitor Audio Ltd, 34 Clifton Road, Cambridge
Tel (0223) 242898

RECOMMENDED



This speaker is larger than usual for its price range and consists of an excellently-veneered 36litre enclosure that has been rigidly constructed from 18mm-thick heavy chipboard. Internal bracing has been used to raise the frequency and also to moderate the amplitude of the panel resonances. A fine rebated grille is also fitted. Foam absorbent blocks line the interior, and the system is bass-reflex tuned to 50Hz by a realistically-dimensioned tunnel port.

The interestingly-designed 200mm flared pulp cone bass unit uses a special magnet system which provides a better flux distribution at the pole tip, while the controlled local pole saturation should also reduce second harmonic distortion due to improved motor coil flux modulation.

A 20mm soft plastic dome tweeter (not ferro fluid damped) completes the lineup and this crosses over at around 3kHz. A high-power hard-

wired crossover is fitted showing heavy duty wiring, and 4mm socket/binding posts for rear connection. Both this model and the companion 252 come with very helpful and well written instruction manuals.

Sound quality

The 352 scored well up the field, achieving a good overall rating which was impressive for its price category. It was liked for its well controlled, smooth and yet lively character, the bass appearing articulate but gutsy and demonstrating reasonable extension. The mid sounded clear and showed less boxiness than usual while the slightly bright treble was even and well detailed.

Stereo effects were sharply focused, with presentable depth effects where appropriate, and the speaker also proved itself capable of revealing the different ambience and acoustics present on a variety of recordings.

Rock programme was reproduced with a lively, tuneful beat and some panelists remarked that the sound 'grew on them' as the tests proceeded.

A slight muddiness and graininess was however present in the reproduction, as well as a touch of fundamental bass overhang, but none of these effects were at all serious.

Lab results

Pair matching was good, as judged by the 1metre responses. A narrow notch was present at 5kHz but did not appear to affect the results, and overall the response was pretty flat with a well tuned bass extending to 50Hz, -6dB, which is average for the type but with a well damped and slow rolloff. Sensitivity was high at 90dB/W, providing good levels from as little as 10W and a rather loud 105dBA from the 100W per channel maximum input power. Grille effects were negligible.

At 2metres the lateral off-axis responses were fine but the speaker was clearly a mite critical in the vertical plane. Dips were recorded at and 15° above and below so accurate beaming to the listener would be important with this model. ± 3 dB limits comfortably held a 50Hz to 15kHz range.

Room averaged, the speaker's fine overall balance could be appreciated. The bass was uniform to 45Hz and well integrated while the treble showed a correct and gentle rolloff towards the extreme frequencies.

At the 96dB sound level distortion was quite low, particularly above 500Hz, and at 86dB the

results were especially good, averaging 01.%! (!) over most of the range for both second and third harmonic.

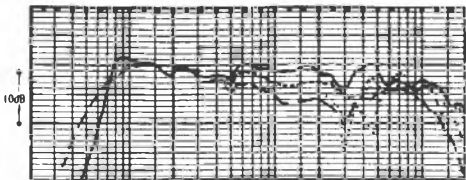
Impedance averaged 12ohms and possessed no injurious low levels at any frequency, so the 352 should be particularly easy to drive, and as such presents a 'kind' amplifier load.

Summary

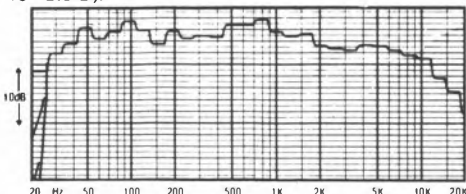
This well-finished and constructed speaker provides a sound quality and engineering performance that only a few years ago was expected of models costing twice as much. It is sensitive, low in distortion, accurate in balance and predominantly faithful to the programme fed it, and it will also provide good stereo effects. It is tonally well balanced and can provide high sound levels, being easy to drive and capable of extracting the most from any decent amplifier. Reauditioned in 1985, the '352 continues to set a decent standard. The competition is increasing but this model manages to hold a comfortable recommendation for the life of this issue.

GENERAL DATA

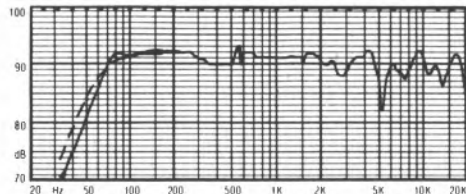
Size (height x width x depth).....64 x 25 x 32cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(10)—100W
 Recommended placement.....stands (Monitor Audio optional)
 Frequency response, within ± 3 dB, at 2 metres55Hz to 15kHz
 Low frequency rolloff (-6 dB point) at 1 metre.....50Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....90dB
 Approximate maximum sound level (pair) at 2 metres.....105dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....average
 Typical price per pair, including VAT.....£200



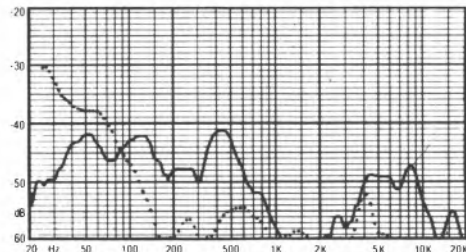
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



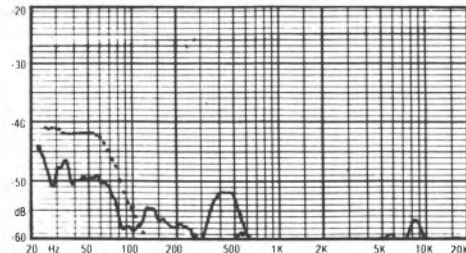
Averaged forward characteristic response in room at listening position.



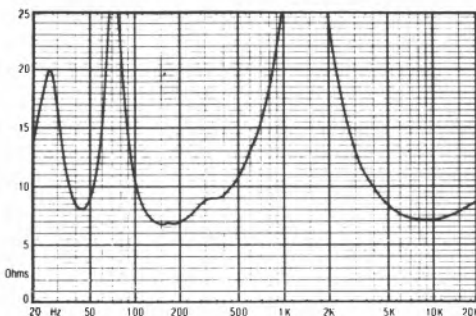
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Monitor Audio R552

Monitor Audio Ltd, 34 Clifton Road, Cambridge CB1 4ZW
Tel (0223) 42898



A model of particularly striking appearance, the Monitor Audio 552 speaker comes with matching stands, the whole assembly, stands included, finished in one of several high quality veneers, including the best Rosewood. In detail terms, this exterior finish could be worth as much as 25% of the final cost, and this should be borne in mind when considering this speaker; certainly the appearance can be spectacular with some veneer choices.

The 552 is a compact two way sealed box of 25 litres internal volume. Bass and midrange are handled by a Cobex-coned 175mm driver with a custom cast chassis. Treble is allocated to the usual 25mm polyamide SEAS tweeter, and the crossover operates at around 5kHz, using four main elements plus three resistors, although it is of normal commercial quality. Internal construction was good, with bracing and bitumen pad damping while the units are

hardwired with 'sound cable'. Electrical connection is by means of 4mm sockets.

Sound quality

The panel found this speaker to be a disappointment. It scored well below average which does not begin to justify the price, despite the fine finish. The panelists were aware of a general tendency to thinness in the tonal balance, with a bright, 'obvious' treble. Bass seemed too dry and restrained, lacking extension, and overall it sounded rather 'small', failing to convey the space and atmosphere of much programme. However, in stereo terms it did focus fairly well, and the coloration level was evidently fairly low; however this was not sufficient to redeem it in the ears of the panel.

The 552 coped well when driven hard, and survived 200W peak programme despite the relatively small bass driver size. At high levels, increasing hardness became apparent in the upper midrange.

Lab report

This speaker demonstrated an average sensitivity of 86dB/W and in conjunction with a 150W power handling, a stereo pair could provide up to 103dB in a listening room.

The axial response was quite uniform; indeed ± 2.5 dB limits were sufficient for an 85Hz to 20kHz response though the treble was a bit lumpy. The bass however rolled off early, with -6 dB at 65Hz, which is rather high for a speaker in this price category. The grille was seen to have little effect on the response.

At 2 metres, the treble had smoothed out and the family of off-axis responses suggested a well integrated output from the two drivers. The 30° off axis curve was one of the best in the issue, so these speakers could be left in a neat 'straight head' position. The 'lightweight' quality was seen in the overdamped bass, rolling away from 150Hz.

For a speaker of this average sensitivity, the 96dB distortion results were very creditable, even at low frequencies. At 86dB spl, third harmonic improved markedly to a 'good' level, and while it was poorer than average on compression, measuring 2.2dB, the inter-modulation was rather better at -44 dB.

Edging a fraction below 6 ohms in the treble, this speaker was otherwise easy to drive and would qualify as a straightforward 8 ohm load, uncritical of amplifier choice.

As with the similar 152, the room response proved most revealing. While some extreme bass was evident the main bass range was surprisingly deficient, leaving the midrange exposed and 'forward'. From then on, however, the output was pretty good. In design terms, I would say that the sensitivity target was too high, and that a smaller magnet, providing a realignment to 84dBW, would possibly be the trick — unHINGING the bass and bring the rest into balance.

Summary

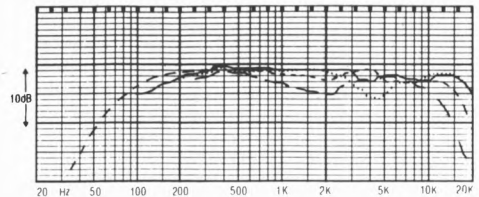
Despite considerations of excellent finish, good build quality and the inclusion of stands in the price, in *HFC* sound quality comes first. The panel clearly heard faults, which were also revealed in the computer averaged room response, and consequently the scores were insufficient for recommendation.

(Note: Just before we went to press, and too late for full test, we were able to audition a revised 552, which showed worthwhile improvements in bass and midrange performance. Accordingly, the 552 must now be rated as very much worth considering.)

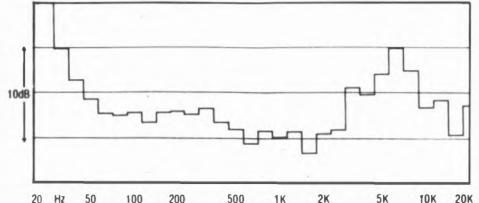
GENERAL DATA

Size (height x width x depth).....51 x 20 x 28cm
 Recommended amplifier power per channel
 (for 96dB/A per pair at 2 metres minimum).....(15)—150W
 Recommended placement.....on stands supplied
 Frequency response, within ± 3 dB at 2 metres.....80Hz-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....65Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....86dB/W
 Approximate maximum sound level (pair) at 2 metres....103dB/A
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....good
 Typical price per pair, including VAT.....£350

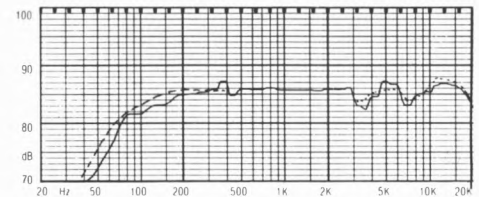
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



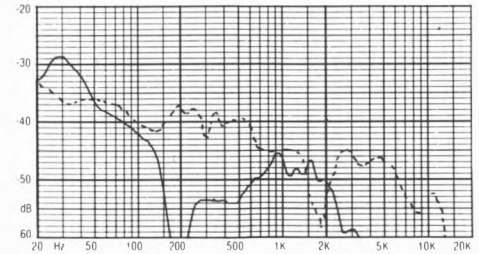
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



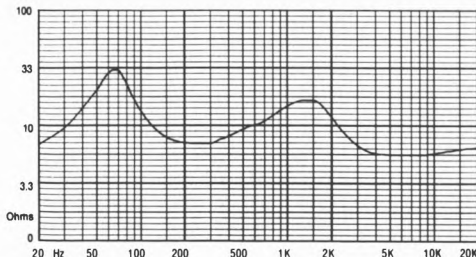
Averaged forward characteristic response in room



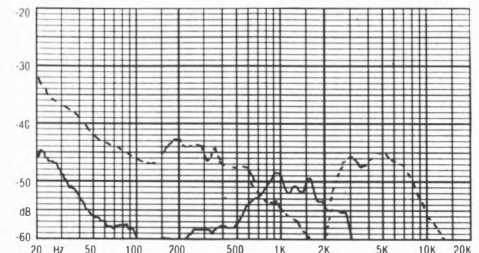
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Mordaunt Short MS10

Mordaunt Short Ltd, Durford Mill, Petersfield, Hants GU31 5AZ
Tel (0730) 80721



Rising costs are now weighing heavily on the shoulders of the quality system producers, who have been compelled to seek unusual solutions to the problems of producing speakers at the £80 a pair level. Here Mordaunt Short have made use of a small bass/mid driver with a cone just 90mm across, with a pressed steel frame to support it. This two way system is completed by a 19mm plastic cone/dome tweeter, both units manufactured by Audax.

The diminutive enclosure has a 5.2 litre internal volume, reflex tuned to a high 68Hz by a 30mm diameter tuned port, 65cm long, located on the rear panel. Built in plain chipboard the cabinet was well finished in 'black ash' vinyl, but the grille baffle was unrebrated, with an acoustically poor profile.

A three-element crossover network aims at nominal 12dB/octave acoustic slopes, with push-on tags used for the internal wiring. 'Positac' pro-

tection against overload is included, a most uncommon and welcome feature at this price level. Electrical connection to the amplifier is made via 4mm socket/binding posts.

Sound quality

The panel were very consistent in their judgments scoring the *MS10* below average but not seriously so, and in fact this is a commendable result given the group context.

On 'blind' testing, it was identified as a small box, and its weak bass and thin forward character were noted, particularly a blend of metallic brashness in the upper midrange. Some boxiness was also evident. On the other hand, it did have some appealing qualities — stereo focusing was particularly good and its sound was detailed as well as subjectively transparent. It also managed to convey some measure of the recorded acoustic.

Lab report

Measured on axis at 1 metre, sensitivity was below average at 85dB, though this is good for the size. An amplifier range of 20 to 50W was appropriate, giving a maximum sound level of 98dB, sufficient for all but 'disco' domestic use. Set against the reference sensitivity, the low frequency rolloff was high at 80Hz, -6dB. Conversely, the impedance characteristic was excellent, not falling below 8.5 ohms and rated as a very easy amplifier load.

The reference response was encouragingly uniform, and with the grille removed 100Hz to 20kHz limits (± 3 dB) were easily met, though the trend shown at 2 metres suggested some brightness as well as a shyness in the bass. Bar a small notch in the vertical axis, the forward response set looked very tidy and the drive units can be seen to integrate well.

Driven to 96dB sound level, the speaker was working near the practical limit with distortion rising to 4% at 300Hz. At higher frequencies it was more satisfactory; a useful reduction in distortion occurred at the lower 86dB sound level with the overall result averaging 0.4%, though this was still higher than usual. Conversely, the figures at low frequencies were quite good for such a small box.

In the listening room the *MS10* provided a relatively uniform mid/treble response, but the bass was lumpy at 50Hz and lacked extension, as well as being rather deficient. A thin tonal quality was only to be expected from this.

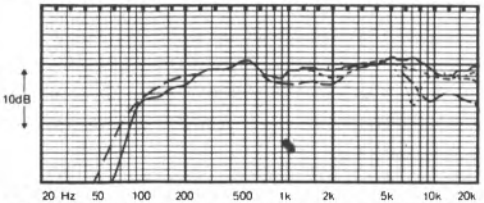
Summary

Well worth considering, this miniature would

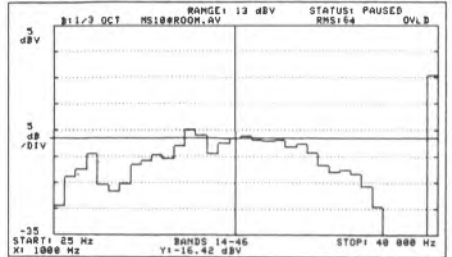
perform well in a bookcase location with a system fitted with a sweet-sound cartridge. It produced a lightweight sound, but this was redeemed by the low levels of subjective coloration as well as the fine clarity. The treble was also better than average for its class.

GENERAL DATA

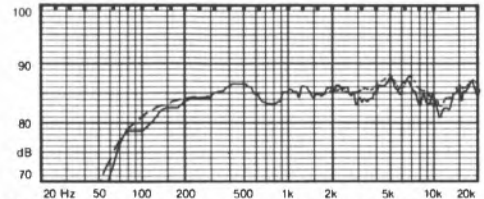
Size (height x width x depth).....28.5 x 19.5 x 17.8cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(20) -50W
 Recommended placement.....wall or shelf
 Frequency response, within ± 3 dB, at 2 metres..100Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....80Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....85dB/W
 Approximate maximum sound level (pair) at 2 metres.....99dB
 Impedance characteristic (ease of drive).....excellent
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£80



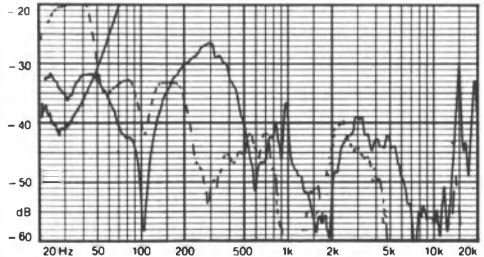
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



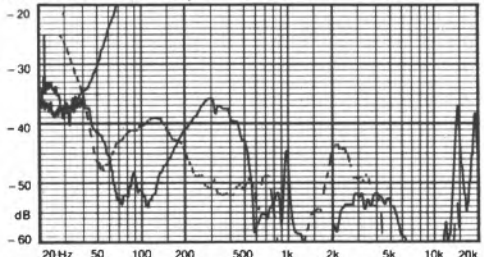
Averaged forward characteristic response in room.



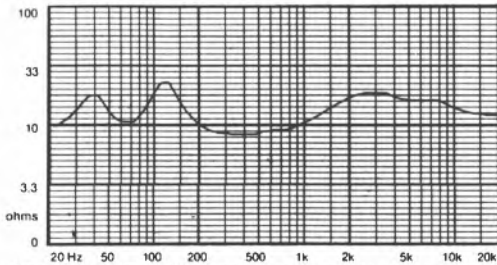
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

BEST BUY

Mordaunt-Short MS20

Mordaunt Short Ltd, Durford Mill, Petersfield, Hants GU31 5AZ
Tel (0730) 80721



When launched a couple of years ago, the *MS20* could possibly be regarded as an economy version of the *Carnival* — with its vinyl-wrap cabinet, it offers a substantial cost saving. Fortunately for the consumer, things do not always turn out exactly as the manufacturer intends, and this is just one of those instances of an 'economy' model where the end result turns out to be embarrassingly good!

A slim, two-way 14litre box enclosure, the *MS20* is well finished in a convincing black ash vinyl with an unrebated grille, which as the tests show is best discarded.

Bass is provided by the wide-range Mordaunt Short doped pulp-cone 200mm driver, complemented by a diminutive plastic-dome Audax tweeter, the latter ferro-fluid cooled.

Working at around 3.5kHz, the crossover uses five medium power components and rear connection is by means of plain 4mm sockets. The

enclosure is made of 15mm rigid chipboard, with a volume filling of polyester wadding. While it probably will work best on open stands, the *MS20* will also survive shelf mounting if such a location is deemed essential.

Sound quality

Rated at the upper end of the 'good' category, the *MS20* sound is quite exceptional at the price. When re-entered several times in the 'blind' listening tests, as one of the 'repeat' references, its performance was judged consistently good.

Bass, although of moderate depth was felt to be well balanced, tight and tuneful, while the midrange was relatively uncolored, detailed and possessed of good transient definition. The treble was slightly recessed, but pleasantly so, with only mild fizziness and sibilance in evidence. The lower-mid did however show some moderate boxiness.

The overall effect was tidy and civilised with good control over the whole frequency range. Stereo images were well focused and revealing of recording acoustics, possessing fine depth and fairly good transparency was also evident, these results fine at the price.

Lab results

Marginally above-average, the sensitivity measured 87dB/W and with a 15 to 75W amp power range, up to 102dBA could be obtained from a pair. The bass rolloff was typical at 55Hz, -6dB, while pair matching was fine. As can be seen from the dotted response on the one metre measurement, the output was rather smoother with the grille detached, this also confirmed by the listening tests.

At 2metres a mild mid plateau was evident but otherwise the output was quite uniform on all measured axes. At 15° above-axis a mild dip was evident, suggesting that the speaker should not be positioned below the listener's head level. Conversely the 30° off-axis lateral position looked to provide a fine result, and, so the speakers do not need to directly face the listener in the lateral plane.

At 96dB distortions were about average, at typically 2% second harmonic and 0.8% third, with a worthwhile improvement at 86dB spl. The tweeter showed a distinct distortion peak at 20kHz, but this was not considered too important.

With the impedance close to the 8ohm standard, the *MS20* was classed as a very good amplifier load, and so can make the most of its

available sensitivity.

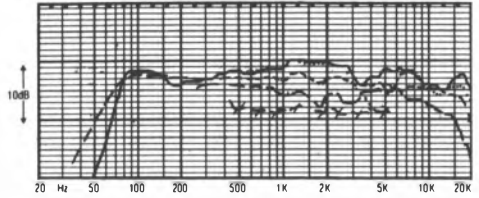
The integrated room response was most revealing, showing the midrange forwardness, plus a surprisingly extended, slightly 'shy' bass as well as a treble which uniformly decayed with the right curvature.

Summary

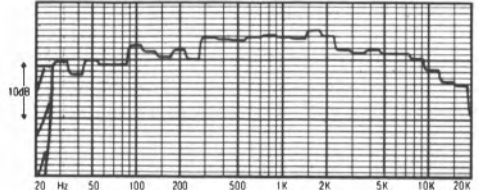
This speaker produced a remarkably good performance for the price. Slightly upper-mid forward, in all other respects it offers a finely-balanced array of subjective and objective qualities, which made Best Buy classification mandatory. Subsequent experiments with the MS20 have shown that if well positioned it can do justice to very costly ancilliary equipment. Re-auditioned for this issue, comments from the panel were much as before and the 'Best Buy' rating still well justified.

GENERAL DATA

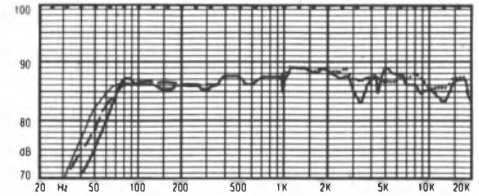
Size (height x width x depth).....42 x 25 x 20cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(15)—75W
 Recommended placementopen stands or shelf
 Frequency response, within ± 3 dB, at 2 metres65Hz to 20kHz
 Low frequency rolloff (- 6dB point) at 1 metre.....55Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into Bohms at 1 metre).....87dB
 Approximate maximum sound level (pair) at 2 metres102dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformly.....good
 Typical price per pair, inc VAT.....£110



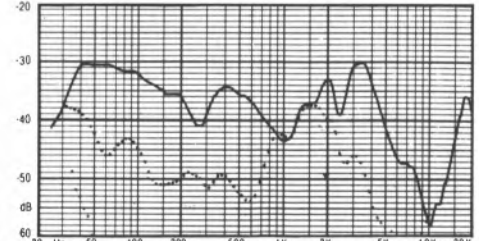
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



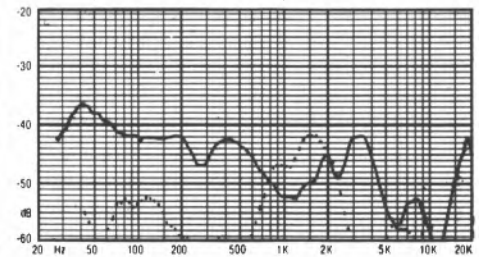
Averaged forward characteristic response in room at listening position.



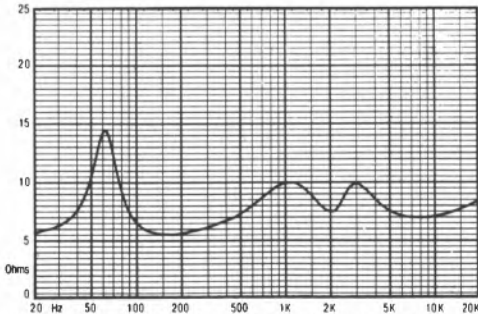
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Mordaunt Short MS100

Mordaunt Short Ltd, Durford Mill, Petersfield, Hants GU31 5AZ
Tel (0730) 80721



The *MS100* is a new design from Mordaunt Short, and is an upmarket miniature in real wood veneer. The finish is excellent and the box rigidly constructed, but the grille baffle is a thick unrebated structure, which, as M-S themselves admit, is best detached for serious listening. The speaker can be supplied with optional matching stands, which bolt securely to the underside, and optimum placement is said to be close to the rear wall of a room.

This speaker is unusual in its use of a custom-made 170mm frame size bass unit using a 120mm rigid pulp cone, which is designed to operate without a crossover network. In this sense most of the speaker's working range, in fact everything up to 5kHz, is fed direct and unobstructed to the bass/mid unit. A simple crossover network allocates a sensible proportion of the remaining 1½ octaves to the 19mm plastic cone/dome tweeter, this a popular Audax model.

Damped by a dense fibre filling, the sealed box volume of 8½ litres tunes the system resonance to 75Hz. Positec overload protection is fitted, this is a self resetting system using special positive temperature coefficient links which translate from a very low to a high resistance once a continuous averaged current is exceeded. Fast transients are unimpaired.

Sound quality

In the past I have favoured the use of a small passive equaliser with this system to help correct a degree of forwardness in the mid range. Conversely other listeners both here and in their own homes, have decided to leave it 'untouched'.

In this unaltered state the *MS100* performed quite well on the subjective tests.

The mid was clearly prominent with some associated 'shout' but it proved possible to adjust to this provided that it was not played too loud. It offered in return a high level of transparency and detail throughout the frequency range, an aspect which, despite its near-to-wall location, gave considerable depth to the stereo image, while recorded ambience was also read well. The overall balance was tidy, with fair bass extension and low coloration (mid area excepted here) while stereo images were well focused.

Lab report

At 1 metre under anechoic conditions, the reference response showed a well damped low frequency range while the output gently climbed to 800Hz. Above this range the output was uniform, levelling out at 88dB/W, an average sensitivity. The -6dB low frequency point was at 80Hz but the rolloff rate was desirably shallow.

Out at 2 metres, the forward response family confirmed the broad mid forwardness, and showed excellent responses laterally off axis. In the vertical plane the loss at '15° above' was more serious than usual suggesting the use of fairly high stands, which indeed M-S can supply.

At 96dB sound level, the distortion was about average at 1% second harmonic, and rather less third harmonic. By 86dB both had settled at the 0.3% level over most of the range except above 14kHz where some minor high frequency resonances disturbed the results.

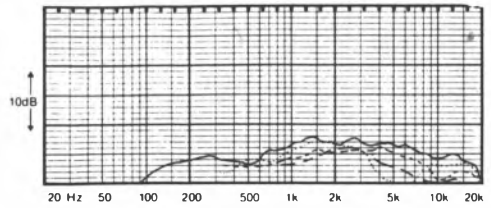
The suggested amplifier power range is 15 to 50 watts, the latter providing reasonable sound levels of up to 100dBA for a stereo pair in a typical room. The *MS100* was rated as an easy amplifier load with a non-reactive trend and an average impedance value.

Summary

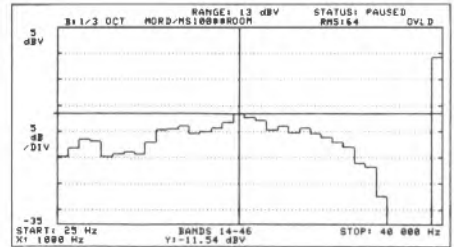
The 'official' rating based on the test results would indicate a 'worth considering' verdict but I feel that its particular strengths in terms of immediacy, plus stereo focus and depth, all outweigh its tonal balance weakness. While I must suggest a careful audition prior to purchase, I do feel that this well made speaker deserves a recommendation.

GENERAL DATA

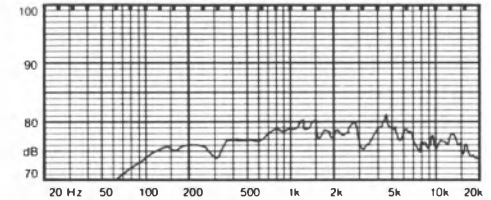
Size (height x width x depth).....32.5 x 22.5 x 21.5cm
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(15) -50W
 Recommended placement.....on stand near wall
 Frequency response, within ± 3 dB, at 2 metres.....95Hz to 18kHz
 Low frequency rolloff (-6dB point) at 1 metre.....80Hz
 Voltage sensitivity (ref. 2.83V, or 1W Into 8ohms at 1 metre).....88dB/W
 Approximate maximum sound level (pair) at 2 metres...100dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....very good
 Typical price per pair, Inc VAT.....£185



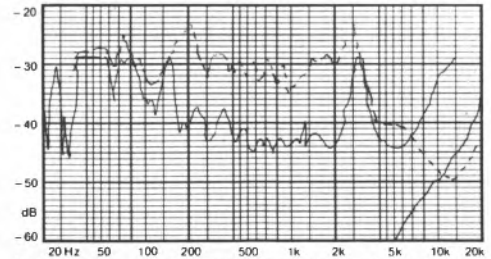
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



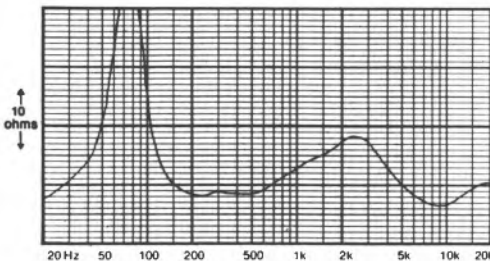
Averaged forward characteristic response in room.



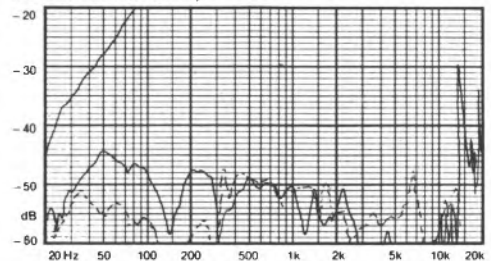
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Mordaunt-Short MS40

Mordaunt Short Ltd, Durford Mill, Petersfield, Hants GU31 5AZ
Tel (0730) 80721



Mordaunt Short designer Mike Deadman took a crucial step some years ago when the MS 200mm bass/mid unit was developed. This pulp cone, with its critical flare, applied damping and sensible sensitivity, has since proved to be the foundation of a whole range of designs, which are still current. Now well-established is the *MS40*, a middle-category compact of some 22 litres internal volume, reflex loaded at low frequencies. The port, which is 35mm in diameter by 18cm deep, is highly damped, yet serves to tune the low frequency range and load the bass unit in the main power range. In this two-way system, the treble is handled by a 25mm dome/cone tweeter, with integral phase plate.

The chipboard cabinet is strongly constructed with deep, well-glued corners and circumferential bracing. Mainly in 15mm grade, the front and back panels are MDF and the

cabinet has fittings on the underside to take a matching stand. Electrical connection is by 4mm sockets. A good quality crossover is fitted, with six elements plus two special protection devices, the latter thermally operated and changing from very low to high resistance under overload, thereby protecting the drivers. Their influence, if any, on sound quality is not known at present, but we can state that no untoward effects were noted.

Sound quality

Scoring a straight 'good', which was a fine result for the price, the *MS40* proved to be a well designed model. Panelists found little to criticise on grounds of coloration or balance and it proved consistent over a wide range of material. The bass was quite well extended if a little 'softened', while the mid was even and clear with an open quality. Both mid and treble showed good detail, and the treble was generally rated above average.

Stereo images were well focused, and a fair representation of image depth was obtained including a sense of the recorded acoustic.

Coloration included a hint of boxiness allied to some 'cone' sound — evident, for example on male voice, but not felt to be serious. It sounded very well controlled, too much so for one panelist who felt a little more life and attack were required; he considered it a touch bland.

Lab report

Pair matching was good, meeting 0.5dB limits except at 400-500Hz where a minor 1.3dB difference was noted. The grille did have some effect and was considered better detached (dotted line on the reference response) Sensitivity was about average at 86.5dB/W while the bass cut-off was typical at 50Hz. With its excellent power handling of up to 200W programme, the *MS40* will be capable of up to 105dB in a typical room in stereo. The response showed a mild mid forwardness but met ± 2.5 dB limits from 60Hz to 20kHz nonetheless.

Out at 2 metres, the forward response family showed very good control with fine lateral off axis results. The mild dip in the vertical plane at 15° suggested the speaker should face the listener, preferably on a good stand, 30-50cm high. Driven to 96dB, the distortion harmonics were well controlled particularly at low frequencies, and it improved generally at 86dB

where third harmonic was low except at 2kHz, where it remained close to 1% — a little on the high side. The compression test was handled well, with -1.1dB loss and a -40dB intermodulation.

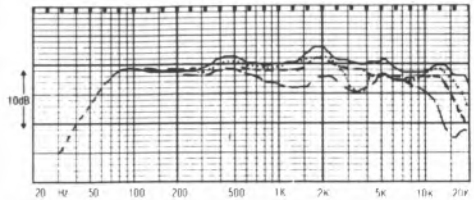
The reflex tuning did not show on the impedance curve since it was so highly damped, while the characteristic demonstrated a straightforward 8 ohm amplifier load. The room averaged response held no surprises with the speaker maintaining a fair output to 30Hz, and reasonably balanced to the smooth midrange. The interchange to the treble looked well controlled while the treble rolloff was almost as it should be.

Summary

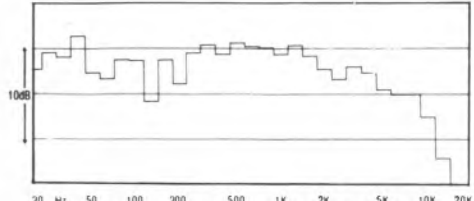
The *MS40* is yet another well balanced and civilised Mordaunt Short system. Its fine control and open, even-handed sound attracted good marks from the panel and it should fit unobtrusively in a number of good audio systems. Both rock and classical were handled well and the *MS40* wins Best Buy rating.

GENERAL DATA

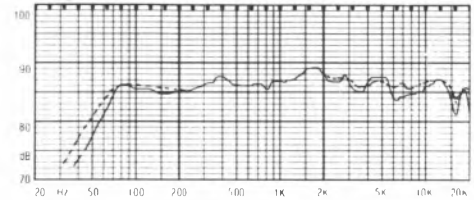
Size (height x width x depth).....	52 x 25.5 x 24cm
Recommended amplifier power per channel (for 96dBA per pair at 2 metres minimum).....	(15)—200W
Recommended placement.....	on open stands
Frequency response, within $\pm 3\text{dB}$ at 2 metres.....	55Hz-20kHz
Low frequency rolloff (-6dB point) at 1 metre.....	50Hz
Voltage sensitivity (ref. 2.83V or 1 watt into 8ohms at 1 metre).....	86.5 dB/W
Approximate maximum sound level (pair) at 2 metres.....	105dBA
Impedance characteristic (ease of drive).....	very good
Forward response uniformity.....	very good
Typical price per pair, including VAT.....	£185



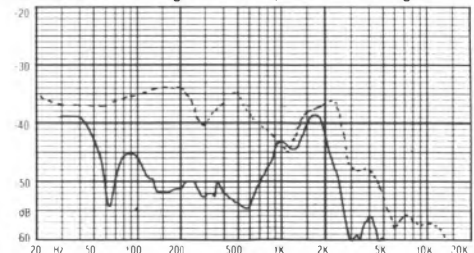
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



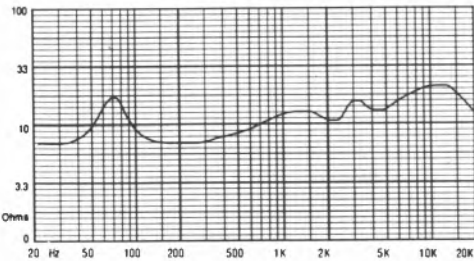
Averaged forward characteristic response in room



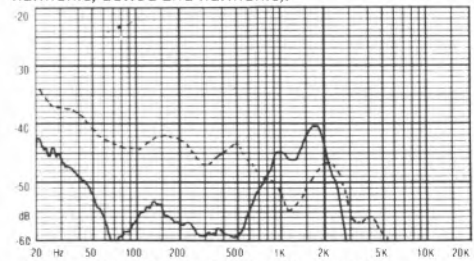
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Mordaunt Short MS300

Mordaunt Short Ltd, Durford Mill, Petersfield, Hants GU31 5AZ
Tel (0730) 80721



Selling at a little under £300, the *MS300* is a larger version of the *MS100*, similar in concept but extended in height to allow the addition of a second 160mm base unit. The result is a 54cm tall enclosure with a sealed box volume of 19 litres, this tuning the pair of bass drivers to 80Hz. One of these drivers receives input direct from the amplifier (as in the *MS100*) and so covers the bass and midrange; the other is fed a tapered signal so that its main contribution is in the lower frequency range. In this way the system becomes self-balancing in a way the *MS100* is not. The bass units are made by the British firm Elac, to Mordaunt Short design; located between them on the front panel is the 19mm Audax tweeter, the same as that used in the *MS100*.

Nicely veneered in walnut, the cabinet is of 15mm thick chipboard, reinforced by effective circumferential bracing in the vertical plane. The grille baffle is of unrebrated thick MDF, and should

be detached for critical listening. As with the *MS100* electrical connection is made in plain 4mm sockets while the speaker is fully protected against any possible damage from overload by the Positec system.

Sound quality

The '300 scored a straight 'average' in the listening tests, a fair result but not really up to the price level. It did not sound as well integrated as the *MS100* nor did it manage to really avoid that thinned mid 'forwardness'.

Some richness was present lower in the range but the bass extension was just average and the treble, similarly, judged to be of average smoothness.

Some boxiness was evident though the 'direct coupled' sound did break through. As with the '100 it proved to be nicely transparent with good stereo focus and depth. Recorded acoustics were well portrayed while a good power handling was also evident.

Lab report

The axial response was lumpier than that of the '100 while the supplied grille could be seen to exert an adverse effect on the performance. Well damped, the bass rolloff was slow with a -6dB point at 65Hz, which was higher than average for this price group. Sensitivity was good, and at 89dB/W was sufficient, along with the 100W peak programme power capacity, to generate substantial 104dBA sound levels. A minimum power input of 10W was indicated. The sensitivity was not compromised by the impedance characteristic, which met the 8ohm standard and rated as a very good amplifier load.

Measured at 2 metres with smoothing, the response was fairly stable in the lateral plane, but the speaker clearly showed poorer drive unit integration in the vertical plane. The listening height must be carefully judged to get the optimum performance. On axis, ± 3 dB amplitude limits were met from 90Hz to 20kHz.

At 96dB sound level, distortion was well controlled, averaging 0.4% above 200Hz save for a harmless peak of 2nd harmonic, inaudible at 20kHz. At the lower sound pressure level of 86dB, distortion showed a general improvement to a 'very good' level.

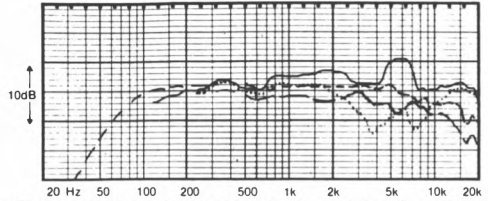
Room averaged, the overall characteristic was better than expected, since the upper midrange sounded more prominent than this curve suggested. From this response I would judge the system to be quite well balanced with good low frequency extremes.

Summary

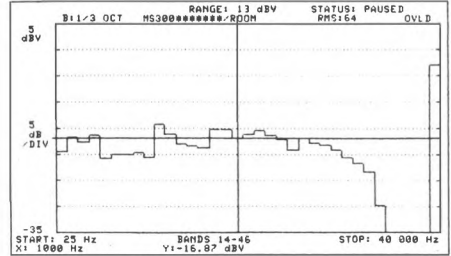
While in a general sense the *MS300* is better balanced than the *'100*, and also has greater power handling as well as lower distortion into the bargain, it sounded less direct as well as more colored than did the *'100*. Overall this speaker is rated as 'worth considering'; I consider it to have some promising qualities, and feel it is worthy of audition.

GENERAL DATA

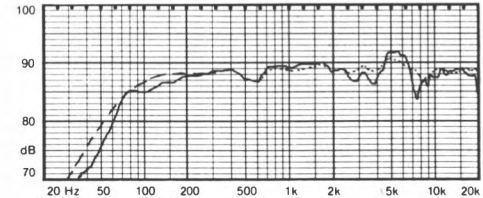
Size (height x width x depth).....54 x 22.5 x 25cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(10) –100W
 Recommended placement.....on stands near wall
 Frequency response, within ± 3 dB, at 2 metres....90Hz to 20kHz
 Low frequency rolloff (-6 dB point) at 1 metre.....65Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....89dB/W
 Approximate maximum sound level (pair) at 2 metres....104dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£300



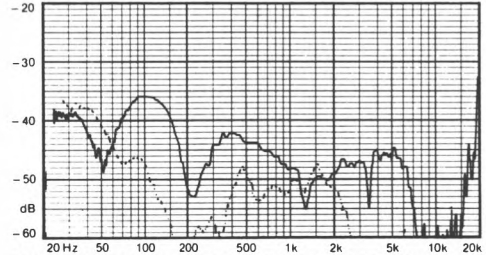
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



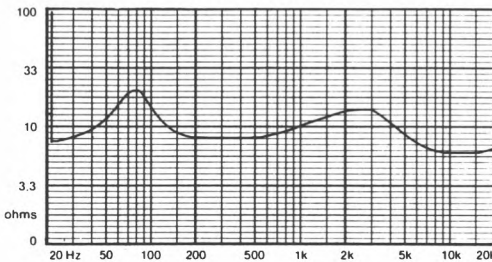
Averaged forward characteristic response in room.



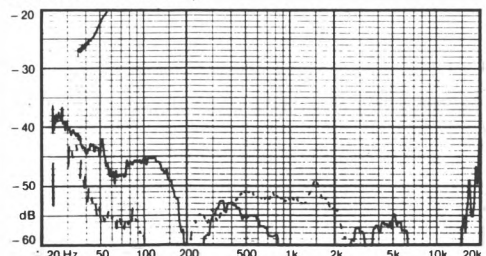
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

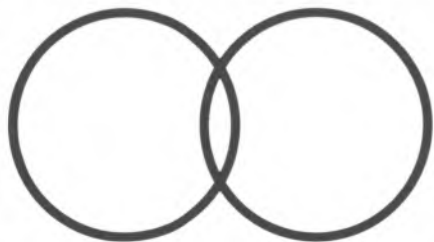
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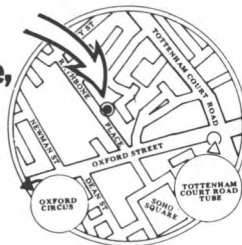
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NAD 20

NAD Ltd, Cousteau House, Greycaine Road, Watford, Herts WD2 4SB
Tel (0923) 27737



This medium priced loudspeaker is unusual in that it is designed for free space floor mounting without the need for a stand. A slim structure, it measures 75cm high, and is fitted with a neat plinth. The complete system, including drive units, is built for NAD by Braun in West Germany.

With an internal volume of 25 litres, this sealed box enclosure is tuned to 62Hz. Coverage of the bass and midrange is allocated to a steel-framed driver of 220mm, diameter, fitted with a straight sided pulp cone of 170mm radiating diameter.

The crossover is of commercial quality, 12dB/octave electrical slope, using four elements. Above 3kHz the treble is handled by the well established Braun 25mm soft fabric dome driver, in production for over a decade now. On our pair as delivered, one of these had an off centre voice coil but this was reset without difficulty.

Clip terminals are fitted on the underside of the enclosure, leaving all visible panels finished in

black grained vinyl. At 15mm thick the acoustically poor grille frame is unrebated, and the enclosure is built of plain, unbraced chipboard. The interior does however have a fibre glass filling for volume absorption; but when tested for resonance by knocking, the panels did seem louder than usual.

Sound quality

Sight unseen, the speaker scored rather below average, which is disappointing for the price. The panel criticised it for a mild bass softness and excessive fullness; for a muddled lower mid; a thinned, forward upper mid and a lifted, almost edgy treble.

Depth was poorly represented in the stereo image, which in addition showed less focus sharpness than usual. Basically quite lively with reasonable levels of musical detail the sound did not fully 'gel', leaving the panellists somewhat uninspired.

Lab report

At 1 metre, the axial sinewave energised reference response showed a high 90dB/W sensitivity. With a good power handling of up to 100W peak power programme, high sound levels of 105dBA are possible from a stereo pair. Bass extension was quite good, -6dB at 50Hz, but underdamped with an overhang of 2dB. Pair matching was rated average while the grille (solid line) added quite an obvious ripple to the otherwise smooth impedance response. Overall the curve roughly corresponds to a breed of speaker which generally tends to be crudely condemned as the 'boom and tizz' brigade.

At 2 metres this speaker's rising response trend was obvious, some 3dB from 200Hz to 10kHz. Above axis, the vertical response was noticeably notched out in the crossover region, so the median driver axis should aim at head height. Overall the forward response set looked fairly good.

In room, the mild mid bass excess noted by the panel can be seen, likewise the treble, range which was too 'flat' on this graph — a level 3dB less would be nearer the mark. The 'thin' midrange was associated more with coloration than energy balance.

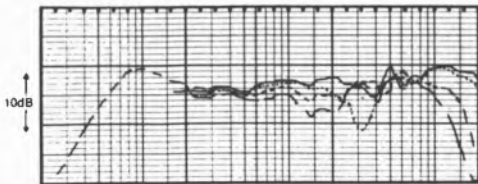
Distortion was average at 96dB sound level and did not improve greatly at the lower 86dB level. A 'below average' amplifier load, the impedance dipped to just below 4ohms at three points and might need some care in the choice of amplifier, which should preferably be a model which is rated for 4ohms use.

Summary

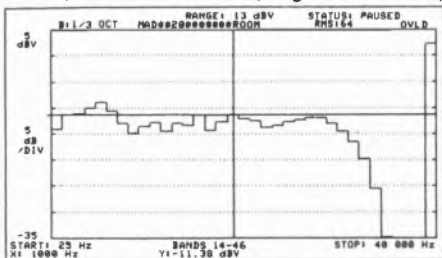
Both listening and laboratory tests showed weaknesses in this otherwise promising design. The concept is a good one, but the execution did not attain a high enough standard, in our view, for UK success.

GENERAL DATA

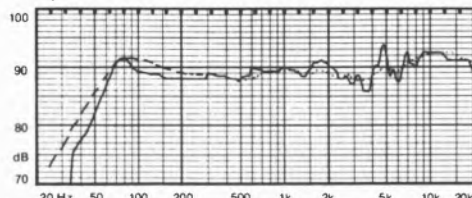
Size (height x width x depth).....75 x 23 x 26cm
 Recommended amplifier power per channel (for 96dBa minimum per pair at 2 metres).....(10) -100W
 Recommended placement.....on floor, clear of walls
 Frequency response, within ± 3 dB, at 2 metres...55Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....50Hz
 Voltage sensitivity (ref. 2.83V, or 1W Into 8ohms at 1 metre).....90dB/W
 Approximate maximum sound level (pair) at 2 metres...105dBa
 Impedance characteristic (ease of drive).....average
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£160



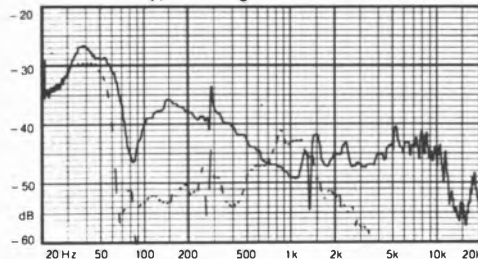
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



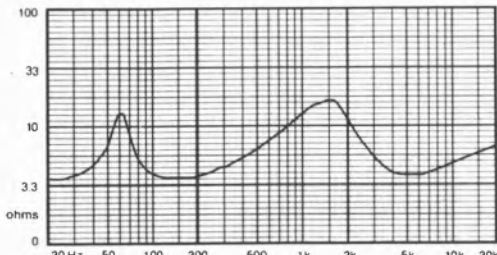
Averaged forward characteristic response in room.



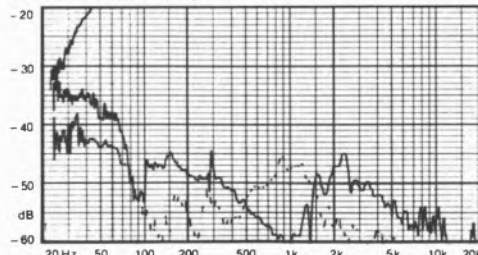
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

ProAc Tablette EBT Super

ProAc Loudspeakers, 130-132 Thirsk Road, Borehamwood, Herts
Tel 01-953 8933



This ProAc is the latest model in the *Tablette* series, with the 'ebt' designation related to the extended bass afforded by the use of two bass/mid drivers as opposed to the single bass unit of the standard *Tablette*. The 'Super' suffix indicates cabinet and component improvements, which now apply to both *ebt* and standard *Tablettes*. Our samples were purchased, not supplied by the manufacturer for this review.

A very slim enclosure for vertical orientation, the *ebt* measures just 15.5cm wide. A 19mm soft fabric dome tweeter, the Scan *D2008*, is fitted in the middle, while above and below it are placed the miniature 110mm bass units from SEAS. Built on a cast housing and fitted with good magnets, the pulp cones are heavily damped 80mm radiators.

With an 8 litres internal volume, the system is reflex tuned at 61Hz by a small multi-aperture damped port 45cm diameter by 100mm long, this

located on the rear panel. Superbly finished in a choice of fine veneers, the carcass is built of damped MDF. A fine quality seven element crossover is used with electrical connection made via 4mm socket binding posts. Matching low resonance 'Foundation' stands are available.

Sound quality

Scoring close to average, the *ebt* did quite well for its size but not for its price. On blind listening and irrespective of either cost or dimensions, the panel liked this speaker for its open sound and explicit detail. Comments on stereo were mixed with some panellists finding good depth and focus while others were somewhat confused. The tonal balance was lightweight, with clearly more treble than average while low bass was virtually absent. Overall the coloration was fairly low.

Lab report

Pair matching was excellent with this system, pointing to tight tolerances in production. At 1 metre on axis, the response was very uniform, particularly with the grille detached (dotted line). A rising trend was apparent, some 10dB from 75Hz to 20kHz; this characteristic was the opposite to that of many other small speakers which are balanced on the richer side to disguise their size.

Bass was well damped with a -6dB point at a high 75Hz, which is poor for the price. Sensitivity was close to average, and taking into account the good 75W power handling, sound levels of up to 100dBA will be possible; sensitivity was not compromised by the impedance characteristic, which rated as a very good amplifier load. It did not fall below 6.4 ohms and thus met the 8ohm standard nicely.

At 2 metres, with some averaging, the response was clearly uplifted with excellent dispersion off-axis in the lateral plane, probably one of the best ever. In the vertical plane, it proved axis-sensitive and at 15° above, a broad area of crossover loss was noted. Care should be taken to align the tweeter at head height.

At 96dB sound level distortion was higher than average but certainly quite satisfactory while at 86dB the results were quite good, averaging over 0.2% over most of the range.

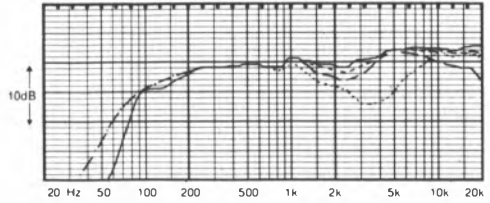
Summary

While the speaker's light balance clearly upset the listening panel, it proved to be a well engineered design of considerable merit. If a wide dispersion miniature of good overall control, low

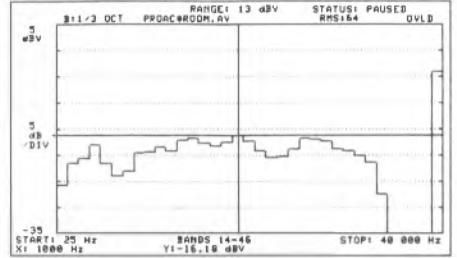
coloration and good power handling is required, the *Tablette ebt Supers* should be high on your list — its clarity and detail demand an audition but only personal trial can settle the matter. As regards bass extension and straight value for money, it fared less well.

GENERAL DATA

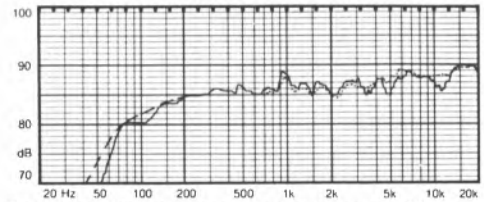
Size (height x width x depth).....40.5 x 15.5 x 23cm
 Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres).....(20) – 75W
 Recommended placement.....rigid high stand, near wall
 Frequency response, within ± 3 dB, at 2 metres..125Hz to 20kHz
 Low frequency rolloff (–6dB point) at 1 metre.....75Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....86dB/W
 Approximate maximum sound level (pair) at 2 metres.....100dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£330



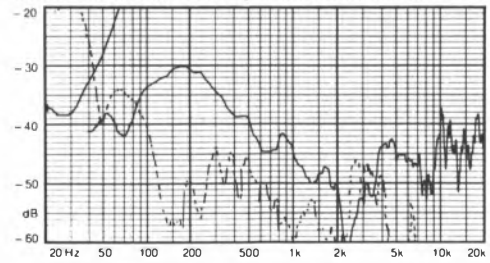
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



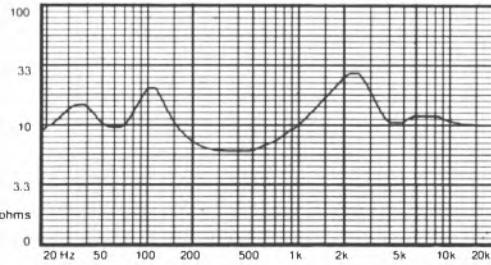
Averaged forward characteristic response in room.



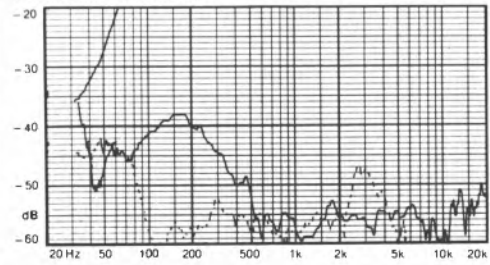
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Quad ESL-63

The Acoustical Manufacturing Co Ltd, St Peters Road, Huntingdon PE18 7DB
Tel (0480) 52561

RECOMMENDED



This new design was very long awaited, and we received our samples just in time for inclusion in the 1981 issue. The original *Electrostatic* was reviewed some years back by a different author in *Choice*, and certain of the problem areas which emerged, namely directivity, bandwidth sensitivity, power handling and amplifier loading have all found partial solutions in the new model, albeit at a high price.

A single large-area damped plastic film diaphragm has been electrostatically energised to operate as a phased array of eight concentric elements, and the emerging wavefront is an approximate simulation of the radiation from a theoretical point source 30cm behind the centre of the panel. A high voltage delay line feeding the multiple elements incorporates compensation for the clamped boundary of the diaphragm, and also equalisation for the axial frequency response. The size and apportionment of frequency range and delay to the elements allows control of directivity, which is adjusted to give a smooth and uniform decay at increasing off-axis angles. But it should still be borne in mind that the directivity of the 63 is poor by comparison with the best moving-coil designs, and that the speaker remains rather critical of listening angle.

The latter characteristic presented a problem on tests, since in the modest confines of my listening room only two of the six Quad panelists could be in the optimum zone, and when used as suggested on the floor at our typical 3-3.5m listening distance, the main axial treble response was directed nearer to their chests than their ears. Accordingly, the speakers were elevated by

about 20cm on open stands and marginally tilted backwards. As with the Acoustat, further auditioning was also conducted with solo listeners to augment the panel subjective data.

The Quad 63 is a bipolar design which generates regions of acoustic power fore and aft but is suppressed in the sideways directions. In consequence a rather different drive of room reverberation results compared with small box speakers which are considerably more omnidirectional. Thus even if the Quad did provide an identical axial frequency response to a low coloration moving-coil model, it would not sound the same due to the significantly different room reverberation tonal balance.

Lab performance

The sensitivity reading was not comparable with a normal speaker due to the doublet directivity and furthermore, the 1 m reference response was theoretically too close, risking proximity and integration errors. Approximation or not, the reading was below average at 84dB/W, the reference response meeting +/-2dB limit: between 50Hz and 9kHz, outside of which some irregularities were charted which could not be wholly blamed on proximity, as a 2m and 3m check verified.

Averaged in 1/3-octave bands at 2m, the speaker demonstrated a superbly even mid and low range response, with some mild 'lumpiness' above 5kHz. The response sensitivity to axis was shown by the special dotted curve, just 7.5° off axis: vertically, which reveals more than a 5dB loss above 12kHz. The output decayed much more than average off-axis, but the decay pattern was exceptional in terms of consistency and evenness (see Acoustat.) In practice the bass rolloff point was indeterminate, depending on the listening room boundaries and in particular the distance to the rear wall (with zero bass when placed against the latter). In open air or in large rooms 34H: -6dB is possible, but at a modest acoustic level.

While not as kind a load as Quad suggest, the speaker should not cause most amplifiers too much trouble, but when the speaker is heavily overloaded it protects by a short-circuit 'crowbar' which may damage some amplifiers and dips to 3.5 ohms were recorded at 50Hz and 10kHz. Above 60Hz, even at a full 96dB, the distortion performance was superlative, though the curves does not illustrate the 63's inability to accept inputs over 30W or so below this frequency without diaphragm rattling. Above 100Hz the distortion was 10-100 times better than usual, but due to the speaker's protection circuit compression occurred at a 100W peak input.

however at 50W, just 3dB less, the pulse reproduction was simply too perfect to register measurements.

Due to the unusual directivity the room response is probably of marginal value, and certainly cannot be directly compared with the results for normal box systems. It is however included just for the record, but did not correlate well with the subjective data. The midrange at least is notably smooth, but the 60Hz prominence is more exaggerated than usual.

Sound quality

At risk of appearing to make excuses for the 63, the subjective data did partly reflect its directionality, and side positioned listeners were not well served. Prolonged solo sounds suggested that to some extent the sound was something of an acquired taste, and that if its particular qualities appealed, these could assume such overriding importance that no other model would suffice. On first hearing however it can sound somewhat 'dead' and 'clothly' due in part to the loss of reverberant energy in the upper frequencies when compared to a conventional speaker. A trace of a 'whistly' quality in the extreme treble was audible to a few keen-eared listeners, while the sweetness and integration of the mid/treble band at first lends a dim impression until experience shows that the necessary treble detail still exists but in an unusually natural form.

Listeners accustomed to a dynamic and punchy bass of good power handling, particularly on rock-oriented programme, found the 63 disappointing since it could not play very loud, and the bass power though a little more extended than a 3/5A, was little greater. Without the 'liveness' and 'excitement' of some of the better box systems, it at first appears to lack detail and transparency. But prolonged listening showed that this was due to the misleading frequency balance, and that on axis superb image depth as well as detail were apparent. Respectable scores were nevertheless achieved throughout the sessions.

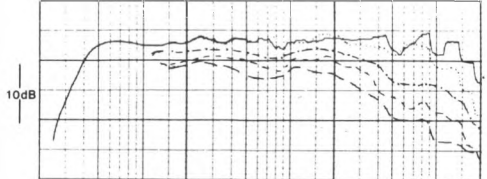
Summary

Since our original review minor improvements have been made to this speaker, notably considerably revised protection circuitry, allowing louder and better reproduction of bass transients. While not a powerhouse, it does at least now do respectable justice to the bass on rock material, particularly if this is digitally derived and hence free of overhang or subsonic excitation. Fully re-auditioned for this edition, it achieved very respectable scores especially on digital masters.

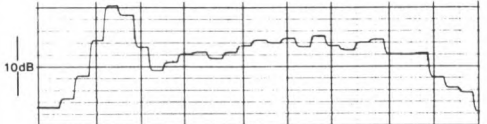
The Quad has uniquely musical qualities through the vital mid registers, and deserves auditioning on high quality material if its blend of strengths and weaknesses are to be fairly assessed by the intending purchaser. The results continue to justify a *Choice* recommendation despite the elevated price.

GENERAL DATA

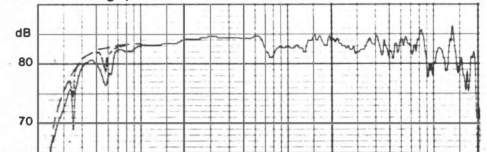
Size (h x w x d)	93 x 66 x 27cm
Recommended amplifier power per channel (for 96dBa per pair at 2 metres minimum)	(25)-100W
Recommended placement ... on open stand, well clear of rear wall	
Frequency response within \pm 3dB (2m)	40Hz to 18kHz
Low frequency rolloff (-6dB) at 1m	34Hz
Voltage sensitivity (ref 2.83V, ie: 1 watt in 8 ohms) at 1m	84dB/W
Approximate maximum sound level (pair at 2m)	99dBa
Impedance characteristic (ease of drive)	fairly difficult
Forward response uniformly	good*
Typical price per pair, including VAT	£1278
*see text	



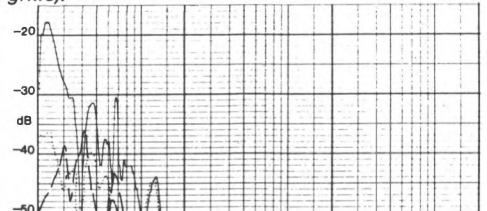
Forward characteristic response (1/3-octave @ 2m, dotted 15° vert., small dash 30° lateral, long dash 45° lateral).



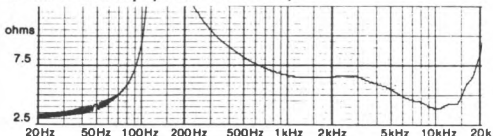
Averaged forward characteristic response in room at listening position.



Reference sinewave response (1m on axis, 2.83V input shows sensitivity) (dashing corrects for chamber LF, dotting shows response without grille).



Harmonic distortions: solid 3rd 96dB, dotted 2nd 96dB, dashed 3rd 90dB, chain-dashed 2nd 90dB, o shows stop point at 96dB).



Impedance (mod Z).

Rogers LS2

Swisstone Electronics Ltd, 310 Commonsides East, Mitcham, Surrey
Tel 01-640 2172



This very compact loudspeaker may be considered as having grown out of the little *LS1*, which it now replaces. With a 10.5 litre internal volume, the proportions are improved, and this should produce lower box coloration. The cabinet is nicely veneered in real walnut, and has a decent chamfered grille baffle with an MDF board front panel. Plain chipboard is used for the rest of the carcass. Reflex loaded, the box is tuned to 60Hz by a decently sized port, 50mm diameter by 110mm long.

In this two way system, bass and midrange are handled by a Rogers-built polypropylene coned unit, constructed on a 110mm pressed steel frame. High thermal power handling is obtained via a Kapton motor coil former. A five element crossover of nominally 18dB/octave slopes is used to divide the frequency range at around 3.5kHz, with the treble register handled by a 19mm soft plastic dome unit of good dispersion.

The enclosure is undamped, but the bass unit is partially decoupled to reduce the transmission of driver frame vibrations to the cabinet panels. Electrical connection is made via 4mm socket binding posts while the overall constructional quality is very good.

Sound quality

Scoring well above average on the panel tests, the *LS2* has improved on the earlier *LS1* result. Some panel variation was noticed in the results however suggesting a mildly biased speaker character. It was weaker on rock material and lacked full dynamic power, but it nonetheless sounded tidy and coherent throughout the frequency range.

Coloration was fairly low, though the bass did not achieve a clean 'slam', the mid could show mild upper range hardness, and the treble a hint of 'sizzle'.

On the plus side, it sounded well balanced with good detail, fair clarity, reasonable depth, and good stereo focus. Bass was tidy but low bass was rather muted.

Lab report

A low sensitivity of 86.5dB/W was recorded, which suggested a minimum power input of 25-30W per channel; 150W is a sensible maximum power input, though it survived much higher powers without complaint. Maximum sound levels of 100dBA will be possible from a stereo pair.

With the grille removed (dotted line) the response was smoother in the upper range. The curve was somewhat unbalanced, the trends suggesting the extraction of all that was available from the main driver. Well tuned the bass extended to a respectable rolloff at -6dB, 51Hz.

Measured out at 2 metres, the speaker showed a slightly respectable set of forward and off-axis responses which confirmed its generally balanced and well integrated nature. A 60Hz to 20kHz frequency range was easily met for the quoted ± 3 dB limits.

A 96dB sound level was some task for this system, yet good distortion results were obtained on this test, averaging 1% second and 0.3% third right down to 50Hz. At 86dB the results improved to a surprisingly good level. Just dipping to 6.4ohms at 230Hz, the speaker was a typical 8ohms amplifier load, rated very good.

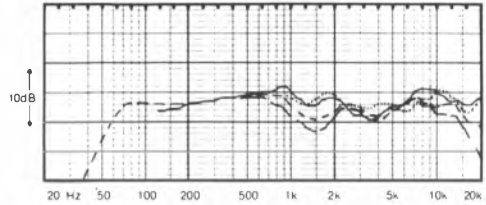
With the forward response computer averaged in the listening room, this speaker's pedigree was confirmed. Low bass did roll off quickly below 50Hz and the treble was a touch forward, but the Overall result was distinguished by its notably even nature.

Summary

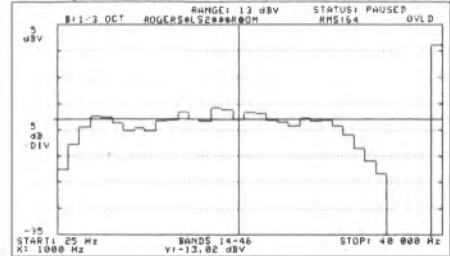
Another finely crafted design from the hand of Richard Ross (now managing director at Rogers), the *LS2* stands as a neutral miniature offering good power handling, fine stereo and encouraging sound quality. More suited to classical programme, this design is confidently recommended.

GENERAL DATA

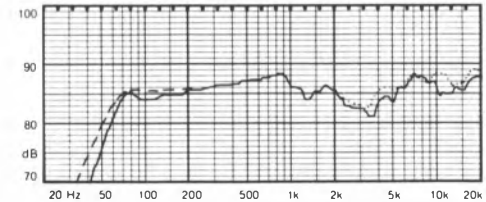
Size (height × width × depth).....36 × 23 × 22cm
 Recommended amplifier power per channel.....(25) – 100W
 Recommended placement.....on stand, perhaps nearer wall
 Frequency response, within ±3dB, at 2 metres...59Hz to 20kHz
 Low frequency rolloff (–6dB point) at 1 metre.....51Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....86.5dB/W
 Approximate maximum sound level (pair) at 2 metres...100dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....excellent
 Typical price per pair, inc VAT.....£200



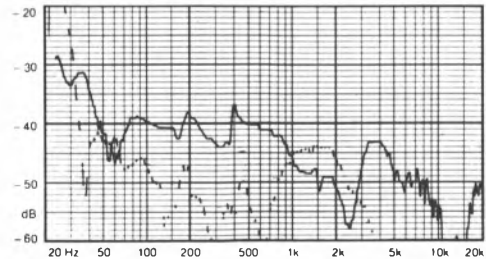
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



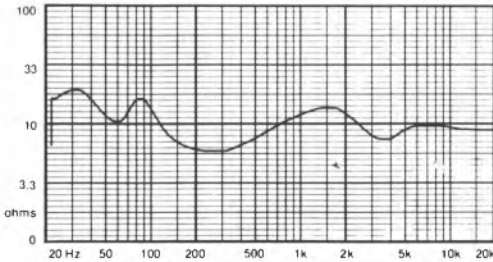
Averaged forward characteristic response in room.



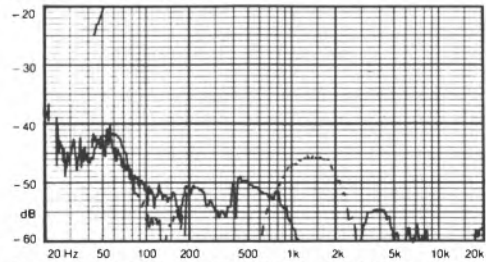
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Rogers LS6

Swisstone Electronics Ltd, 310 Commonside East, Mitcham, Surrey
Tel 01-640 2172



The new *LS6* slots in below the established *LS7*, and offers a similar basic package in terms of size but at a lower price. A newly developed polypropylene cone is used for the bass/midrange unit, this built on steel frame and fitted with a generous magnet. The treble is handled by 19mm soft plastic domed SEAS unit, crossing over at around 3.5kHz.

Standing 51cm high, this speaker is suited to free space mounting on solid stands, like the *LS7*. The 23 litre enclosure is reflex tuned to 50Hz by a 50mm diameter port; the internal section is slant-cut to approximately a 110mm length. Reflexing gives a fourth order bass response but in fact this system is 5th order, achieved via a 440 μ F series capacitor.

The high quality crossover network is essentially to a 3rd order pattern and is built using excellent components.

Built from plain chipboard, the enclosure has

an MDF driver baffle with a chamfered port opening and grille baffle. The constructional quality and standard of finish is high. Electrical connection is via 4mm socket/binding posts.

Sound quality

Scored with great consistency by the panel, the *LS6* achieved a very similar rating to the *LS2*, though with superior bass extension and power handling. The '6' was found to be very well balanced with a transparent, informative mid, and an open, airy nature. Stereo depth was quite well developed, and good width as well as image focus were observed.

Quite lively and dynamic, coloration was generally low though the bass lacked attack and real extension while the upper treble could sound grainy on occasion. It handled high powers well, showing a convincing superiority here over the *LS2*, but not quite reaching the standard set by the *LS7*.

Lab report

At the reference 1 metre microphone distance, set on the median driver axis, this speaker provided a very uniform well controlled response. There was no difficulty in establishing a sensitivity at a solid 87.5dB/W. With the grille off (dotted line) the response met ± 2 dB limits from 55Hz to 16kHz, very creditable with a -6 dB low frequency limit at 50Hz, about average for the price and size.

Out at 2 metres, this speaker's fine driver outputs are excellently integrated, producing a first class set of off axis responses.

In the listening room the forward energy was finely balanced above 80Hz but bass was also up a few dB at the 50Hz system resonance, falling quickly at lower frequencies. A lower system tuning frequency could improve matters here.

Driven to 96dB sound pressure, the speaker offered moderate distortion levels averaging a good 0.3 to 0.4%. At the 86dB level, the frequency range above 100Hz averaged a fine 0.25%.

With a 150W maximum power handling, this speaker will provide generous sound levels up to 104dBA in a typical room. Conversely, as little as 15W will produce enough volume for normal purposes. The sensitivity was not compromised by the impedance characteristic, which showed an easy 8ohm amplifier load.

Summary

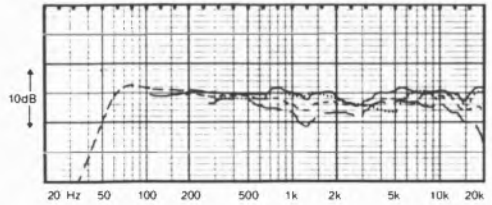
Though not cheap, this honestly built loudspeaker has achieved sufficiently high standards in both laboratory and listening tests to qualify for a recommendation. With its neutral balance,

smooth response, fine stereo and a consistent off-axis uniformity, it also provided low distortion as well as good power handling into the bargain.

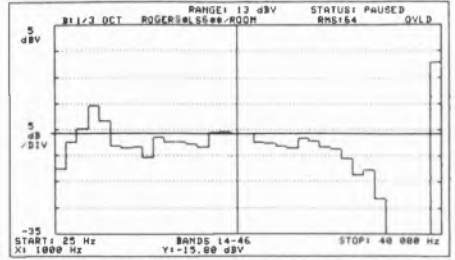
GENERAL DATA

Size (height x width x depth).....51 x 27 x 28cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(15) – 150W
 Recommended placement.....open stands
 Frequency response, within $\pm 3\text{dB}$, at 2 metres.....50Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....50Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....87.5dB/W
 Approximate maximum sound level (pair) at 2 metres....104dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....excellent
 Typical price per pair, inc VAT.....£260

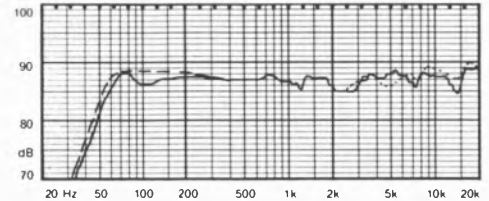
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



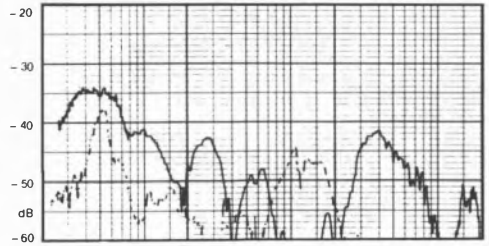
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



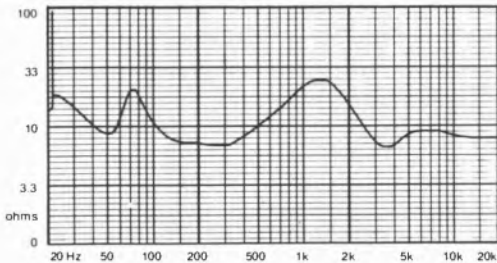
Averaged forward characteristic response in room.



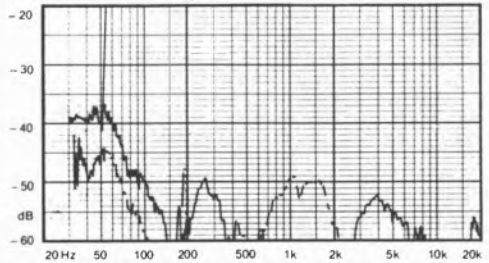
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



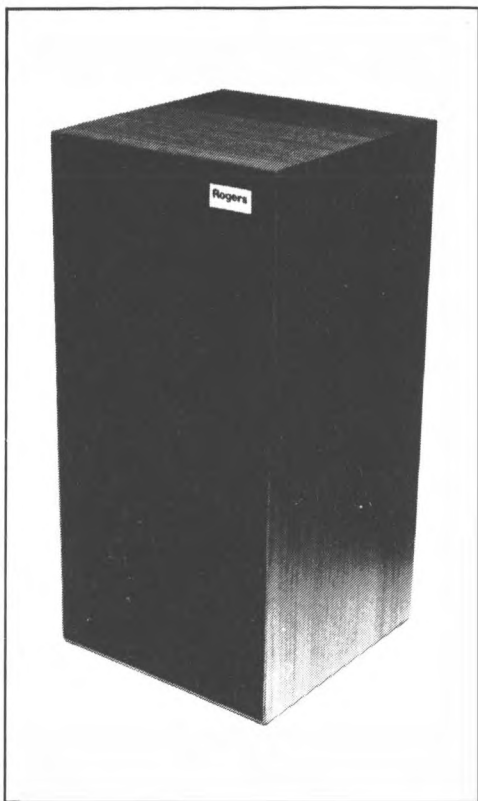
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Rogers LS7

Swisstone Electronics Ltd, 310 Commonside East, Mitcham, Surrey
Tel 01-640 2172



Rogers' LS7 is a fairly compact stand-mounted system, with an internal volume of 30litres. The design has been refined since it was first introduced, and the pair reviewed here are representative of current production.

Tuned to give a damped quasi-Butterworth alignment, the large reflex ducted port is 65mm in diameter, its exit flared to reduce distortion. The excellently finished enclosure is constructed of 12mm bituminous damped MDF with a reinforced 19mm-thick MDF front baffle. None of the panels are removable, internal access gained via the bass unit aperture.

The bass/midrange unit has a nominal diameter of 200mm, and uses a generous magnet, a high-power voice coil and a patented polypropylene cone possessing the classic BBC profile. A selected version of the Celestion HF1000 soft-dome 25mm tweeter covers the remaining frequency range, the excellent-

quality 13 element 3kHz crossover.

External connection is by means of 4mm socket/binding posts and the internal wiring is to a high standard, the LS7 typifying Rogers traditionally fine workmanship.

One component which I do feel needs revision, though, is the grille. Strong enough to resist warping by its now rather dated Tygan cloth, the assembly is acoustically unfavourable — a foam replacement would help here.

Sound quality

The panel were highly impressed by the LS7. It was felt to be tonally accurate and well balanced, with an extended and uniform frequency response. Good instrumental detail was preserved throughout the frequency range, while coloration was held to a consistently low level.

Stereo images were spacious, focused and full of the intended recorded-acoustic detail. Images also demonstrated impressive depth, with an almost crystalline transparency.

The LS7 provided good extension in the bass, and while they seemed slightly 'leaden' footed here, powerful and clean articulation were in evidence. The sound was consistently clean and free of boxy effects.

Very mild criticisms were recorded concerning a slight edgy and sibilant treble, with a mild vocal chestiness but neither was of much consequence. The speaker gave fine results on analogue sections but clearly excelled on the digital programme.

Lab results

The LS7 showed fine pair matching when measured at 1metre, the axial response disfigured by a notch at 7kHz. Removal of the grille gave the more elegant dotted response illustrated. The well-damped bass response was uniform and well balanced in character, extending to 48Hz, -6dB, which was fine for the size of enclosure. Sensitivity was above average at 88dB/W, and an impressive 200W power capacity was established. Maximum sound levels of 106dBA were possible from a stereo pair, while as little as 10W would give interesting results. The sensitivity was not compromised by the impedance, which showed only a minor dip at 8kHz, with a mean value of 10ohms, thus making the LS7 a very good amplifier load.

Out at 2metres a fine set of off-axis responses were demonstrated. At 15° above a mild 4kHz dip occurred (still affected by the grille) so the speaker should be directed or elevated sufficiently to face the listener.

Panelists felt the balance to be slightly 'rich', this confirmed by the 2metre trend.

When room-averaged, very good correlation with the subjective findings was established. The bass was only marginally 'rich' and showed a well-integrated response extension in the room. The mid was quite uniform and married correctly with the treble register which smoothly decayed above 8kHz.

Measured at 96dB, low frequency distortion held to below 3% second harmonic and 1% third, and was very fine above 300Hz, which is the more critical range in this respect. At 86dB distortion improved greatly with the midband readings excellently low, measuring less than 0.1% over a couple of octaves!

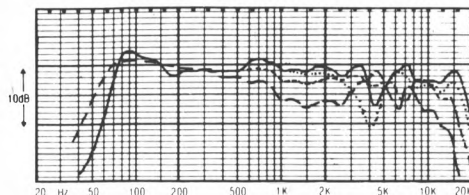
Summary

Clearly 'digital ready' the LS7 in its latest form provides a remarkably well-balanced subjective and objective performance. All aspects of sound quality such as extension, balance, stereo clarity and coloration were very good, while technically speaking it was easy to drive, low in distortion, sensitive, and consistent as regards frequency balance.

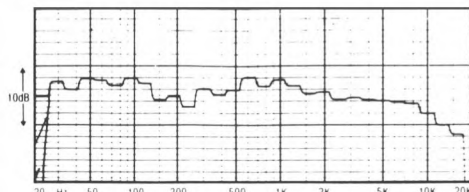
With a recent price increase, the LS7 moves above our 'Best Buy', price limit but remains a strong recommended speaker.

GENERAL DATA

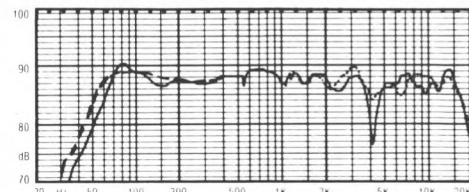
Size (height x width x depth).....	56 x 27 x 28cm
Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....	(10)—200W
Recommended placement.....	open stands
Frequency response, within ± 3 dB, at 2 metres.....	55Hz to 18kHz
Low frequency rolloff (-6 dB point) at 1 metre.....	48Hz
Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....	88dB
Approximate maximum sound level (pair) at 2 metres.....	106dBA
Impedance characteristic (ease of drive).....	very good
Forward response uniformity.....	very good
Typical price per pair, inc VAT.....	£320



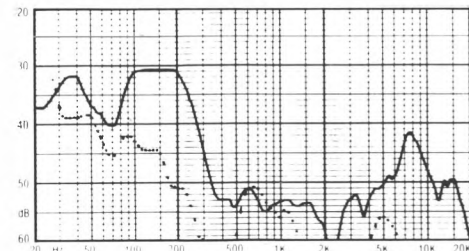
Forward characteristic response ($1/3$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



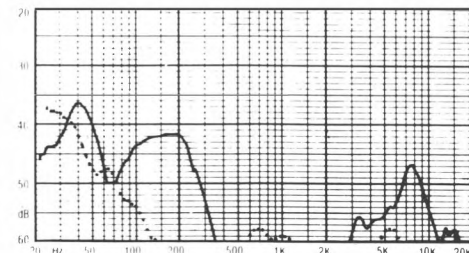
Averaged forward characteristic response in room.



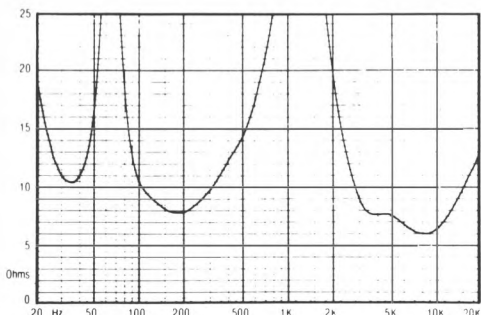
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Rotel RL850

Rotel Hi-Fi, 2.4 Erica Road, Stacey Bushes, Milton Keynes, Bucks
Tel (0908) 317707



A standard, two-way sealed box system, this 20 litre speaker is built in the UK for this Japanese-based company. But the design is UK-inspired and uses a British Elac 220mm pulp cone bass/mid range fitted with a modest magnet and built on a strong pressed steel frame. The treble is handled by a Peerless 25mm soft fabric dome, and the connections are hard wired in oxygen-free copper cable, using a simple three element crossover network, with an additional resistor to provide attenuation for the treble. Built from 15mm thick chipboard, the enclosure is finished in vinyl 'walnut', and well filled with acoustic absorption.

The grille panel is unrebated and 15mm thick -- it probably should be discarded to get the best sound. On the rear panel 4mm socket/binding posts are fitted for speaker cable connection.

Sound quality

Scoring 'above average' on listening tests, the *RL850* did well in its category; it costs less than half the group average.

Some coloration was evident, namely a softening in the bass and a touch of boxiness in the mid, plus a muted fizz in the treble. The frequency response sounded quite even, if slightly dulled, while the upper-mid and treble lacked detail, with an inconsistency here depending on the type of programme played.

Stereo images were good, in terms of width, but central focus was not particularly strong, and depth was muted. Despite the latter characteristic, the speaker sounded fairly big hearted, and could convey some of the weight and ambience present in the programme. Voice quality was quite good, and the speaker also handled high power inputs gracefully, proving quite happy up to 220W peak programme.

Lab report

Pair matching was found to be very good — to within $\pm 0.5\text{dB}$, which is a great achievement for such an inexpensive speaker. The grille has some effect on the treble response and is better left off. The reference sensitivity measured an average 87dB/W and in conjunction with the generous power handling, this means that levels of up to 105dB are possible from a stereo pair, assuming that you have a large enough amplifier. Fairly smooth and well balanced, the response met $\pm 2.5\text{dB}$ limits from 66Hz to 20kHz, while the -6dB bass rolloff came in at 52Hz, which is about average.

Out at 2 metres, the forward response fairly well integrated. A dip at 4kHz occurred above axis suggesting that this speaker ought to be at, or alternatively directed towards, ear level. The lateral responses were nonetheless good.

Driven to 96dB spl, the distortion measured 1% for second harmonic, and rather less for third. Below 100Hz the usual increase to 3% or so was seen. When sound level was reduced to 86dB, distortion improved significantly to a good level to typically 0.4%. Compression was poorer than average at 2.7dB, but the bass-mid intermodulation figure was very good at -48dB.

The impedance curve indicated a normal 8 ohm load, typically measuring 10 ohms at higher frequencies, and posing no problem at all for a modern amplifier. Driving the listening

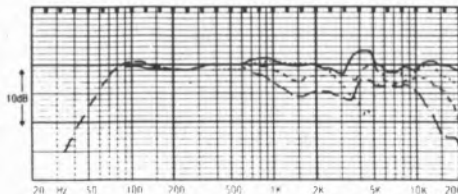
room, the speaker produced a well balanced and extended response. Within that general trend however, the mid showed some prominence at 800Hz while a forward energy notch was clearly present at 2.8kHz, indicating poor phase control through crossover, and this left the treble somewhat isolated as well as uneven.

Summary

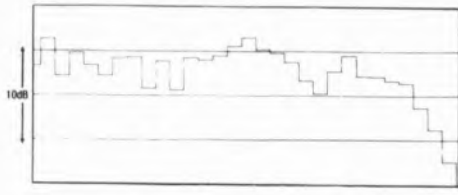
While some quirks have been unearthed in the performance of this speaker, the fact remains that it nonetheless offers very good value. A powerful, competent two-way system with a 200mm driver, when most in this category have 110mm, the 850 achieves Best Buy status. With a little more attention to the crossover, it could possibly be even better!

GENERAL DATA

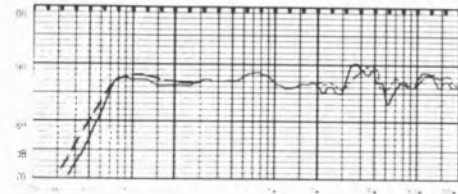
Size (height x width x depth).....44 x 25 x 25cm
 Recommended amplifier power per channel
 (for 96dBA per pair at 2 metres minimum).....(15)— 150W
 Recommended placement.....on open stands
 Frequency response, within ± 3 dB at 2 metres.....63Hz-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....52Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....87dB/W
 Approximate maximum sound level (pair) at 2 metres....103dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good
 Typical price per pair, including VAT.....£99



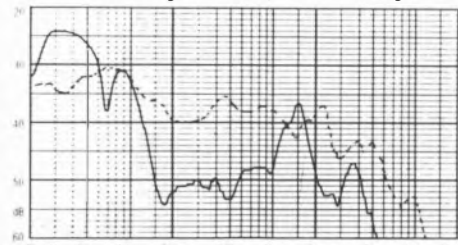
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15 vertical, small dash 30 lateral, long dash 45 lateral).



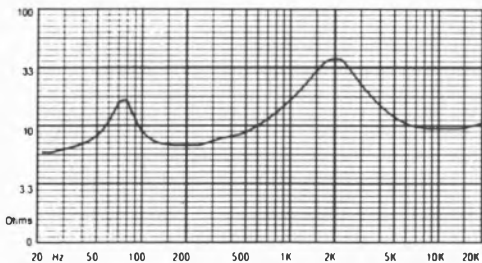
Averaged forward characteristic response in room



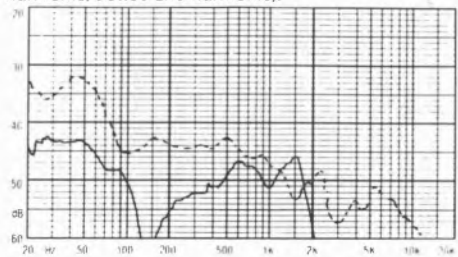
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF. dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Sony APM20

Sony (UK) Ltd, Sony House, South Street, Staines, Middlesex TW18 4PF
Tel Staines 61688



Intended as a smaller brother to the now established *APM22es*, the '20 is targeted at a UK sales price of just under £150. With an internal volume of 18 litres, the system is bass reflex tuned to 55Hz by a rectangular ducted port. Like the '22, the vinyl covered chipboard enclosure has radiused front edges to reduce diffraction.

The bass/mid range unit is an 'APM' square driver using a conventional motor coil and an aluminium honeycomb foil diaphragm of radiating area approximating to that of a 170mm diameter conventional unit. The treble is handled by a titanium domed driver, 25mm in diameter and fitted with an unusual phase/loading plate.

Impressive at first sight, the solid-looking bass driver front frame turned out to be only decorative, revealing a pressed steel frame underneath. The crossover is a four element type, 12dB/octave, or second order, while a small equaliser is also used for the treble. Electrical connection

is via 4mm socket binding posts.

Sound quality

On blind listening tests the Sony scored below average, though not seriously so. It provided good stereo focus with fair width and moderate depth.

Coloration was relatively good through the main mid region, but it tended to hardness and a pinched nasality in the upper range. Upper bass was pretty clean but the genuine low bass was muted. The overall balance was rather bright and thin, and panellists frequently commented on the excess treble which drew attention to itself with a degree of upper range hiss.

Good levels of clarity were shown and dynamics were also above average. Likewise it possessed a fine power handling.

Lab report

The reference frequency response showed an odd set of triangular shaped irregularities, but these were not considered to be of great significance. The grille (solid line) exaggerates these effects in the treble range. The system response showed a touch of 'boom and tizz' effect though $\pm 3\text{dB}$ limits were met from 50Hz to 20kHz. The -6dB low frequency rolloff point was good for the size at 45Hz. Sensitivity was slightly below average at 86dB allowing maximum sound levels of up to 100dBA with 75W per channel amplifiers.

Driven to a 96dB sound level, distortion averaged 0.6% with third harmonic peaked at 2%, 1.3kHz. This remained unchanged at the lower 86dB level though the other results did improve at this lower level.

At the 2 metres measuring distance the overall character could be seen, namely a well integrated response set in the off-axis directions, but a generally forward trend in the treble, plus a touch of bass excess.

With a minor dip to 5.5ohms, the impedance otherwise remained close to an 8ohm value qualifying the '20 as a good amplifier load. Assessed in the listening room the bass was lifted a little at 50Hz but the overall balance was promising except in the treble, where it was clearly excessive.

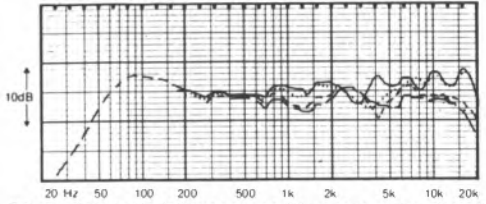
Summary

This smaller Sony had some promising points such as good clarity and well focused stereo image quality, and seemed to be mainly held back by a mid/treble imbalance. On the basis of the subjective results, the *APM20* is worth considering but a full recommendation would be inappropriate.

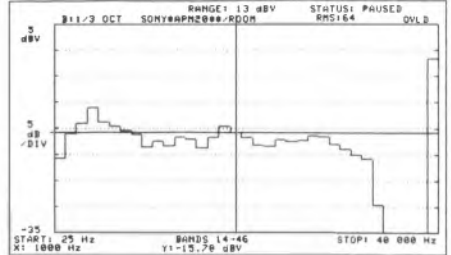
(Note: The author would like it known that he privately auditioned an early prototype for Sony before the issue commenced. Sony (UK) have now informed us that the samples supplied to HFC were early production and that since this review was completed they have refined a version especially to meet UK standards; these are now ready for UK sale, and the earlier speakers will not be available.)

GENERAL DATA

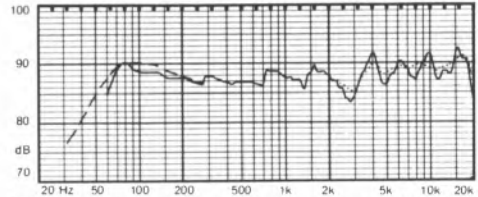
Size (height x width x depth).....43 x 25 x 29cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(15) - 75W
 Recommended placement.....open stands
 Frequency response, within ± 3 dB, at 2 metres...52Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....45Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....86dB/W
 Approximate maximum sound level (pair) at 2 metres...100dB
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£150



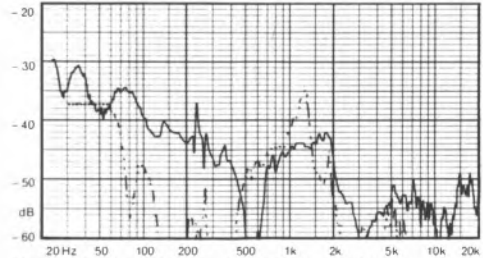
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



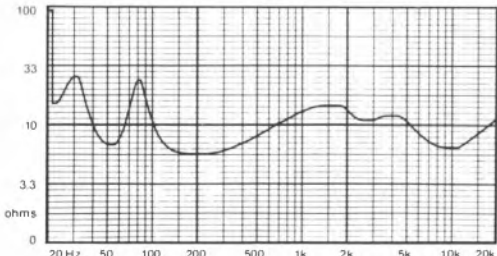
Averaged forward characteristic response in room.



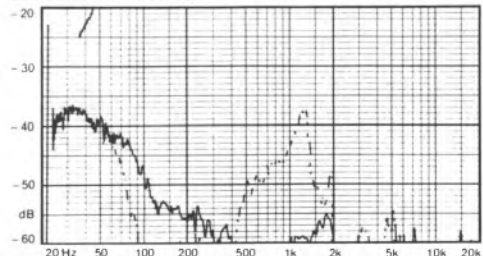
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Sony APM22ES

Sony (UK) Ltd, Sony House, South Street, Staines, Middlesex TW18 4PF
Tel Staines 61688



Sony, in company with several other Japanese manufacturers, have been developing planar drivers. First seen in the expensive 'Esprit' speakers, the APM piston technology has been brought down market to a point where a two way system could be developed to supercede the successful G1. The APM22 is built in Germany at Sony's Wega plant, using two Japanese drivers; these are a 220mm square bass/mid and a 25mm square treble, both with extra light, strong aluminium honeycomb diaphragms. The bass driver is built on a fine die cast frame and is fitted with a generous magnet, and a high quality five element crossover is used. The 30 litre enclosure is reflex tuned by a rectangular port 75mm deep, its 44 square centimetre area equivalent to a generous 7.5cm diameter aperture.

Finished in vinyl laminate, the solid enclosure has some bracing, and is built from

high density chipboard. Sensible 4mm socket/binding posts are provided for electrical connection, and while shelf use is possible, this system gives of its best on rigid stands, well clear of room boundaries.

Sound quality

Scoring well on the panel tests, the APM22 achieved a 'good plus', which was very fine for the price. Clearly impressed, the panel actually found little to criticise. The bass was powerful and tuneful, with a hint of excess, while the mid was a mite thin and forward, showing mild boxiness as well. The treble was judged to be slightly bright but of very good quality — 'near electrostatic' was one comment.

The APM22 sounded notably clear and clean with excellent dynamics, an 'open' explicit presentation plus a pleasing transparency. Stereo images were well focused and both depth as well as the recorded acoustic were well presented. It also handled high powers well, surviving 300W programme with no limiting, and really high sound levels were produced in the process.

Coloration, particularly of the 'cone' variety was found to be quite low, which was appropriate in view of the absence of driver cones!

Lab report

Reflex tuned to 55Hz the speaker showed about average sensitivity, at 88.5dB/W. Pair matching was excellent, to within ± 0.5 dB while the -6 dB low frequency cutoff was a respectable 46Hz — good for the size. The grille did not impose unduly on the treble response, but this was still better with the grille removed. Out at 2 metres the axial response was exemplary, meeting fine ± 1 dB limits from 60Hz to 20Hz. The off axis family of responses looked tidy with the 3kHz crossover dip in the vertical plane suggesting that the speaker should be near ear level or at best directed towards it. At 96dB sound pressure level, distortion was pretty good, though rising to normal values below 200Hz; while at 86dB, it was much improved, though a mild peak in third harmonic was evident at 1kHz. Compression was poorer than expected at 2.5dB but the intermodulation product was excellent at -51 dB.

Dipping just below 6 ohms at 170Hz, the impedance curve was otherwise well controlled, and will present no good amplifier

with any problems.

In the listening room, the computer-averaged response confirmed the listening test results. The curve showed a well balanced output, with good integration and some moderate bass excess at 50Hz. The treble was particularly good.

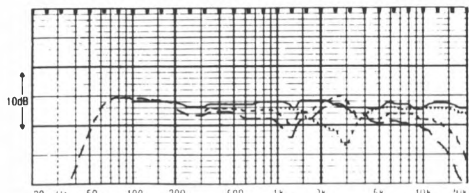
Summary

Here is the classic 'Best Buy' loudspeaker. Well engineered, it offers an essentially neutral, open, transparent sound, full of detail and life. The response is wide, the stereo good and the distortion moderate, while the sensitivity is above average. Furthermore it is easy to drive and usefully compact, interfacing well with our listening room. High sound levels of up to 105dB were also possible.

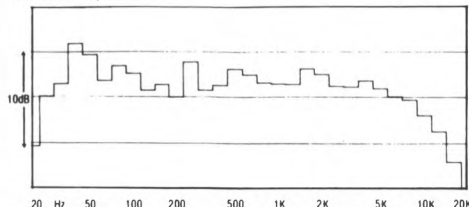
After this review of the APM22 was first published in the 1984 edition, production models were found to differ from our review pair in subjective sound quality; however, recent production maintains the original high standard and a Best Buy rating is confidently achieved once more.

GENERAL DATA

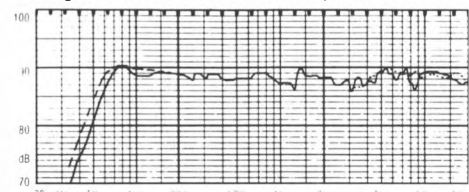
- Size (height x width x depth).....51.5 x 29 x 30cm
- Recommended amplifier power per channel
(for 96dBa per pair at 2 metres minimum).....(15)—200W
- Recommended placement.....on open stands
- Frequency response, within ± 3 dB at 2 metres.....53Hz—20kHz
- Low frequency rolloff (- 6dB point) at 1 metre.....46Hz
- Voltage sensitivity
(ref. 2.83V or 1 watt into 8ohms at 1 metre).....88.5dB/W
- Approximate maximum sound level (pair) at 2 metres....106dBa
- Impedance characteristic (ease of drive).....good
- Forward response uniformity.....very good
- Typical price per pair, including VAT.....£200



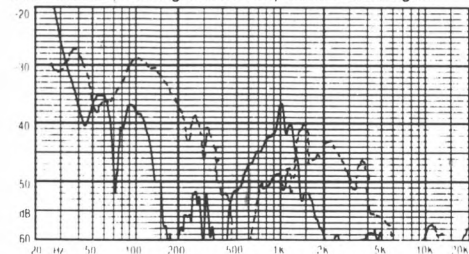
Forward characteristic response (1/2 octave at 2m, dotted 15 vertical, small dash 30 lateral, long dash 45 lateral).



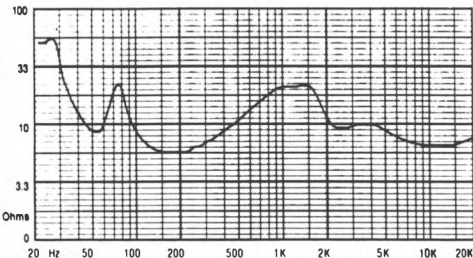
Averaged forward characteristic response in room



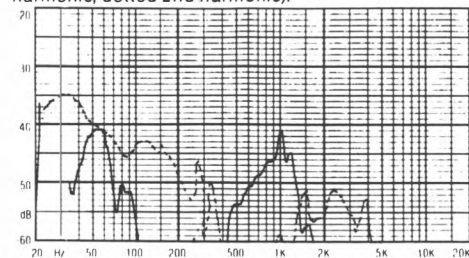
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Spendor Prelude

Spendor Audio Systems Ltd, Unit 12, Station Road Industrial Estate, Hailsham, Sussex BN27 2ER Tel (0323) 843474



Spendor's *Prelude* has now superseded the more expensive SA2 from which it was developed. A vinyl-wrapped chipboard cabinet replaces the veneered multi-ply of the SA2, allowing a cost saving of some 30%, but with overall performance very little changed. For completeness, this review continues to include comparative reference to the SA2.

The 28litre internal volume is reflex-tuned by a large ducted port, 75mm in diameter. The interior of the thinwall enclosures is damped by a bituminous cladding plus an acoustic foam lining. While the SA2 has a superior foam grille, the *Prelude* is fitted with a attractive framed wooden grille, whose acoustic effects can be seen from the response charts.

A Spendor-designed high-power Bextrene-coned bass unit is fitted to both systems, this using a 40mm pole and massive magnet, and built on a strong die-cast frame. The tweeter is a

selected version of the once ubiquitous Audax 25mm soft dome.

A close-tolerance 8 element crossover carries the units at around 3kHz, with electrical connection made by 4mm socket binding posts in the case of the SA2, and less worthy spring connections for the *Prelude*. Both systems are intended for free space positioning on open stands.

Sound quality

Taking the newer *Prelude* first, listening panel scores were very promising and placed it in the 'good plus' category which was a fine result at the price. As with the other Spendor models, the midrange tonal quality and balance was a strong point, with voice and piano reproduced well. Overall frequency balance seemed accurate with a wide smooth response, while the bass was firm, and possessed quite good extension — if slightly bumpy or heavy at times, it was nonetheless low in distortion and high in detail.

Good clarity and detail were evident everywhere except in the lower mid where some cabinet boxiness and 'muddiness' were observed. The SA2 also suffered from this phenomenon though this time the result was an over-rich and almost chesty effect and on this aspect, the *Prelude* was ultimately preferred to the SA2.

Both gave fine stereo images with good staging and focus, plus impressive depth. Mild sibilance as well as a little 'slurring' was however observed in the treble. However, it was obvious that the difference in sound quality was not commensurate with the *Prelude's* lower price.

Lab results

At one metre an above average 88dB/W sensitivity was recorded and the bass was perfectly tuned to rolloff at 48Hz, -6dB.

With a fine 200W maximum power handling the SA2 (and *Prelude*) is capable of a substantial 105dBA sound level in a room, using a stereo pair. Pair matching was itself very good, the two models very similar with the effect of removing the *Prelude* grille shown in the dotted response.

At 2metres the design demonstrated a very even, well-integrated forward characteristic, the overall trend being that of a gentle downtilt with increasing frequency. Limits of ± 3 dB were comfortably met from 55Hz to 20kHz.

In the listening-room computer-averaged re-

sponse the bass was slightly uneven, and mildly prominent at 50Hz. The mid was broadly uniform, with a slight presence dip evident before the treble rolled gently away.

Driven to a 96dB sound level, fine distortion results were demonstrated, averaging 1% at low frequencies and reducing to 0.3% above 500Hz. At 86dB the distortion improved considerably to a very good level for both second and third harmonic.

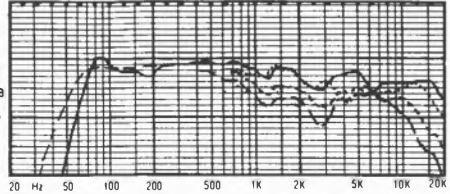
Averaging 13ohms, the impedance fell to a minimum of 6.7ohms in the treble. The system may be happily classed as an easy amplifier load, allowing full use to be made of its good measured sensitivity.

Summary

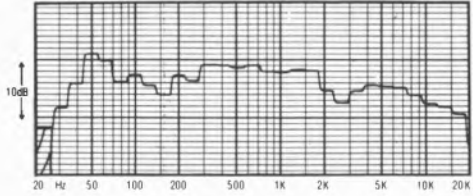
The *Prelude*, at a small sacrifice in cabinet finish achieves much the same performance as that previously attained by the *SA2*, and in the opinion of some may even achieve a better sound. Good sensitivity, smooth natural sound and fine stereo, all at an extremely attractive price, ensure that the *Prelude* is awarded a Best Buy.

GENERAL DATA

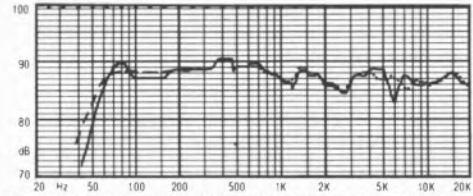
- Size (height x width x depth).....50 x 26 x 28cm
- Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(15)—200W
- Recommended placement.....open stands
- Frequency response, within 13dB, at 2 metres55Hz to 20kHz
- Low frequency rolloff (-6dB point) at 1 metre.....48Hz
- Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....88dB
- Approximate maximum sound level (pair) at 2 metres105dBA
- Impedance characteristic (ease of drive).....very good
- Forward response uniformity.....good
- Typical price per pair, inc VAT.....£250



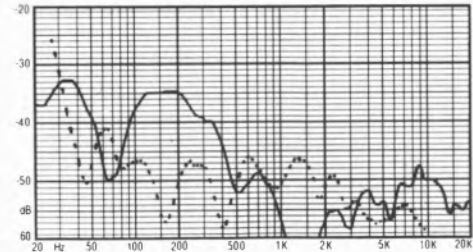
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



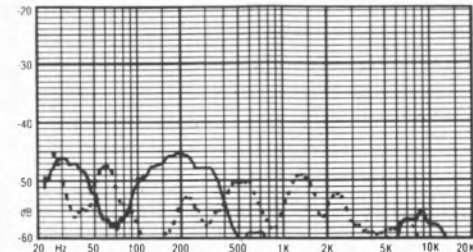
Averaged forward characteristic response in room at listening position.



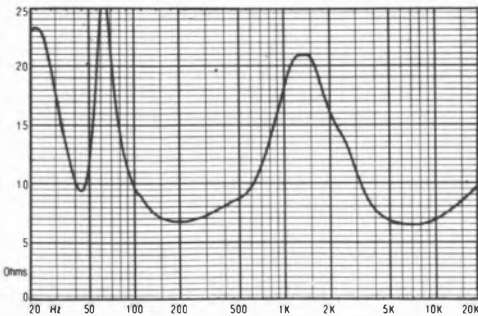
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

Spendor SP2

Spendor Audio Systems Ltd, Unit 12, Station Road Industrial Estate, Hailsham, Sussex BN27 2ER
Tel (0323) 843474



Spendor models have done well over many issues of *HFC*, and a new design from them is usually something of a milestone. With the original *BC1* and its virtual successor the *SP1* well established the company has been researching a less expensive 30 litre alternative for a few years now. The *SA2* came first, to some degree then eclipsed by the superior and cheaper *Prelude*. Now, developed from the *SP1* and sharing that fine model's 200mm polypropylene coned bass-mid unit, we have the *SP2*.

The finely veneered enclosure is critically balanced by an optimum choice of chipboard grade and thickness, the panels bitumen damped internally. This is a reflex loaded design, tuned to 33Hz, and the ducted port is internally damped by a foam lining, this absorbing the energy due to higher resonant modes in the duct.

The crossover uses top quality components and is to third order, imposing 18dB/octave roll-142

offs on the acoustic response, so wide is the available driver overlap. The treble is handled by a special version of the established Scan *D2008* tweeter, a 19mm soft dome offering a superior performance, and in this case, ferro-fluid damped. Electrical connection is via 4mm socket/binding posts. Optimum positioning is in free space, on 40-50cm high stands.

Sound quality

On test the *SP2* achieved a very high-ranking position, only a little behind that of the *SP1*.

Stereo images were well focused, and showed very good width and depth. Well balanced tonally, the response sounded very uniform, though with a touch of softness in the low bass, the latter showing good extension. In the upper mid, a hint of hardness was noted, plus slight wispieness in the high treble.

In the Spendor tradition, the *SP2* offered a highly articulate, detailed midrange. Dynamics were presented well, the system sounding open and relatively uncolored. Just a touch of boxiness was present in the low midrange, but even this was much less than usual.

Lab report

Reference sensitivity was about average at 87dB while the axial frequency response showed a highly uniform characteristic, ± 2.5 dB 50Hz to 15kHz. The bass was well extended, reaching 45Hz, -6dB.

A minimum power rating of 15W was indicated while it coped with up to 150W peak programme, the latter generating decent sound levels of 104dBA from a pair in a typical room. The impedance curve showed an easy load, aiding the sensitivity in amplifier terms.

At 2 metres, the ± 3 dB response was wide at 48Hz to 20kHz, with the set of forward responses showing quite excellent uniformity. A slightly down-tilted response was seen, this typical of subjectively well balanced, compact box systems. In the listening room the speaker showed an even, well balanced characteristic with good power down to 30Hz. Integration was very good.

At the high 96dB sound level, the distortion above 150Hz held to a moderate 0.4%, bar some minor clutter above 100Hz. With level reduced to 86dB, third harmonic averaged 0.25%, second 0.1%, these both fine results.

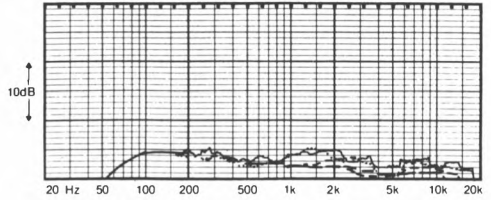
Summary

Spendor now have their compact 30 litre monitor. Offering great consistency and accuracy, it slots in neatly below the *SP1*, conceding little to

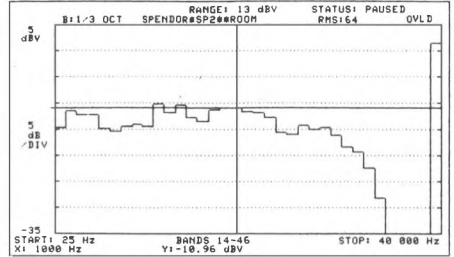
that respected, larger model. With its natural, extended response, low coloration wide dynamic range, easy amplifier loading and very fine stereo, the *SP2* is a class winner and is strongly recommended.

GENERAL DATA

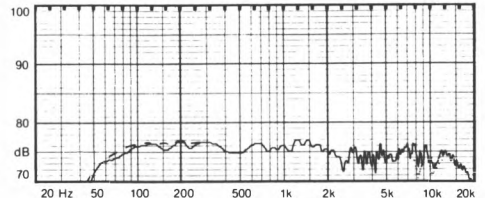
Size (height x width x depth).....50 x 26 x 30cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(15) -150W
 Recommended placement.....rigid open stands
 Frequency response, within ± 3 dB, at 2 metres....48Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....45Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....87dB/W
 Approximate maximum sound level (pair) at 2 metres....104dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....excellent
 Typical price per pair, inc VAT.....£350



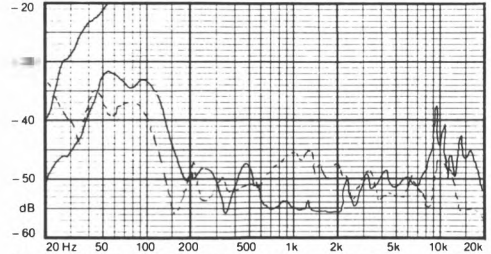
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



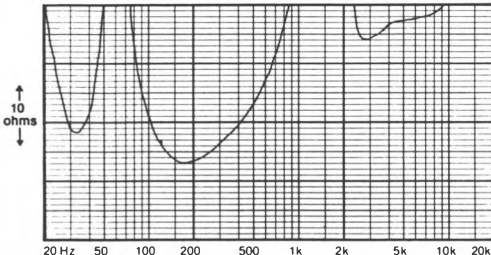
Averaged forward characteristic response in room.



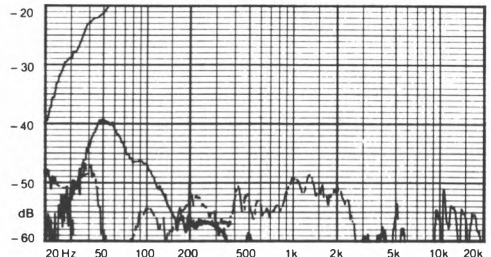
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

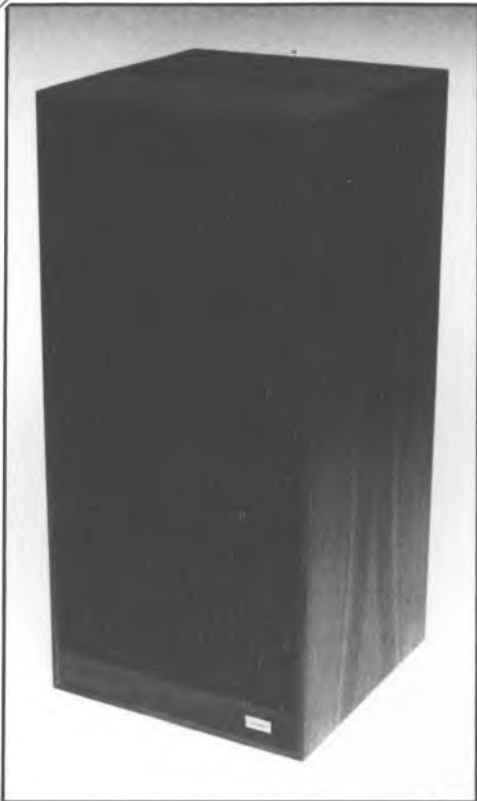


Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

RECOMMENDED

Spendor SP1

Spendor Audio Systems Ltd, Unit 12, Station Road Industrial Estate, Hailsham, Sussex BN27 2ER Tel (0323) 843474



Over the past years Spendor have produced variants on the theme of the legendary *BC1* — for example, the higher sensitivity *BC2* — but none of them have quite captured the subtlety and midrange quality of the original.

While the new *SP1* is built in the *BC1* tradition, it uses a new grade of polypropylene exclusive to Spendor for the bass/mid unit. This 200mm driver has an extensively-developed cone, intended to work with a larger motor system than the *BC1* in order to provide higher sensitivity and power handling. It is built on a die-cast chassis and energised by a massive magnet assembly. The cone is doped by hand, and has its front pole cavity filled by an alloy plug, this attached to the pole face.

Spendor's traditional radiometal cored inductors are used for the high-quality crossover which also employs plastic-film capacitors. Above 3kHz Spendor's own closely selected

version of the Celestion HF1300 dome tweeter takes over, the final half-octave filled in by the Coles 19mm plastic dome unit.

The 44litre enclosure is excellently veneered and is built of thinwall multi-ply, heavily bitumen damped and lined with acoustic foam.

The system is reflex-tuned by a large, offset ducted port and is intended for free space mounting on open stands.

The *SP1*s were initially supplied in a provisional prototype form, but these models were updated with final production samples before completion of the review.

Sound quality

The *SP1* did well on the *HFC* test programme, providing favourable results on analogue material and even better scores using digital masters.

In balance terms it was felt to be tonally accurate with very good reproduction of human voice, showing natural sibilants and character. The frequency response sounded wide and uniform, with good extension, although with a slight excess in output at the lowest frequencies.

Mid coloration was generally low, the treble sweet and clear, while stereo perspectives were well constructed. Frontal focus, width and depth were all well presented.

High sound levels were possible with low apparent distortion and while some mild lower mid plumminess was observed, plus a touch of 'BBC' nasality this was not considered to be very important.

Lab results

Measured at 1metre on axis, the *SP1* delivered a smooth response except for a small 3.5kHz peak (improved later on production speakers). The bass was precisely tuned and well extended to 41Hz, -6dB. Sensitivity measured 87dB/W, a little above average and more than double that of the *BC1* (in decibel terms, an increase of more than 3dB), and pair matching was judged very close. The recommended power input range is 12-150W, and maximum levels of up to 103dB were possible, again rather higher than for the *BC1*.

At 2metres the averaged response was very uniform, meeting ± 2 dB limits for 60Hz to 13kHz. The vertical dispersion was very satisfactory and laterally it proved well above average.

In the listening room the integrated response was very good indeed, and only marred by the slight bass excess noted previously.

Fine distortion results were obtained at 96dB

sound pressure level, measuring around 0.3% above 200kHz and holding to around 0.3% at lower frequencies. With the sound level reduced to 86dB, a substantial improvement to 0.8% or better was recorded at low frequencies, with negligible midrange second harmonic and an average of 0.2% third. These were fine results. The impedance curve averaged 14ohms, with a momentary and pretty harmless dip to 5.3ohms at 20kHz, and the SP1 was therefore classed as a very good amplifier load.

Summary

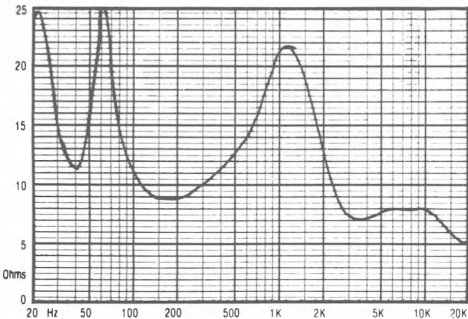
The SP1 has evolved into a subtle and musical sounding performer in the true Spendor tradition. It is expensive, but the good test results go quite some way towards justifying the price. Offering an easy amplifier load plus improved bass power, articulation and clarity, reduced midrange distortion and a higher sensitivity, the SP1 can give a decently high acoustic level. It possesses a clean, neutral tonal balance and should be equally valuable for medium-level monitoring or domestic use.

The SP1 receives a warm recommendation and will probably slowly displace the BC1 from its time-honoured position, especially where master-quality programme reproduction is concerned.

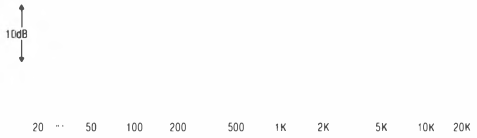
GENERAL DATA

- Size (height x width x depth)63.5 x 29.5 x 30.5cm
- Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(12)—150W
- Recommended placementfloor stand
- Frequency response, within ± 3 dB, at 2 metres45Hz to 20kHz
- Low frequency rolloff (-6dB point) at 1 metre.....41Hz
- Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....87dB
- Approximate maximum sound level (pair) at 2 metres103dBA
- Impedance characteristic (ease of drive).....very good
- Forward response uniformityvery good
- Typical price per pair, inc VAT£540 (Rosewood £636)

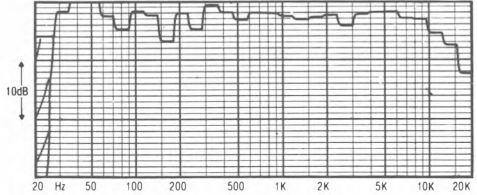
OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.



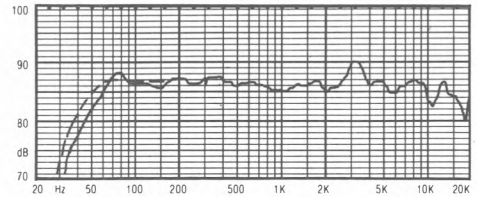
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



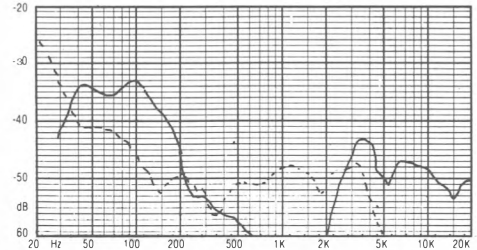
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



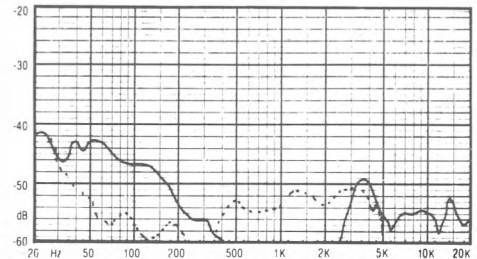
Averaged forward characteristic response in room at listening position.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Tannoy Titan

Tannoy Products, The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks
Tel (0494) 450606



An early *Titan* turned up rather late for the last edition of *Loudspeakers*, and proved somewhat unpromising. However, since then it has been improved and was resubmitted here in full production form.

Built a little like the *Mission 70*, the *Titan* uses rear mounting for its two drivers, with a fixed front grille; access is via the flimsy screwed-in rear panel. The sealed box interior of 9.3 litres is damped by a loose fill of polyester fibre wadding.

The drive units originate from Japan, and include a soft dome treble, plus a 160mm steel frame bass/mid unit, the latter having a light pulp cone. In one sample the tweeter fixings were loose. The crossover has three elements plus a damping resistor and is aiming at 12dB/octave acoustic slopes. Push-on connectors are used, while the rear terminals are 4mm socket/binding posts.

Vinyl covered, the 15mm thick chipboard en-

closure is grooved on the long sides to reduce panel resonance. Optimum placement is near a rear wall and the angled front means that this speaker may be left neatly in the 'straight ahead' position.

Sound quality

Scoring a straight 'average', with little panel dissension, the *Titan* did well for its price group. The sound was described as somewhat 'boxy' with a forward upper midrange plus a bright, moderately ragged top end. On the plus side the speaker also showed a clear, open character with explicit detail, and a 'lively' nature. Low bass was absent, but upper bass was fairly 'quick' and clean.

Lab report

A rising response trend was characteristic of the *Titan*, though this was not extreme, at 4dB from 100Hz to 20kHz, a result expected from a design intended for wall mounting.

Pure sensitivity came out at 89dB/W which was above average, and uncompromised by the impedance characteristic; this happily met the 8ohm standard and thus the *Titan* rated as a very good amplifier load. System resonance was rather high at 90Hz, and from the axial response (nearfield converted at low frequencies) the -6dB bass roll-off was fairly high at 67Hz. With a power input range of 10 to a maximum of 50 watts, realistic maximum sound levels of up to 102dBA can be achieved.

Out at 2 metres, this speaker's forward response balance, seen in the pattern of the off-axis responses, looked well integrated with good uniformity. Pair matching was fairly good, though in the 3-4kHz crossover range up to 2dB difference was noted.

When driven to 96dB sound level, distortion was poorer than average, reaching 3% in the lower frequency range for the relatively innocuous 2nd harmonic. Third harmonic was variable with frequency, up to 0.8% in the midband. Reduced to a moderate 86dB sound level, third harmonic remained the same, while second showed a considerable reduction.

In the listening room the *Titan* gave a forward upper mid with some treble unevenness but a fair overall balance. The bass was smooth and well integrated even if it did decay gently in the lower range.

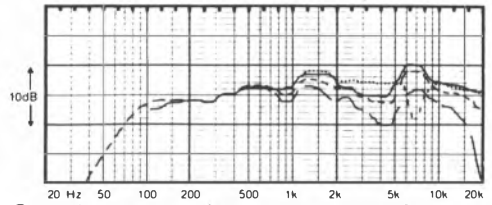
Summary

Apart from the loose tweeter on our sample, the *Titan* did quite well on both lab and listening tests,

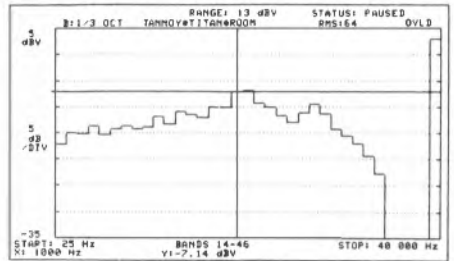
confirming its suitability for shelf mounting. It sounded much better than our early examples, and is now recommended.

GENERAL DATA

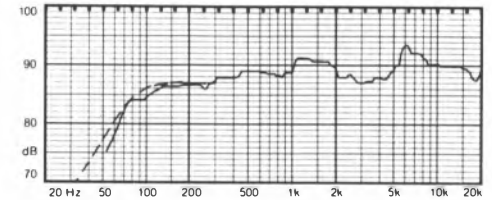
Size (height x width x depth).....41x24x27cm
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(10) -50W
 Recommended placement.....stand or shelf, near wall
 Frequency response, within ± 3 dB, at 2 metres....90Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....67Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....89dB/W
 Approximate maximum sound level (pair) at 2 metres....102dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....fairly good
 Typical price per pair, inc VAT.....£100



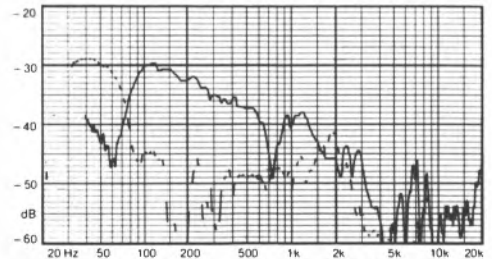
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



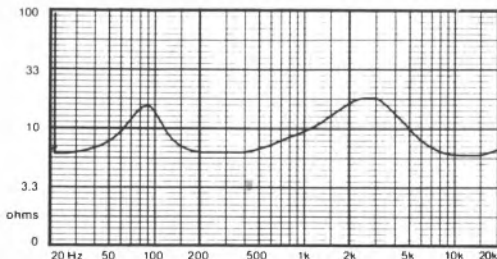
Averaged forward characteristic response in room.



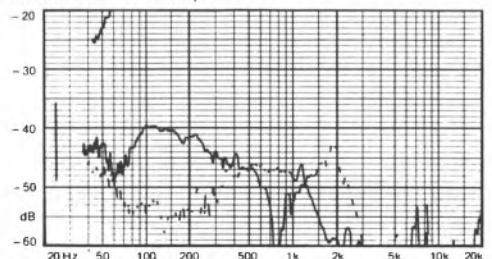
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L F



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Tannoy Mercury

Tannoy Products Ltd, The Bilton Centre, Coronation Road, Cressex Ind Est, High Wycombe, Bucks HP12 3SB. Tel (0404) 450606



The *Mercury* is the smallest of the 'planet' speakers from Tannoy, using their variety of the polypropylene cone plastic which they call 'polyolefin' — a vague-sounding name, though chemically correct! This 19litre enclosure is rigidly constructed from 15mm thick chipboard with a presentable vinyl walnut finish. Bass reflex tuning is employed, the ducted port 50mm in diameter by 70mm deep.

Bass and midrange is provided by a powerful controlled-excursion driver, steel-framed and 200mm in diameter, using a 25mm pole plus a modest magnet. Treble is covered by the popular 25mm soft fabric dome Audax unit, and the crossover is of unusually high quality, employing air-cooled inductors and a plastic film capacitor. 4mm socket/binding posts are used for secure electrical connection, though push-on connectors are used for internal driver wiring.

With a good overall appearance, this system unfortunately has unrebrated 9mm thick grill frame — luckily this is easily removed, which will marginally improve the sound.

Sound quality

The fine panel results bore little relation to this speaker's modest size or price. Rated 'good plus' it was well up in the field, a very promising result indeed.

It was liked for an essentially neutral tonal balance with moderate levels of coloration, but in particular its lively, transparent and detailed nature won it appreciation.

Stereo images were well focused with a fair presentation of depth where appropriate and stereo information was present throughout the range — bass, mid and treble — in a balanced manner. The good quality bass had somewhat limited extension at the lowest frequencies but voices spoke and sang correctly, and the system could convey the natural acoustic present on many recordings.

Some coloration was present but to a mild degree. The usual boxiness, slight featheriness and sibilance in the treble were all evident together with a hint of 'plastic nasality'.

Lab results

Measured at the standard 1metre distance, this Tannoy provided a pretty uniform frequency response, improved a little by grille removal (dotted graph line). Sensitivity was above average at 88dB/W, and not compromised by the impedance characteristic, whose trends suggested that the *Mercury* was a very kind amplifier load. Reasonable bass extension was noted, to 52Hz, -6dB.

In conjunction with the 100W maximum power handling capability, sound levels of up to 103dBA should be possible from a pair.

At 2metres the speaker's good frequency balance was well established, if mildly flawed by the suppressed treble lump at 14kHz. This speaker proved to be somewhat axis-critical in the vertical plane, both plus and minus 15° off-axis responses showing a 4kHz dip, so the speaker should be positioned to face the listener's head, and mounted on a reasonably high stand to give the best sound. Fine results were obtained off-axis in the lateral plane.

Room averaged, its basic character was plain to see, with a smooth well controlled output shown over most of the range. Bass was reasonably extended and in good balance with the uniform midrange.

At 96dB sound level, distortion was good in the important midrange and about average at lower frequencies, peaking to 8% second harmonic at 100Hz which is probably just audible as a bass tonal quality change. Third harmonic was rather better, this in any case arguably the more important result, averaging 0.2% at both 96 and 86dB spl. At the lower level second harmonic also showed a great improvement attaining a very fine level.

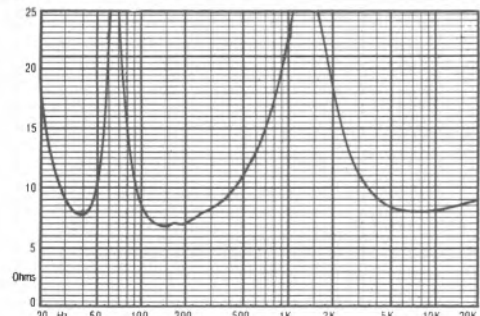
Summary

Tannoy have an undoubted winner in the *Mercury*. If treated like a big speaker and mounted on stands clear of room walls, a highly satisfactory sound was obtained, with fine detail, clarity and stereo image presentation. Essentially neutral and vice-free, the *Mercury* was usefully sensitive and easy to drive, fully deserving its Best Buy rating. This system will do good justice to some surprisingly expensive ancillary equipment!

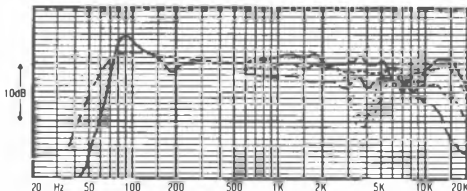
Reaconditioned for the new edition, the *Mercury* virtually maintained its previous placing in the listening tests and it happily survived the competition from the newer introductions in its price bracket. With the grilles removed and the cabinet 'toed in' for the axes to cross ahead of the listener, we still rather liked this model, and the Best Buy rating is confidently maintained.

GENERAL DATA

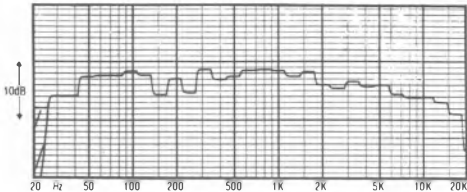
Size (height x width x depth)..... 48 x 26.5 x 23cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres).....(12)—100W
 Recommended placementopen stands or shelf
 Frequency response, within ± 3 dB, at 2 metres53Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....52Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into Bohms at 1 metre).....88dB
 Approximate maximum sound level (pair) at 2 metres103dBA
 Impedance characteristic (ease of drive).....excellent
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£145



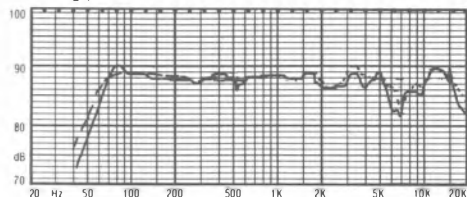
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



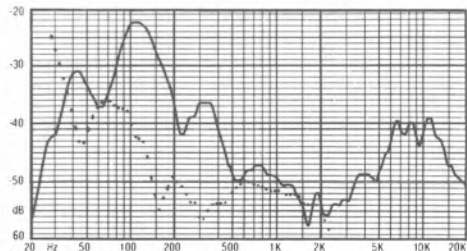
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



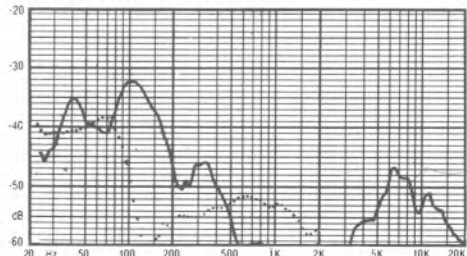
Averaged forward characteristic response in room at listening position.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Tannoy Venus

Tannoy Products Ltd, The Bilton Centre, Coronation Road, Cressex Ind Est, High Wycombe, Bucks HP12 3SB. Tel (0404) 450606



Tannoy's *Mercury* is an established 'Best Buy' speaker, and so for this edition we have also tested the *Venus* model; in a higher price and quality category, the *Venus* is similarly sized, though with an internal volume of around 30 litres as against the *Mercury's* 19 litres, and comes in a real walnut veneer finish. It has a substantial 6cm diameter and 6cm deep port, this reflex tuning the enclosure to 48Hz.

Both drivers are made by Tannoy and comprise a 25mm plastic dome tweeter with a 210mm bass/midrange. The latter has a generous magnet, the whole being built on a steel frame with critically flared polypropylene cone.

The sturdy enclosure is built of 19mm chipboard, bitumen damped with interior absorbent. The drive units are 'time aligned', in that the treble signal passes through a time delay network to synchronise it with the

midrange, while the crossover is a basic 12dB/octave type; including the time delay network, a total of 16 elements are employed. The 9mm thick grille panel is unrebated and is probably best left off to get the best results. 4mm socket/binding posts are fitted for electrical connection.

Sound quality

Scoring a substantial 'good plus' the *Venus* has done well on audition. It was felt to be well balanced, with an extended wide range response, with a touch of bass excess. Coloration was comparatively low, while the sound was considered 'open' although it stayed 'sweet'. A touch of grain was occasionally noted in the treble.

The stereo imaging was fine, the speaker demonstrating good perspectives with fine depth and ambience as well as good focus and stage width. Coloration was comparatively low with just a touch of 'plastic cone' and some mid boxiness. It handled high sound levels well, surviving a respectable 300W peak programme and it still sounded civilised and well controlled.

Lab report

This speaker demonstrated an average sensitivity of 86.5dB/W. Low frequency rolloff was at 47Hz, good for the size and price, while pair matching was also good, with just an absolute difference of just 1dB overall. The axial response was quite smooth, and better still with the grille detached. A mild downtilted response was indicated, the overall trend meeting ± 2.5 dB limits from 50Hz to 20kHz, grille detached.

With a 200W power handling maximum sound levels of 104dB should be possible from a stereo pair, particularly as the impedance does not fall below 6.4 ohms, allowing an 8 ohm rating for this well balanced design. Driven to 96dB, distortion was higher than expected, though still mainly innocuous: second harmonic. At a reduced 86dB level, it improved to a satisfactory level. The compression test was well handled, with 1.7dB of loss and a fine -46dB figure for intermodulation.

Out at 2 metres, the forward response family showed excellent integration with the benefits of time alignment fully realised. This was as perfect a medium-sized two way as I have seen.

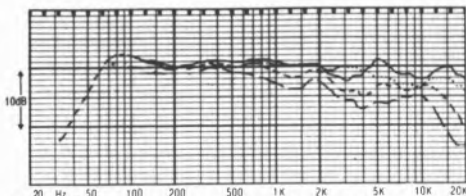
Charted by computer integrated responses in the listening room, the *Venus* showed some low frequency excess plus a fairly well balanced mid band, a mild presence loss, leaving the 4-4kHz range a trifle exposed. ± 4 dB limits were possible from 25Hz to 8kHz, a good result.

Summary

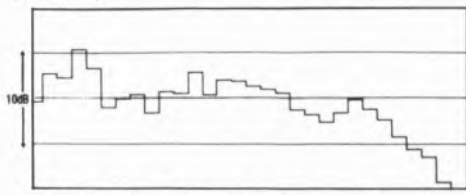
Smooth and sweet was the panel's impression of this well finished and carefully built loudspeaker. It does most things pretty well and is also easy to live with. Its subtlety and good stereo pleased the panel, whose scores suggest that Best Buy rating is appropriate here.

GENERAL DATA

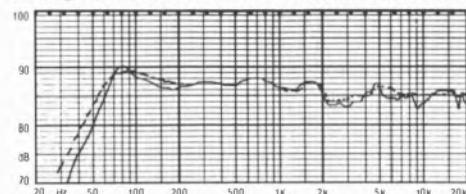
Size (height x width x depth).....53 x 30.5 x 27cm
 Recommended amplifier power per channel
 (for 96dB/A per pair at 2 metres minimum).....(15)—300W
 Recommended placement.....on open stands
 Frequency response, within ± 3 dB at 2 metres.....48Hz-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....47Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....86.5dB/W
 Approximate maximum sound level (pair) at 2 metres....106dB/A
 Impedance characteristic (ease of drive).....very good
 Forward response uniformly.....excellent
 Typical price per pair, including VAT.....£270



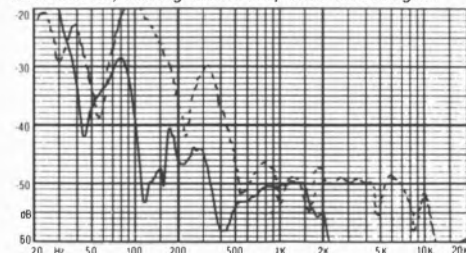
Forward characteristic response (1/2 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



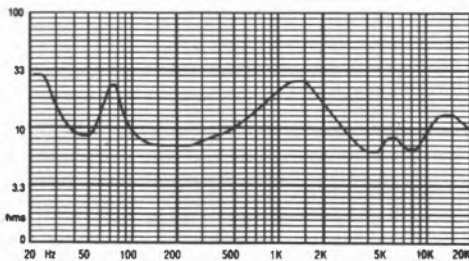
Averaged forward characteristic response in room



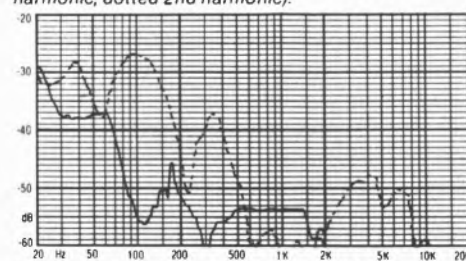
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Toshiba 33ES

Toshiba (UK) Ltd, Toshiba House, Frimley Road, Camberley, Surrey
Tel (0276) 62222



Toshiba have the British-designed 33es built and tested at the UK cabinet factory responsible for the enclosure, which makes for a useful saving in transport costs as well as one less mark-up to be taken into consideration.

A moderate sized 22 litre sealed box, the plain, 15mm thick chipboard enclosure is well finished on all frontal surfaces in a 'rosewood' vinyl. The grille baffle is also 15mm thick, unrebrated and is best left detached for more serious listening. Large enough for stand mounting, it suits a free space position in the room, not too close to the rear wall.

The 200mm steel framed bass-mid drive unit is by the British firm Elac, with a nicely flared, doped pulp cone. Treble is handled by a Tonegen 25mm soft dome with the crossover essentially to a third order 18dB/octave alignment. Connection is via spring clips and the internal wiring is achieved using push-on connectors. The

cabinet panels are undamped while the interior has a loose lay of fibre wadding for internal standing wave absorption.

Sound quality

Remarkably, the 33 scored 'above average', which is excellent for the price. The mid-band was essentially good with quite good balance and above average detail. The same was true of the stereo depth effect and it also focused quite well. The overall effect was quite well balanced though with a distant upper mid. By contrast, the bass was a bit slow and undynamic, while the treble showed some isolated 'hiss'; it was not perfectly integrated with the rest.

Some colorations were present, notably a boxy thickening in the low mid, but this was not too serious.

Lab report

Measured at the reference one metre on the median axis, the 33es demonstrated an average 86dB/W sensitivity. This was not compromised by the impedance, which rated as a very good amplifier load, and conformed to an 8 ohm characteristic.

System resonance was at 73Hz, typical for the type, the loading never falling below 6.2 ohms while the bass response extended to a low 49Hz, -6dB. With a 15 watt programme minimum power input, this model proved quite happy on up to 75 watts peak programme, proving capable of maximum sound levels of 100dBA.

Pair matching was very good, with the reference responses portraying a recessed mid and a balanced but isolated treble range. Out at 2 metres, the family of off-axis responses showed that the median axis was not ideal and that an above axis angle was superior. In fact if used on fairly low stands and directed straight ahead the response is at an optimum. The forward response set was classed as 'fairly good'.

In-room, the substantially favourable result (slight treble excess) confirmed the extended, controlled sound as heard by the panel.

At 96dB sound level the distortion was satisfactory at low frequencies and improved above 200Hz, here averaging 0.3 to 0.4%. By 86dB, good distortion levels were established throughout the range.

Summary

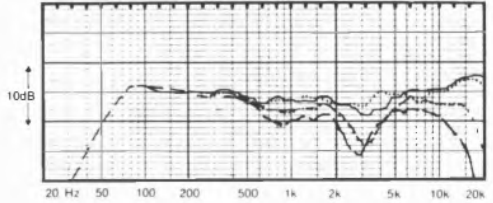
This is a lot of speaker for the money. With a classic 'UK sound', the 33es sits very comfortably in a highly competitive field. Its performance was nicely balanced as regards both listening and lab

test results, and offers very good value for money — an easy qualifier for Best Buy status.

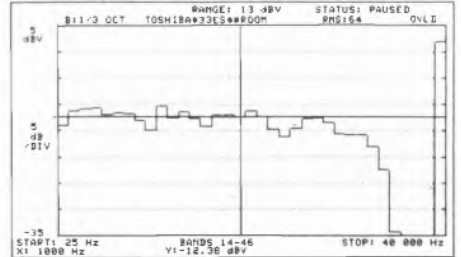
(Note: The '33es will soon be replaced by a 'Mk 2' version in a slightly smaller, lower-coloration box. First reports indicate better integration and a more articulate midband. Price is expected to remain under £80.)

GENERAL DATA

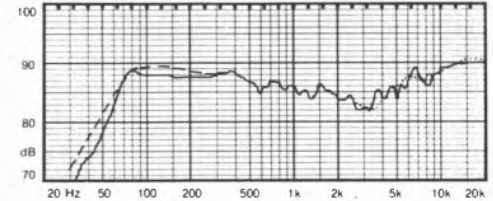
Size (height x width x depth).....54 x 29 x 23cm
 Recommended amplifier power per channel
 (for 96dB minimum per pair at 2 metres).....(15) – 75W
 Recommended placement.....open stands
 Frequency response, within ± 3 dB, at 2 metres...55Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....49Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....86dB/W
 Approximate maximum sound level (pair) at 2 metres...100dB
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....fairly good
 Typical price per pair, inc VAT.....£80



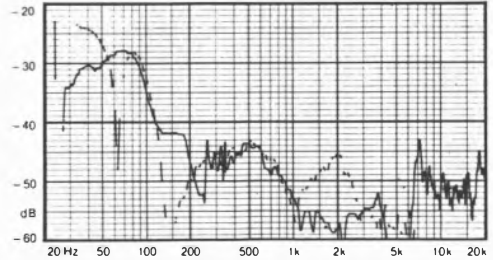
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral)



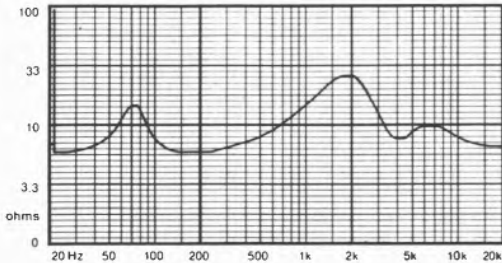
Averaged forward characteristic response in room.



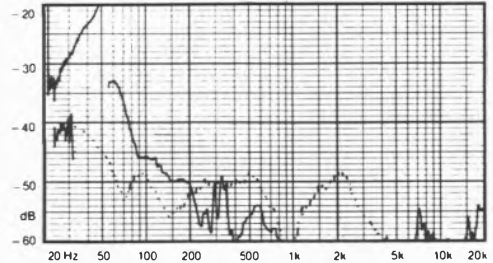
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

BEST BUY

Wharfedale Diamond II

Wharfedale Loudspeakers Ltd, Sandeas Way, Crossgates, Leeds LS15 8AL
Tel (0532) 601222



The *Diamond* was born out of the *TSR102* project, which resulted in and the development of an appropriate small, long throw bass/mid driver with a modern polypropylene cone. While two are used in the *'102*, the *Diamond* has only one, its tiny 5.2 litre volume reflex-loaded by an equally small ducted port 30mm in diameter by 65cm long, this positioned on the rear panel. The bass alignment is in fact 5th order since a large series capacitor is also used.

The 120mm bass unit is built on a steel frame, with treble allocated to the 19mm Son Audax plastic dome/cone tweeter. The crossover is very simple, comprising just two elements plus an attenuating resistor for the treble.

Built from plain 12mm thick chipboard, vinyl coated, the cabinet has a 12mm thick unbraced grille, and spring clip terminals are

provided on the rear panel for electrical connection.

Sound quality

For the price the *Diamond* did reasonably well but its absolute rating on the listening test was not too promising, with a well below average score. The panel results were confusing, some listeners liking this speaker fairly well while others considered it to be too weak for serious attention.

Almost all the panel recognised it as a small box, and it was criticised for 'boxy' coloration as well as a thinned midrange, and an uneven treble which tended to emphasise background hiss. The bass was soft and weak though reasonably balanced and extended, in fact more so than one would expect. Positioned close to the wall it managed to produce a fairly big sound though depth effects were fairly muted. Left to right imaging was fairly good.

Some merit definitely lurked within, and once one had become accustomed to the sound, it began to make its own impression quite respectable for the size and price.

Lab report

Pair matching was fine to 2kHz, but poor thereafter with up to 4dB of mismatch. This could well account for the just passable stereo focus. Reference sensitivity averaged 86dB/M taking into account normal wall mounting. The bass -6dB point was rather high at 74Hz, which was not unexpected in view of the size of the speaker. The reference axial response was uplit, and the irregularities in the upper range were partly the responsibility of the grille (better detached) as well as the lack of crossover for the bass unit, this notching the treble response in a variable manner at 13kHz.

Out at 2 metres, these effects are smoothed out with the analysis averaging, but the lump quality remained. The 100Hz to 20kHz range required ± 4 dB limits, although the family of forward responses were quite good.

Driven to 96dB sound level, the distortion was unacceptable; typically 3% of second harmonic and 1% of third. At the reduced 86dB level, a moderate improvement occurred though the third harmonic still did not improve much in the midrange. It survived the compression tests with a poor 3.5dB of loss and -19dB for the intermodulation product.

The impedance curve did not fall below 6

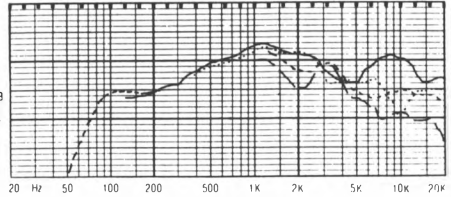
ohms, and the *Diamond* can be regarded as a safe 8 ohm type amplifier load. Out in the room the averaged forward response clearly showed the speaker for what it was, a seriously midrange-forward design. Bookcase mounting will help but will not entirely solve this aberration.

Summary

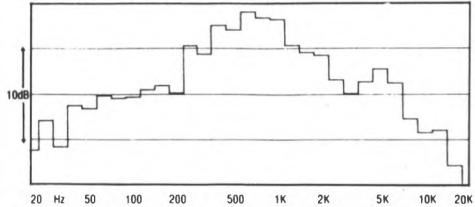
An interesting and inexpensive miniature, as originally tested the *Diamond* appealed to some panelists; but conversely others could not get on with it. Limited in power handling as well as bass, it did not stand up well to the speakers from the next price group up. However, new *Diamonds* were supplied just in time for auditioning in the 1985 test programme. The mid/treble range was now better integrated and resulted in a more natural tonal balance, the speaker achieving better scores than before. Still competitively priced, the model now achieves Best Buy status.

GENERAL DATA

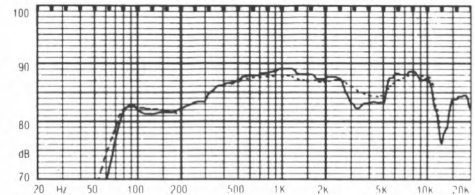
- Size (height x width x depth).....24 x 18.5 x 20.5cm
- Recommended amplifier power per channel
(for 96dBa per pair at 2 metres minimum).....(15)—50W
- Recommended placement.....15cm from rear wall
- Frequency response, within ±3dB at 2 metres.....see text
- Low frequency rolloff (-6dB point) at 1 metre.....74Hz
- Voltage sensitivity
(ref. 2.83V or 1 watt into 8ohms at 1 metre).....86dB/W
- Approximate maximum sound level (pair) at 2 metres.....98dBa
- Impedance characteristic (ease of drive).....very good
- Forward response uniformity.....good +
- Typical price per pair, including VAT.....£80



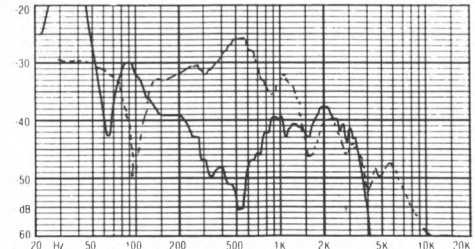
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



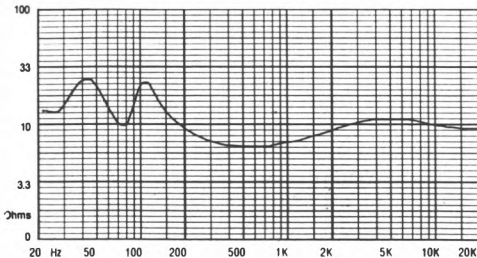
Averaged forward characteristic response in room



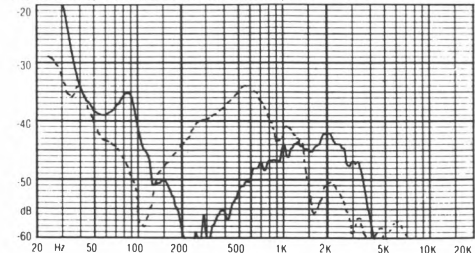
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber LF, dotting shows response without grill.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

RECOMMENDED

Wharfedale 506

Wharfedale Loudspeakers Ltd, Sandless Way, Crossgates, Leeds LS15 8AL
Tel (0532) 601222



Least expensive of a new Wharfedale speaker range, incorporating their advanced 19mm aluminium dome tweeter, is the 506. It is a compact sealed box enclosure with an internal volume of 18 litres. A three way design, the 200mm bass/midrange driver is a flared pulp cone unit with a critically selected surround termination. Wharfedale's new 'building' system is used, together with their lock-in die cast chassis. The tweeter has already been mentioned, and the two drivers are married at 3-4kHz by a good quality nominally 18dB/octave crossover.

As one might expect, the finish is a walnut vinyl with a dark grille, the latter a thick unrebrated structure and for more serious listening it is probably better detached (as we did with this and other models of questionable grille design).

This system is tuned to 48Hz at third order, via a large series capacitor. Aside from the grille, the enclosure is superior in design and while built

from plain chipboard is well reinforced by the recessed back panel technique as well as a circumferential internal brace.

Sound quality

Scoring above average, the 506 did quite well in this category. Tonally speaking its character tended to dullness, the sound rounded and rich in the lower range, tending to sweetness. In the upper bass it was very tidy but extreme bass was rather attenuated.

Some boxy coloration was noted, with a mildly 'thickened' effect but conversely the speaker remained subtle and smooth throughout the frequency range.

Stereo images were well focused with fair depth, particularly in the treble, the latter proving to be of very fine quality. It scored better on the classical than the rock sections, and produced exceptional bowed string tone.

Lab report

The reference response showed an average sensitivity of 87dB/W. A minimum power of 15W was indicated, while inputs of up to 75W were happily dealt with allowing maximum sound levels of up to 102dBA from a stereo pair in a typical room.

With the grille off (solid curve in this graph) the axial response was pretty uniform. Very smooth to 2kHz, it was well controlled thereafter with a mildly depressed treble range. At 2 metres it met ± 3 dB limits over a 58Hz to 15kHz range with a -6dB low frequency limit of 55Hz which is typical for the size. In the forward region the family of off-axis responses looked very tidy, particularly in the lateral plane. At 15° above axis a crossover notch developed indicating that the speaker's median axis should be near ear level for the seated listener. The smooth forward trend was also seen in the computer averaged room response where the mid treble energy relation was near ideal. This curve also showed the noted loss of low bass and a tendency for mid forwardness.

Driven to a 96dB sound level, distortion was fine above 100Hz, and satisfactorily controlled between 50Hz and 100Hz. The second harmonic 'glitch' at 22kHz related to the high 44kHz dome resonance. By 86dB distortion had improved to a good level, consistent through the range. The impedance fell to 5 ohms, 8kHz, and the 506 was rated as a basically 'good' amplifier load.

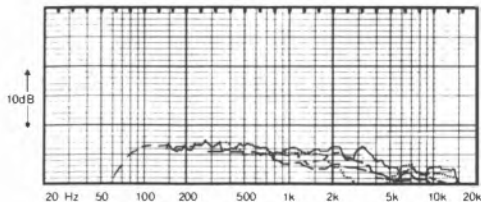
Summary

This inexpensive model provided a tidy and well controlled sound with a laid back, effortless

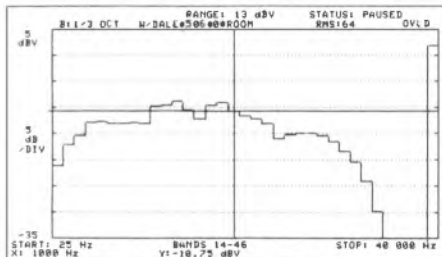
treble. With a first rate input it offered a subtlety out of its class, but may be too 'sweet' for an inexpensive turntable cartridge combination. A good dealer will cover such considerations however and setting these aside, the 506 was a fine loudspeaker which can be warmly recommended.

GENERAL DATA

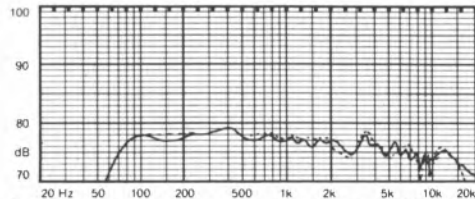
Size (height x width x depth).....47.6 x 26.4 x 22.5cm
 Recommended amplifier power per channel (for 96dBA minimum per pair at 2 metres).....(15) - 75W
 Recommended placement.....on stands, possibly near wall
 Frequency response, within ± 3 dB, at 2 metres...58Hz to 15kHz
 Low frequency rolloff (-6dB point) at 1 metre.....55Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....87dB/W
 Approximate maximum sound level (pair) at 2 metres...102dBA
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....very good
 Typical price per pair, inc VAT.....£120



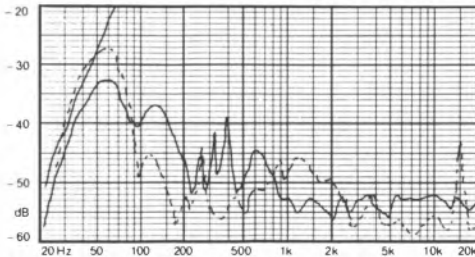
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral)



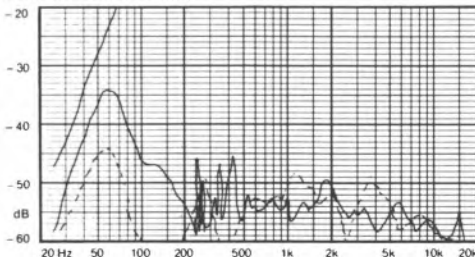
Averaged forward characteristic response in room.



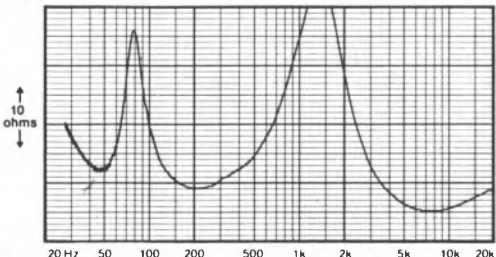
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.

BEST BUY

Wharfedale 508

Wharfedale Loudspeakers Ltd, Sandieas Way, Crossgates, Leeds LS15 8AL
Tel (0532) 601222



In several respects the 508 could be considered as an 'economy' version of the more expensive 708. The same new-technology aluminium dome tweeter is used for both models; this is a 19mm diameter driver with ferrofluid coil damping/cooling. Furthermore a similar polypropylene flared cone 200mm bass unit has been fitted. Both drivers use the 'build ring' system for the motor assembly plus a diecast frame with a bayonet lock fitting directly to the enclosure.

The crossover network conforms to 12dB/octave second order design with good quality components. Standard 4mm socket binding posts are provided for electric connection.

Built of 'walnut' vinyl covered chipboard, this 17 litre sealed box is reinforced by a substantial circumferential brace and has better than average coloration. The system resonance is at 61Hz promising good bass extension when used in a real room.

Good as the enclosure construction is, the grille baffle was a thick unrebrated section, which we removed for the listening tests.

Sound quality

Scoring consistently well for the price, the 508 was well liked by the panel. Good bass extension was confirmed while the upper bass was free from overhang or 'boom'. Tonally it tended to 'richness' as did the 506 with a sweet somewhat distant treble. The main mid register was a touch thickened and forward by comparison. It handled power well, retaining its generally good clarity level and pleasing stereo focus. Colorations were mild and generally of the boxy variety but did not conceal its ability to convey fair depth as well as a favourable impression of the recorded acoustic. The treble was devoid of the usual grain or wispieness and was also kind to programme distortion.

Lab report

With a slightly below average sensitivity, assessed at 86dB/W, the 100W power handling will allow maximum sound levels of up to 102dBA. A stereo 15W represents a sensible minimum input power. The -6dB rolloff was at 52Hz, and the 508 provided a smooth reference response with no bass 'boom'. The lower mid was dominant the output decaying gently above 800Hz, and a smoother treble resulted when the grille was removed.

Out at 2 metres, the forward response set showed an exactly integrated set of on and off axis curves, these confirming its generally uniform character. Here ± 3 dB limits were met from 53Hz to 20kHz.

In the listening room, the bass was extended but showed some loss from 60-80Hz due to the early shallow bass rolloff. This left the mid and treble dominant while the upper frequency range was excellent. Impedance was basically 8 ohms, but did fall to 5 ohms at 10kHz — almost 1.5 ohms below the minimum of 6.4 ohms specified for a nominal '8 ohm' load. The loading was classed as 'good'.

At 96dB the distortion was very good above 500Hz at around 0.2% for second and third harmonics, while below 500Hz 1% was nearer the mark, which is still more than satisfactory. By 86dB however very good distortion results were obtained.

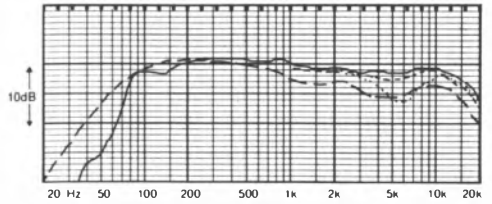
Summary

This fine middle-priced compact offered a smooth civilised sound with good frequency response

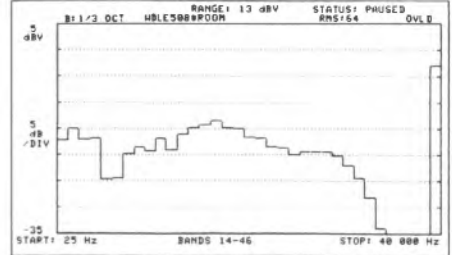
extension. The stereo performance was a strong point and recorded acoustics were well read. Coloration was moderate, power handling fine and the forward response uniformly was exceptional. All in all, a Best Buy rating is appropriate here.

GENERAL DATA

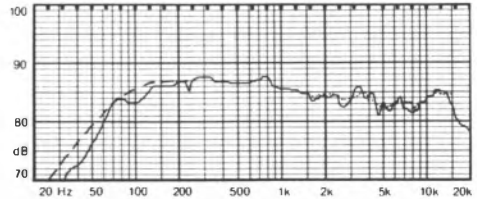
Size (height x width x depth).....54 x 28 x 24cm
 Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres).....(15) -100W
 Recommended placement.....on rigid stand, free space
 Frequency response, within ± 3 dB, at 2 metres...53Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....52Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....86dB/W
 Approximate maximum sound level (pair) at 2 metres....102dB
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....excellent
 Typical price per pair, inc VAT.....£160



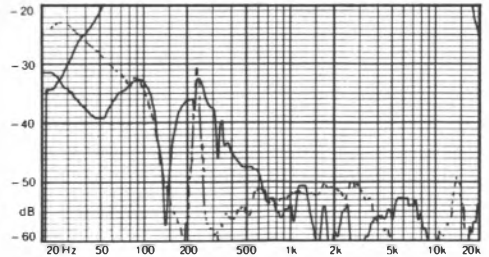
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



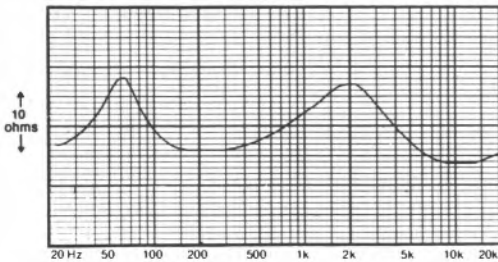
Averaged forward characteristic response in room.



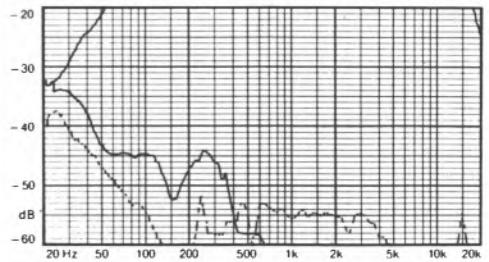
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



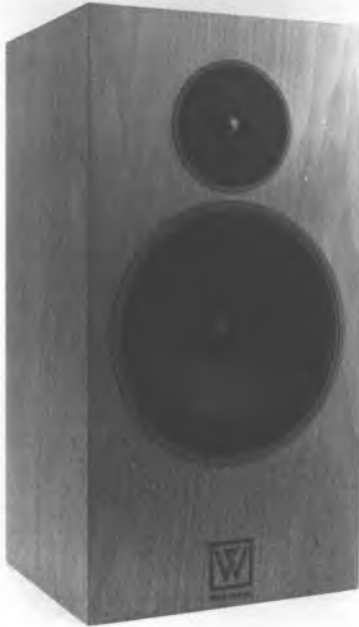
Impedance (mod Z), Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Wharfedale 708

Wharfedale Loudspeakers Ltd, Sandieas Way, Crossgates, Leeds LS15 8AL
Tel (0532) 601222



A high-quality compact design, this loudspeaker heads in the direction of the Celestion *SL6*, with some of the technology of the *600* thrown in as well.

Wharfedale use a 200mm unit for the main driver, this covering bass midrange up to a few kHz. Built on a self-locking diecast chassis, the motor coil 'build ring' is employed in its construction to aid consistency and aid assembly. The cone is of polypropylene with a flared contour and a synthetic surround termination.

A 12dB/octave crossover divides the range, feeding the higher frequencies to the 19mm alloy dome tweeter. This new Wharfedale unit gives an exceptional response, free from breakup until its first upper resonance at about 45kHz.

The enclosure is very light and non-resonant, built of a 25mm thick foam-cored sandwich with melamine laminate outer skins. The entire volume of 14 litres is filled with highly absorbent acoustic

foam to reduce sound transmission from within the enclosure to the outside. Electrical connection is by projecting 4mm socket binding posts. The box is fully finished on all sides, and does not use a grille.

Sound quality

Scoring favourably on blind auditioning, the sound quality of the *708* matched its price. Coloration in the traditional sense was very low, though some residual panel-associated 'warmth' was evident in the lower mid range.

Stereo focus was to a high order with good representation of depth and ambience. Tonally it was accurate, if a touch rich, and musically proved capable of representing the scale and tonal balance present in the recording.

A good frequency range was observed with fair bass present to low frequencies. The upper bass was firm and played tunes well while the treble was limpid, smooth and unexaggerated. Decent power levels were handled well with good clarity and dynamics.

Lab report

Measured at 1 metre the axial frequency response gave a below average 85dB/W sensitivity. Given a generous power handling of up to 150W, satisfactory maximum sound levels of 102dBA were within reach. A minimum power of 25W per channel is our suggestion. The bass rolloff was 54Hz, -6dB, which is average for the size, but it was nicely damped.

On the median axis, the response showed some ripples from 5-7kHz, this somewhat variable with axis as the 2 metre family of responses showed. When average at this latter distance the *708*'s output looked good in the lateral plane but dipped sharply in the crossover range at 15° above axis. Clearly a decent stand height is essential, 40-55cm. A 60Hz to 15kHz frequency range fitted ± 3 dB limits, the overall effect being smooth, and gently downtilted with increasing frequency.

At 96dB sound level, very good distortion was obtained above 400Hz, rising to 3% at low frequencies. By 86dB the distortions at low frequencies were down to 0.3% and still less was obtained in the upper range. Not falling significantly below 6 ohms, this speaker was classed as a relatively easy amplifier load. In room, the response was extended with good upper range control. Some mid dominance was evident however.

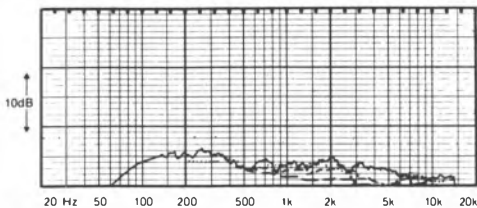
Summary

Wharfedale have a respectable achievement in the

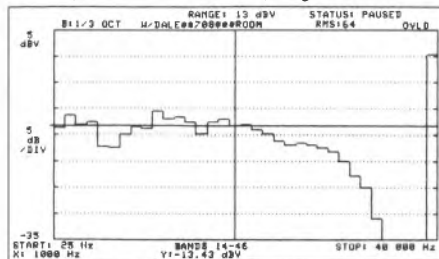
708. Offering a fine stereo performance it has a 'classical' tonal balance, ideal for free space mounting on high quality stands. In its price class the value rating on lab and listening tests indicated a strong 'worth considering' verdict though I now feel it should be in the recommended class on grounds of its relaxed musicality.

GENERAL DATA

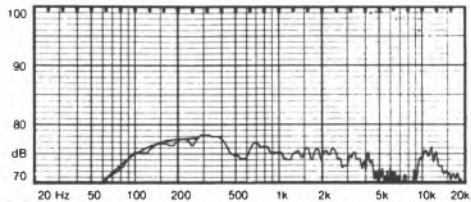
Size (height x width x depth).....49x25.5x22cm
 Recommended amplifier power per channel
 (for 96dBa minimum per pair at 2 metres).....(25) -150W
 Recommended placement.....on stands
 Frequency response, within $\pm 3\text{dB}$, at 2 metres...60Hz to 15kHz
 Low frequency rolloff (-6dB point) at 1 metre.....54Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre).....85dB/W
 Approximate maximum sound level (pair) at 2 metres...102dBA
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....good plus
 Typical price per pair, inc VAT.....£350



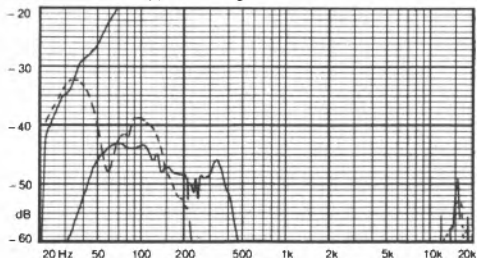
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



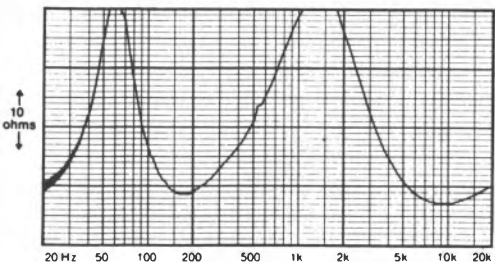
Averaged forward characteristic response in room.



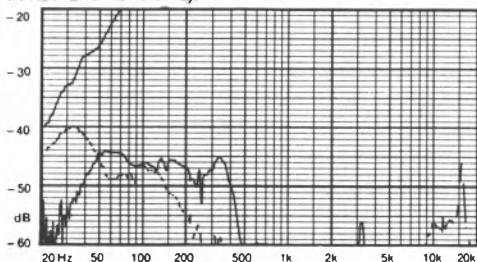
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Yamaha NS200

Natural Sound Systems, 7 Greycaine Road, Watford, Herts WD2 4SB
Tel (0923) 36740



The *NS200* is a recent example from Yamaha's currently extensive speaker range. No baby, its 35 litre sealed box volume is driven by a 270mm frame diameter bass unit founded on a massive diecasting. The system resonance was well damped at 58Hz, which in-room gave good extension to 35Hz due to the slow rolloff.

In this three way design, the mid is handled by a 60mm metal diaphragm, a combined dome/cone unit, with the treble allocated to Yamaha's established 25mm beryllium dome design, long fitted to the *NS1000*. The high quality crossover network is essentially to second order pattern.

Substantially built of 20mm thick, black ash vinyl finished chipboard, the cabinet incorporates computer-optimised internal bracing and reinforcement. The grille baffle is a deep moulded structure, unfortunately lacking the side window slots necessary to reduce the resulting acoustic obstruction in the off axis directions.

Sound quality

Receiving a mixed reception, this model was liked by some panellists while others were more critical, favouring some aspects but remaining aware of other flaws.

The general impression was of a big box, but with a pinched nasal effect to the midrange, the latter helping on percussion but spoiling voice sounds. The treble sounded grainy and uneven, and while the speaker could focus well, depth and ambience were only heard in certain parts of the frequency range. In this respect its performance was uneven and the marks varied noticeably between different test programmes. Overall, the sound was quite lively and dynamic with excellent power handling and an incisive clarity. The bass was solid and powerful.

Lab report

High sensitivity characterised this speaker, which measured almost 92dB/W at 1 metre, way above average. This was barely compromised by the impedance response which touched the 5 ohm level at a couple of points but basically averaged 7 ohms and rated as a 'good' load.

With a generous 150W power handling, high peak sound levels were possible, up to 108dB/A for a pair in room. As little as 10W would produce surprising sound levels. The -6dB bass rolloff was a well damped 53Hz while pair matching was also very good. On axis, the output was very uniform especially with the grille detached though a small lift at 500Hz was evident.

The 2 metre response was more helpful in that it showed the 'hump' more clearly, and also the relatively depressed mid and treble, the latter peaking somewhat at 16kHz. In the vertical plane the speaker notched at the upper crossover frequency, so a decent stand height is worthwhile to bring or angle the mid unit onto the listening axis.

At 96dB sound level, the distortion was generally very good, this despite a rise at 400 to 500Hz to 2% of 2nd harmonic. This improved at a 86dB sound level, while over the rest of the range the distortion was very good, under 0.1% (that is, -60dB), about 1kHz.

In the listening room, the averaged response showed good bass extension and a fair overall balance though with some prominence in the mid and presence range. Furthermore, the final treble 'corner' at 16kHz was a little sharp, which effect is often associated with treble 'grain'.

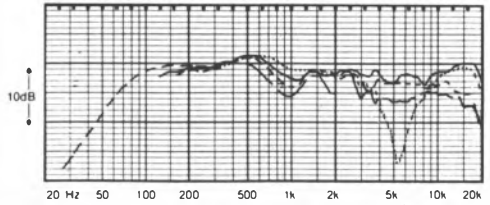
Summary

This speaker possessed some interesting

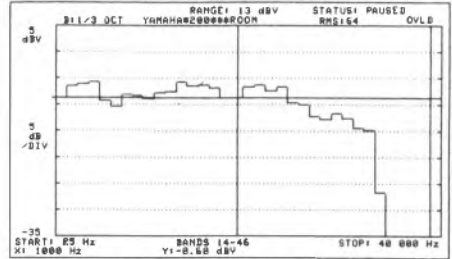
qualities. Capable of high sound levels, it could find some application for the rock user where its good power handling and low distortion plus good percussion sound are advantages. On the classical side, its below average scoring reflects its uneven temperament and by *HFC* standards, this bars it from recommendation.

GENERAL DATA

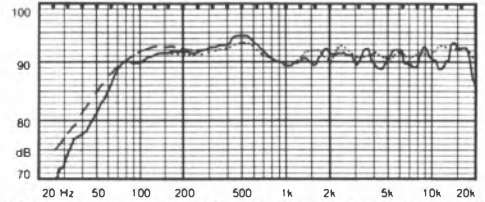
Size (height x width x depth).....55.5 x 32 x 33cm
 Recommended amplifier power per channel (for 96dB minimum per pair at 2 metres).....(10) - 150W
 Recommended placement.....open stands
 Frequency response, within ± 3 dB, at 2 metres....65Hz to 20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....53Hz
 Voltage sensitivity (ref. 2.83V, or 1W into 8ohms at 1 metre).....91.5dB/W
 Approximate maximum sound level (pair) at 2 metres....108dB
 Impedance characteristic (ease of drive).....good
 Forward response uniformity.....good
 Typical price per pair, inc VAT.....£385



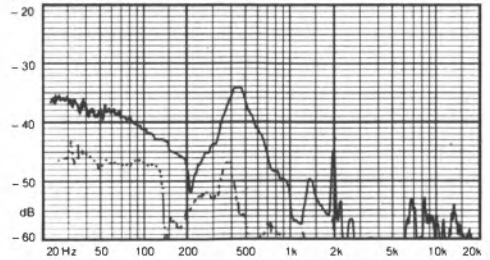
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



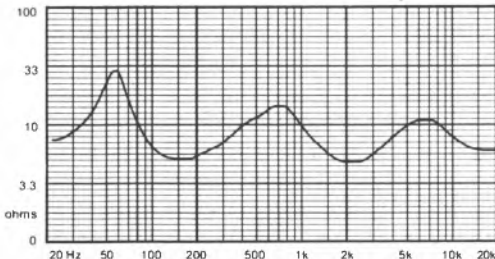
Averaged forward characteristic response in room.



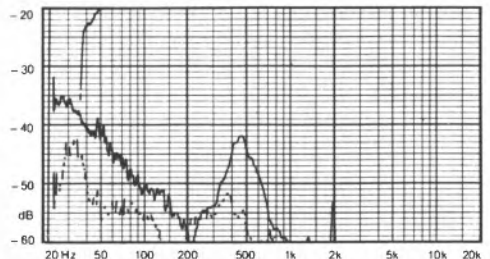
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

OTHER MODELS in this range are covered in the Summary Reviews section. See pages 169-173.

Yamaha NS1000

Natural Sound Systems Ltd, Unit 7, Greycaine Road, Watford Herts WD2 4SB
Tel (0923) 36740

RECOMMENDED



Still current, the Yamaha *NS1000* was in fact originally reviewed several years ago in the first issue of *HFC Loudspeakers* (1976), when the author Angus McKenzie, purchased a pair for high-level monitoring. Though it had been re-tested for subsequent editions, we nonetheless felt that the Yamaha 'flagship' should again be completely reassessed, and very worthwhile this proved to be.

The *NS1000* is a relatively compact, superbly-crafted three-way sealed-box speaker, of a highly rigid and braced construction, with an exterior black paint surface that is best described as 'piano' finish. Working best on strong stands, it can also be placed near, but not too close to the rear wall; about 30cm is about right.

The bass driver is a top-class 300mm pulp cone unit, built on a die-cast alloy frame and employing a massive motor system. The protective grille over the bass driver rings a little, and

fussy owners could discard them, as we did for our tests. The mid and treble units, 85mm and 30mm respectively, are Yamaha's unique ultra-hard beryllium dome units, both fitted with frontal phase correctors. Level controls are also provided for mid and treble, and we obtained the best balance and curves with mid at '-2' and treble '-1'.

A high-quality, high-power crossover divides the frequency range at around 600Hz, and 5kHz, with spring clips for electrical connection at the rear of the speakers.

Sound quality

This speaker has historically attracted some censure, notably on analogue-based programme. Past criticisms included a bass that was too damped and dry, with a somewhat colored mid and a treble that was a trifle fizzy and uneven. However this time round, using mainly digital programme, the speaker appeared to 'come to life', and produced an impressive sound. The bass was quite exceptional, with superb control and articulation, as well as fine depth to formant frequencies. It appeared to produce good stop-start transients, and was also sufficiently transparent to reproduce the natural acoustic on many recordings. Stereo images were also well focused and a decent depth effect was obtained.

Some coloration was still evident, namely a slightly deadened presence range with some mid nasality and a trace of lispingness and grain to the treble, this accentuated on distorted programme.

On high-quality material however its 'monitor' label appeared justified judging by the results, and high sound levels were also possible, with negligible subjective distortion.

Lab results

A high 90dB/W sensitivity was recorded, this being slightly compromised by the impedance, which dropped to 4ohms at 80Hz. This qualifies the speaker as a fairly difficult load.

System resonance was 35Hz, which was lower than the previous samples, and good bass extension to 40Hz, -6dB, was achieved, with a desirably slow damped rolloff below this point. The axial response was pretty uniform at 1metre but by 2metres some 'lumpiness' had crept in through the mid treble. Aside from this however the forward integration was very good over the range of measurement axes.

Turning to the computer-averaged response,

the clean extended bass was clearly evident, while the treble register is well shaped; overall, quite a balanced result.

At 96dB sound level, distortion was remarkably low, with third harmonic much less than 0.1% above 500Hz and second averaging just 0.3 to 0.5%, even at lower frequencies. At the 86dB level, distortion was exemplary, with a further improvement in third harmonic, second averaging 0.15% above 200Hz, and 0.3% at lower frequencies. This makes it the best in the issue as far as distortion results are concerned.

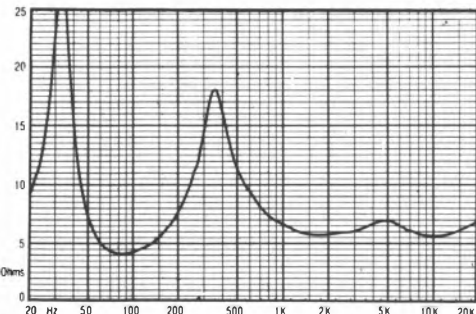
The speaker had a peak power capacity of up to 200W and high sound levels were possible from a stereo pair — up to 108dBA in a typical room!

Summary

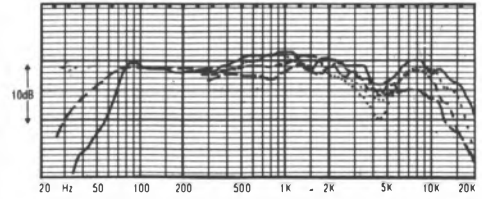
The long-lived *NS1000* remains competitively priced. Superbly engineered and finished, it can provide powerful, clean, articulate and extended bass despite its compact dimensions, and also sets a good standard elsewhere. Stereo images were well formed, the distortion was excellent and available sound levels high, as was the sensitivity. Satisfactory on analogue sources and really coming into its own on digital, the *NS1000* is a worthy contender, and the *HFC* recommendation continues.

GENERAL DATA

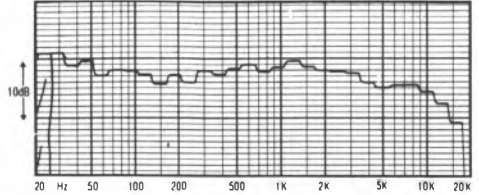
Size (height x width x depth) 67.5 x 37.5 x 32.5cm
 Recommended amplifier power per channel
 (for 96dBA minimum per pair at 2 metres) (10)—200W
 Recommended placement 30cm from wall on rigid stands
 Frequency response, within 13dB, at 2 metres 50Hz to 16kHz
 Low frequency rolloff (-6dB point) at 1 metre 40Hz
 Voltage sensitivity
 (ref. 2.83V, or 1W into 8ohms at 1 metre) 90dB
 Approximate maximum sound level (pair) at 2 metres 108dBA
 Impedance characteristic (ease of drive) below average
 Forward response uniformity very good
 Typical price per pair, inc VAT £750



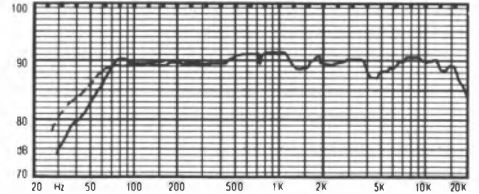
Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



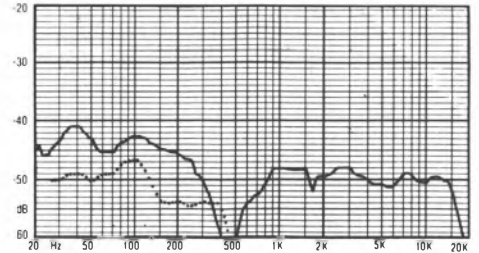
Forward characteristic response ($\frac{1}{3}$ octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



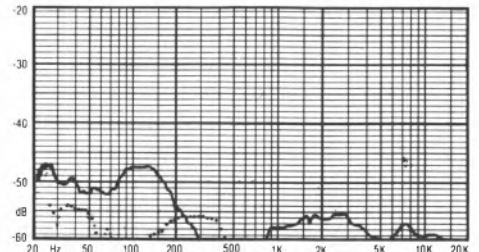
Averaged forward characteristic response in room.



Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

Yorkshire 1/3

Yorkshire Hi-Fi, Coltsgate Hill, Ripon, N Yorks
Tel (0765) 5739

RECOMMENDED



This compact loudspeaker verges on the miniature class with its internal volume of 11 litres. Yorkshire have been making some play concerning their special crossover networks, which employ compensation to linearise the load impedance. This technique is not extended to the bass, as is done in the KEF 104 for example, and the system can be seen to be resonant at 58Hz, reflex tuned by a small 35mm diameter by 80mm long port.

Both units are built by Elac to Yorkshire spec, the bass/mid being a 170mm steel frame bass-mid fitted with a Cobex pvc cone. Treble is handled by a 25mm fabric dome, with the crossover set as usual near 3kHz.

Our samples were in wood veneer but a less costly version is also available in vinyl, and our value ratings correspond to that finish. The crossover is of good quality components, as is the compensation, and the cabinet interior is

foam lined as well as fitted with a front-to-back brace. Plain 4mm sockets are used for electrical connection, and the speakers come supplied with 'ADP' pads which are intended to be placed under the enclosure to improve the sound. We tried these during one session but

Sound quality

The 1/3 scored a respectable 'average' on the listening test, which was quite good for the price and particularly good for the size. Panel comments were mixed with some listeners favouring it and others finding it disappointing. The midrange was somewhat forward, with a degree of 'cuppy' coloration, and the treble showed a touch of 'fizz' high in the range, although this was not too serious. The bass was quite presentable with fairly good extension and fair control.

Stereo images were well focused with moderate depth and some recorded acoustic. It was quite transparent and proved revealing of programme detail. It handled power up to 100W comfortably, and remained in good control.

However some variability with programme was apparent; for example, it got a poor rating on solo piano but a good result on modern rock programme.

Lab report

Pair matching was fine, within 0.5dB on our samples, with reference sensitivity a moderate 85dB/watt which in conjunction with the 100W power handling will provide maximum sound levels in a room of around 100dB. The grille had a minimal effect on the sound, or measured response, while the -6dB bass rolloff was noted at 60Hz, typical for the size of enclosure.

Out at 2 metres the overall reponse character may be seen, with some plateau lift in the mid followed by a mildly depressed treble, rising again at 15kHz. In fact, ± 2.5 dB limits sufficed for an 80Hz to 20kHz range. Very good in the lateral plane, the speaker showed a serious phase dip in the vertical plane, 15° above axis, and by implication, the 1/3 must be used with the central axis directed at the listener, ideally with it placed on a decent stand height (minimum 42cm). At 96dB sound level, distortion was satisfactory, except for an odd peak of second harmonic at 740Hz — the compensation network perhaps?

The peak remained at 86dB, improving to a 3% level but still potentially audible. Third harmonic was however fine. On compression the 1.5dB loss was satisfactory while the intermodulation was very good at -50dB. As claimed, above 200Hz the impedance was very flat and the speaker presents a most uniform 8 ohm load over the range, and should be easy to drive.

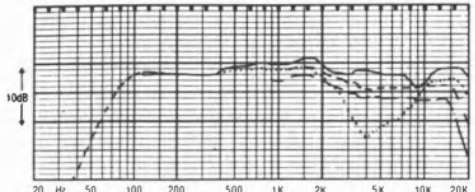
The room response showed a forward, uptilted midrange with a depressed treble but with fair bass extension, although this was also depressed.

Summary

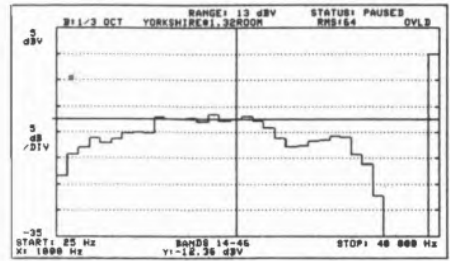
Yorkshire sent new 1/3 samples for the '85 edition. Now costing £200 and in vinyl rather than the original veneer, the system and enclosure have undergone significant improvement, and a higher sound quality rating was achieved. Coloration and smoothness were both improved. In this its latest form, the 1/3 achieved a solid recommendation.

GENERAL DATA

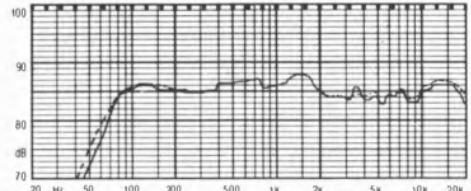
Size (height x width x depth).....37 x 23 x 18.5cm
 Recommended amplifier power per channel
 (for 96dBA per pair at 2 metres minimum).....(12)—100W
 Recommended placement.....on stands or shelf
 Frequency response, within ± 3 dB at 2 metres.....70Hz-20kHz
 Low frequency rolloff (-6dB point) at 1 metre.....60Hz
 Voltage sensitivity
 (ref. 2.83V or 1 watt into 8ohms at 1 metre).....88dB/W
 Approximate maximum sound level (pair) at 2 metres....100dBA
 Impedance characteristic (ease of drive).....very good
 Forward response uniformity.....good +
 Typical price per pair, including VAT.....£200



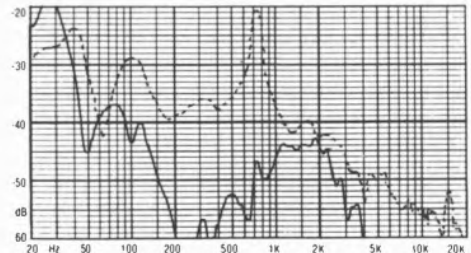
Forward characteristic response (1/3 octave at 2m, dotted 15° vertical, small dash 30° lateral, long dash 45° lateral).



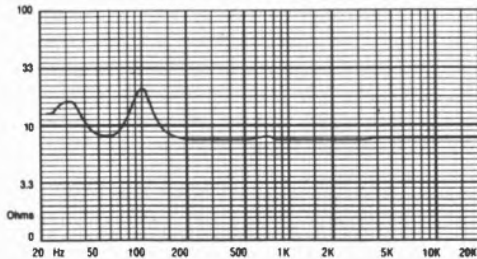
Averaged forward characteristic response in room.



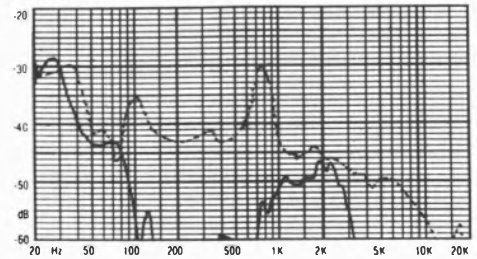
Reference sine wave response (1m on axis, 2.83V input shows sensitivity). Dashing corrects for chamber L.F.



Harmonic distortions at 96dB SPL (solid 3rd harmonic, dotted 2nd harmonic).



Impedance (mod Z). Impedance characteristics give an indication of amplifier loading.



Harmonic distortions at 86dB SPL (solid 3rd harmonic, dotted 2nd harmonic).

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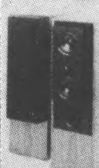


John Bowers
Active 1

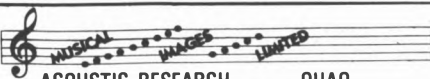
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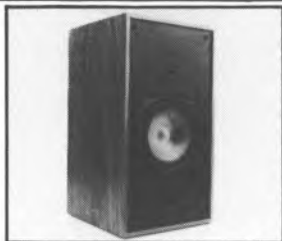
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SUMMARY REVIEWS

In this book we have given the full test reports on as many new models as possible but do not have space to print all our complete tests on current models. A number of these are summarised here.

Every model here has been subjected to the full *HFC* laboratory measurement and listening tests, results from which are quoted in as much detail as space allows. Sensitivity (the sound level the speaker will produce for 1W input) and suggested minimum and maximum amplifier powers are given in brackets at the end of each review.

With a continuing decline in the popularity of three-way loudspeakers, at least as far as the UK market is concerned, the great majority of the models covered here are two-way designs in which each enclosure contains a moderate-sized bass/mid unit and a small-diameter treble unit. Unless otherwise stated, all speakers in this section are two way 'infinite baffle' or 'sealed box' cabinet designs.

Acoustat Model II (£3,000)

When tested a couple of issues ago, the *Model II* was thought to have significant failings despite its near 'magic' midrange. The latest 2+2 model appears to have overcome these criticisms and offers a fine sound. (80-100W)

Audio Pro 4-14 (£750)

This Swedish-built active speaker design received a strong recommendation a couple of issues back, despite some mild criticisms. Since our original review, some refinements have been made to further improve the sound of the mid-range driver. Outstanding features were exceptional bass depth, with freedom from boom, overhang or 'chesty' effects. (Active)

Audio Pro B240 Subwoofer (£280)

Recommended in earlier editions, the *B240* is now available in *Mark II* form. This effective subwoofer system was found to give a very worthwhile bass enhancement, given suitable programme material, when using speakers of Celestion *SL6* size and quality. Power amplification is built in and the crossover to the main speakers is adjustable. (Active)

Audiostatic ES200 (£1,400)

A little larger than the Quad '63, this 130cm high panel electrostatic has a fairly narrow full-height electrostatic element, flanked by a large wooden baffle which helps to augment low frequencies in the room. Mid and treble performance was found superb, particularly on piano and chamber music; but the frequency balance was axis-sensitive and the bass was weak. Low sensitivity combines with modest power handling to make the speaker incapable of high sound levels, the

maximum being typically 93dBA. A costly and idiosyncratic speaker but one worth considering at the price. (80.5dB W, around 100W)

B&W DM220 (£190)

A double-size version of the '110, using two 220mm bass/mid units in each enclosure; the additional driver is electrically rolled-off in the lower midrange, to give a variant of three-way working. Compared with the '110, it added a smoother, slightly more extended bass, with a hint of added upper-mid detail. With exceptional power handling and dynamic range, the '220 cannot offer quite the value of the smaller models but is recommended. (90dB/W, 10-200W)

B&W LM1 (£205)

Intended for general purpose duty at home or in vehicles or boats, the very well engineered *LM1* has a 24cm high fully-styled die-cast enclosure finished in Nextel 'suede' paint in a choice of colours. With a tiny enclosure volume (5.51), low bass was lacking and the balance a trifle thin and 'artificial', but it provided good frontal detail and stereo focus, if with restricted depth. By normal *HFC* criteria, it does not qualify for recommendation, but is probably one of the best micros made, and is worth considering for special applications, including domestic use where unobtrusiveness is the primary consideration. (86.5dB/W, 15-100W)

B&W 1200 (£260)

Developed from the old *DM12* design, the 36cm high '1200 retains the APOC driver protection, which makes the speaker nearly 'unburstable'. Panel test results showed an above average performance but indicated some mixed feelings about the speaker, which though generally open, could at times sound somewhat muddled and lacking in life. Stereo imagery was fine, the bass tidy and coloration low. Overall impression was that of a tidy, 'civilised' miniature which can be recommended, but a careful audition must be advised before purchase. (86dB/W, 15-100W)

B&W 1400 (£260)

Derived from the earlier *DM14*, and again featuring APOC protection, the '1400 stands 60cm high and includes two 180mm bass/mid units in each enclosure, the additional driver adding to the bass power handling. On listening tests the panel liked it if anything less than the '1200, clean and uncoloured in the normal sense, it was not considered to be very convincing when played loud, tending to sound a degree muddled and compressed.



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sed. An otherwise fine treble was marred by a 'zing' at the extreme top end, while piano sounded somewhat 'thin' and boxy. The *DM1400* was rated 'worth considering'. (86.5dB, 20-200W)

Bose 301 (£225)

Each *301* has two tweeters, one facing the rear, with the intention of improving energy output into the room at high frequencies and to encourage some rear-wall reflection. Standing 43cm high, the 15 litre enclosure, with a pulp-coned 200mm base/mid unit, is loaded by a 5cm diameter port. When reviewed in the last edition the *301* produced very mixed reactions from the panel, some thinking very highly of it, others finding it not to their taste. With an open, lively and 'gutsy' character, it nonetheless showed some 'boxy' coloration and a lack of stereo depth, while some critical listeners noted a 'phasey' effect. Rated as worth trying in its 1984 form, the *301* has since been revised as the *301 II*. (87dB, 15-100W)

Bose 901 (£1,250)

Reviewed in Mk IV form, the long established Bose *901* achieved disappointing scores on our blind listening tests. Comments centred around a boxy coloration, poorer than the majority of speakers in the test group, masking stereo depth and seeming to concentrate the image into two left/right zones; central focus was also comparatively weak. On high level tests it could certainly play loud but was found rather harsh and raucous. Lab results for this unusual design required careful interpretation due to the 'direct/reflecting' principle in which eight of the nine 105mm drive units in each speaker are set in the angled rear facets of the 32cm high, 54cm wide cabinet; the *901* should have come into its own on the computer averaged in-room response test, but the result showed a lack of extreme treble and a prominent lower midrange. Since our review, the *901 IV* has been replaced by the revised *901 V*. (93dB/W, 40-200W)

Castle Trent (£90)

Built with Castle's own drivers and to their usual high standards of finish, the 33cm high *Trent* has a 130mm pulp-cone bass unit and is reflex loaded via a 3.5cm diameter port. Listeners considered that the bass lacked extension and articulation while the midrange tonal balance was 'thinned' and the treble thought a touch bright and untidy; on the other hand the traditional Castle virtues of midrange clarity and transparency and stable stereo imaging were in evidence. Suited in our view to a 'dim' cartridge or room balance, the *Trent* rated as worth considering when reviewed in the last issue and should still be available in that

form. (89dB/W, 10-50W)

Castle Tyne (£130)

With a 150mm bass unit and a larger internal volume of 17 litres, tuned by a 5cm diameter port, the 44cm high *Tyne* was preferred to the *Trent* by the listening panel and thought to sound more natural; but the bass was on the dry and muted side while some listeners complained of a 'sting' high in the treble register. It was felt that the *Tyne* suffered strong competition at the price from 200mm bass unit speakers, but was nonetheless worth considering. (12-100W)

Castle Lincoln (£180)

Compact and finely-finished, the 44cm high *Lincoln* has a 150mm bass unit and is reflex loaded by a 5.5cm diameter port. It achieved good results in listening tests in two previous editions, demonstrating a clear, open sound with lively, integrated detail, and although the bass lacked some definition it was firm and free from boom. Treble was well extended and even. With increased competition this long-recommended model is worth considering while still available. (88.5dB/W, 15-50W)

Gale GS402 (£530)

Developed from the *401*, but featuring a new tweeter the *402* (available with '401 style' chrome ends, measures some 61cm high (or wide if the traditional Gale horizontal orientation is adopted) and has an internal volume of 40 litres. Two long-throw 200mm bass units are located towards the ends of the cabinet and work in parallel, while between these are a Peerless 100mm cone mid-range and a 25mm soft-dome Philips tweeter. Like its predecessors, the *402* scored well in listening tests, with a clean but rich and powerful bass (sometimes slightly excessive), good tonal balance and large-scale presentation, though stereo focus was not its strongest point. Despite an increased price and stronger competition, the Gale remains a good speaker, well worth considering. (88dB/W, 25-200W)

JBL L46 (£340)

This 53cm-high JBL design uses a 220mm high-power reinforced pulp cone bass unit, reflex loaded with a 5cm diameter port, and a hard fabric dome tweeter. In listening tests it scored an overall 'good'; demonstrating power, impact and truthfulness in the bass (with some overhang at the lowest frequencies); a clear, articulate mid though with a touch of hardness; and good detail in the treble. Stereo depth and ambience were good, particularly with grilles removed; and dynamics were excellently portrayed, the speaker

SUMMARY REVIEWS

handling 400W peak input with full control. At its new higher price, this fine American speaker can unfortunately no longer be included in the HFC 'BestBuy' listings, but it is still recommended. (87dB/W, 15-150W)

JBL L96 (£720)

A derivative of the L110, this 60cm high model employs a 310mm bass unit, massively engineered to JBL's well-known exemplary standard, while the 40 litre enclosure has a 7.5cm port with a rather long (23cm) duct. The tweeter is a JBL 25mm hard fabric aluminised dome. Listening test results varied between panellists; some coloration was evident, plus a trace of mid sharpness and hardness, with a mild treble roughness oddly combined with a certain dullness. At times the low bass could appear excessive, though upper bass had fine 'attack'. Sounding better with the grille off, the L96 appears to be an idiosyncratic speaker, but its wide dynamic range and good transient performance make it worth considering. (89dB/W, 10-200W)

KEF Chorale III (£85)

As the 1985 edition went to press KEF had announced new 'C Series' models but these were not available in time for review. They will replace the *Coda* and *Chorale* models, which will be available only until stocks are exhausted. In 1984 tests, the 37cm high *Chorale III* proved to be a 'Best Buy' at its modest price. The panel correctly identified it as a small box with a lack of real bass and a rather lightweight acoustic. Some 'boxy' or nasal coloration was evident, and it was not very successful at conveying space or depth ambience in the stereo image. Nonetheless it provided a uniform sound of respectable quality, better suited to classical music than rock. (86.6dB/W, 15-50W)

KEF Coda III (£105)

The III version of this deservedly popular model, standing 47cm high, scored well on blind listening tests, sounding smooth and well balanced. Treble was unobtrusive but, on cymbals or triangle, with some emphasis on the extreme treble with less of the fundamental. Stereo focus was fine, with fair depth, limited by a degree of boxy coloration — not serious at the price. A 'Best Buy' in 1984. (88dB/W, 15-150W)

Linn Sara (£552)

Drive units in the 43cm high Sara are a 19mm Scan fabric domed tweeter, a modified KEF B200 200mm bass/mid unit plus a second B200 mounted internally behind the first and connected in parallel with it. This gives a low resonant frequency of 42Hz but makes the Sara a 4ohm

speaker. On listening tests, the Sara scored only average marks with digital material, with over-heavy upper bass, and thinned midrange on some piano and voice Treble quality was good. The speaker improved noticeably when used with a Linn-based disc system, providing a more musical and realistic effect. Though not recommended in the usual HFC context, particularly if digital programme is to be used, the Sara can provide an 'involving' sound with analogue sources, especially if these are Linn derived. (87.5dB/W, 25-100W)

Marantz LD30 II (£100)

First of a trio of Marantz models to appear was the 42cm high reflex loaded '30, which proved an immediate success. Now in 'Mk II' form, the LD30 is not an entirely neutral speaker, but manages to make less expensive turntables and amplifiers sound rich and spacious, with a relaxed, musical stereo. It offers reasonable detail, with just a mild boominess in the bass. Digital programme revealed some colorations but none were too serious. Comfortably recommended. (85.5dB/W, 20-100W)

Marantz LD50 (£140)

Largest of the 'LD' models, the '50 has a 210mm bass/mid unit and complex crossover. Again reflex loaded, it has an internal volume of 23 litres and stands 42cm high. It scored a convincing 'good' in the 1984 listening tests, and most panellists liked it though noting a 'rich' and even 'dull' tonal balance. Bass was quite tuneful and articulate, while stereo presentation gave a good sense of scale and weight, particularly on classical programme. Despite some mild 'boxiness' and muddle, and a generally 'laid back' character, the LD50 can still be warmly recommended even against the 1985 competition. (86dB/W, 15-100W)

Monitor Audio R152 (£220)

Finished in top class real veneer, the R152 uses a special 170mm Cobex bass/mid unit, with an additional ABR or 'slave' radiator mounted below this in the narrow-aspect 51cm high cabinet. Panel comments suggested some 'unevenness' of tonal balance, and some specific mild colorations including some inner boxiness to the generally clear and open mid. Bass was reasonably balanced and extended, but lacked real attack and tunefulness. Despite these weaknesses, overall value for money earned it a recommended rating, biased towards classical rather than rock programme, in the 1984 edition. (85.5dB/W, 15-150W)

Rogers Studio One (£445)

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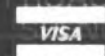
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SUMMARY REVIEWS

litre *Studio One* is a bass-reflex loaded model of comparatively high power capacity. As revised a year or two back, the *Studio One* showed less bass overhang, but still suffered a trace of bass excess, this admittedly more noticeable on digital programme. Overall performance was quite good, with well focused stereo images, fairly good depth and a pleasing level of detail; it appeared accurately balanced tonally, with an even, wide response; but there was some mild 'boxiness' or 'hollowness' with a mild brashness and less than perfectly sweet rendition in the treble registers. This model still represents good audio and engineering value and recommendation is continued. (86.5dB/W, 20-200W)

SD Acoustics SD2 (£450)

Sturdily and carefully made, measuring 55cm tall, the *SD2* uses an efficient 250mm bass/mid unit and a 34mm soft dome tweeter, both from Son Audax. Panel listening results were rather mixed, but a definite 'character' was evident, and treble somewhat uneven, nasal and yet muted on strings. Bass was well controlled but felt to be too dry, this emphasised by the mid prominence. Superbly built and finished, with a wide dynamic

range, good sensitivity and low distortion, the *SD2* is well worth auditioning, though too expensive for a full recommendation. (90dB/W, 20-200W)

Spendor SA3 (£1,035)

Designed specifically for accurately balanced reproduction of high sound levels, in particular where considerable bass energy is present in the programme, the 85cm high *SA4* has a massive 120 litre bass-reflex enclosure, tuned by a port and driven by a special 305mm Bextrene-coned bass unit. Treble unit is a Spendor-adjusted audax high-flux 34mm soft dome. For such a large loud-speaker, the *HFC* listening room is in fact on the small side, and for correct stereo focus a listening distance of 4-5 metres is needed. Within these limitations, the *SA3* scored an 'average' for overall sound quality. Some colorations were observed, namely a tubey, plummy effect, but quite good detail was heard. When not driven hard enough to exploit its wide dynamic range, the *SA3* can be outclassed by smaller systems, but in its intended application it can produce effortless and extended bass with a musical performance well beyond that of the smaller domestic boxes. (89dB, 10-200W)

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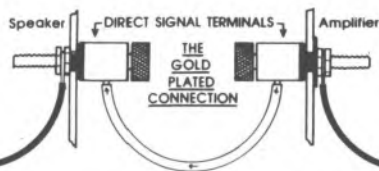
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BEST BUYS AND RECOMMENDATIONS

Drawing on the experience of previous editions as well as the new reviews included this time, the recommendations here are in effect selected from a pool of over 150 models. Inevitably, with each succeeding issue, the poorest models have been weeded out and the number of Recommended and Best Buy models has increased, reflecting higher market standards.

While the principles on which we have chosen Best Buys and Recommended models remain unchanged, readers should bear in mind that in this edition they reflect a generally higher level of attainment than in the last issue.

Best Buy denotes exceptional value for money, and indeed there are a good number of speakers which achieve very high performance at a reasonable price. With this in mind, we have again drawn an upper price limit for the Best Buy category, this time at £270 — above this price, the 'law of diminishing returns' seems to come into effect, and so the better examples priced at more than £270 are 'Recommended' instead.

Recommended means that either the performance was particularly good irrespective of price or alternatively that a good value standard is achieved but overall attainment falls short of Best Buy classification. However the dividing line between what constitutes a Best Buy or a Recommended system is often quite hard to draw, and obviously depends on our interpretation of performance characteristics: as such, given a sensible trial, you could quite possibly prefer a 'Recommended' model to a 'Best Buy', at the same price. Note that a number of these are not now covered in the main review section, but are to be found in the *Summary Reviews*.

BEST BUYS: UNDER £105

This interesting range covers a wide selection of sizes from the generous *Toshiba 33es* (£80 UK built) which suits classic free space location on stands, to the diminutive *Wharfedale Diamond II* (£80) best suited to stand on narrow shelf mounting adjacent to a rear wall. Only slightly compromised, the *Diamond* is the preferred choice where an unobtrusive micro system is required. The *KEF Coda* (£105) and *Chorale* (£90) remain strong contenders and offer good value, but will soon be superseded by a new range using plastic coned units. The *Marantz LD20* (£80) is a lively performer which continues to please while the *Rotel RL850* (£100), British made, also continues to qualify for Best Buy status. *Mission's 70 II* (£100) is another wall mounting type, with exceptional mid clarity and a dry bass, though some find it a little on the bright side. The tough newcomers are undoubtedly the *B&W DM90* (£100) and the *Celestion DL4* (£100), which offer a fine blend of good dynamics, low coloration and accurate mid balance.

RECOMMENDED: UNDER £105

The *Castle Clyde* (£105) soldiers on, a well-balanced miniature of good finish, while the tiny *Mordaunt Short MS10* (£80), designed for wall mounting, scored well on detail and stereo focus but tended to 'thinness' in tonal balance. The *Marantz LD30 II* (£100) is a straightforward, good value system, while the *JPW JP1* (£90) improved this year, offers a good sound and a real wood finish. The *Tannoy Titan* (£100) is another wall-mounting design with unusual styling and its sound has improved to the recommended level, though doubts still remained on build quality.

BEST BUYS: £105-£185

The reliable *Tannoy Mercury* (£145) held a strong position with its fine midrange while the *B&W DM110* (£120) is still deservedly popular for its impressive all round performance. The *Mordaunt Short MS20* (£110) still remains in this group, with an above average bass and a crisp, tidy sound, while the *MS40* (£185) offers more subtlety and authority. With a brighter sound and a balance suited to near wall mounting, the *Heybrook HB1* (£140) still provides an impressive level of mid detail. Strong newcomers include the *Wharfedale 508* (£160) and *Celestion DL8* (£170) which have the new generation alloy dome tweeters of exceptional treble quality.

RECOMMENDED £105-£185

JBL's new entries, the *TLX2* (£130) and *TLX4* (£170) offer an interesting sound, more rock orientated, yet sufficiently good for recommendation. The *Marantz LD50* (£140) remains a solid, civilised model with extended bass and a 'laid back' sound.

Monitor Audio's improved *R252* (£130) is joined by a smaller brother the *R100* (£110) and both gain approval this year for their tidy, dry sound offering reduced coloration. The *Celestion DL6* (£130) is good value with its competent engineering while the *Goodmans Mezzo* (£150) is one of the few larger three-way systems in this price range and has recently been improved (not yet re-auditioned). And finally comes the *MS100* (£160) which is from *Mordaunt Short's* new 'High-Definition' range.

BEST BUYS: £185-£270 (Best Buy Price Limit)

Now settled down, the *Sony APM 22es* (£200) is well engineered and finished and suits rock

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BEST BUYS AND RECOMMENDATIONS

material well. The *Tannoy Venus* (£270) is a highly refined version of the *Mercury* with more control and bass extension while the *Spendor Prelude* (£250) remains a classic compact BBC derivative with a low coloration, neutrally balanced sound, this system optimised for free space use on strong stands.

RECOMMENDED: £185-£270

This wide selection includes a number of well established models which continue to offer good value and a powerful dynamic performance. In the larger sizes we have the *B&W DM220* (£205), the *Castle Pembroke* (£230) and the *Monitor Audio R352* (£200). Worthy miniatures include the latest *Yorkshire 1/3* (£200), the venerable *BBC LS3/5a* (£185-£240), the *Spendor SA1* (£250) and the *Diesis Solitaire* (£220). In a slightly larger package, there is the *Rogers LS2* (£200) leading to the medium sized *LS6* (£260) and the *JPW AP3* (£185) (active operation possible). All these models are suitable for stand mounting at a sensible height and all except the *AP3* work well clear of the rear wall. The *AP3* is not to be placed directly on the wall but spaced at a sensible small distance from it.

RECOMMENDED: OVER £270

Although these models are too expensive to be included as Best Buys, being over £270, they can be recommended on the basis of their high performance and, or, good value.

In this final recommended category we cover some of the true greats of the speaker business as well as a selection of middle priced models offering good value and performance. Dealing with them alphabetically, we have the *Arcam One* (£300) at the head of the list. This model has a detailed revealing nature combined with good engineering and finish. The *Celestion SL6* (£280) still stands up well as a highly civilised miniature with exceptional treble and the virtually hand-built *SL600* (£660) provides an almost unsurpassed level of stereo imagery with low coloration. *Harbeth's* latest *HL1* (£345) a classic two-way monitor, looks very promising in its new Mk IV guise, while the *JBL L46* (£340) packs a powerful extended bandwidth from its compact enclosure.

In the 'Super-fi' category we have the *Magneplanar MG3* (£2,500) which remains a top-class example, offering an extended bandwidth, no box coloration and a fine ribbon tweeter.

The well established *Meridian M2* (£1,000) provides big speaker sound from a small elegant designer package, and with its in-built power amps, only a pre-amp is needed. The *Quad ESL63*

(£1,250) will maintain its position for years to come, as one of the finest electrostatic speakers on the market. Relatively compact it offers good bandwidth, very low coloration and a coherent focused soundstage.

A strong performer in previous issues, the *Rogers LS7* (£320) is a fine piece of design, perhaps more suited to sweeter sounding amplifiers and signal sources. The *Studio One* (£420) is an older stalwart which favours larger spaces and rooms.

Spendor's SP2 (£350) is a powerful new entry, conceding little to our reference *SP1* (£540) and well priced for the performance and high build quality. The *SP1* is fast becoming a classic system of monitor performance enduring quality and tonal accuracy. However, *Wharfedale's 708* (£350) did not fare so well on the listening tests sounding a little too restrained, but further analysis showed it to have fine musical qualities and a recommendation is appropriate.

With a decade or so of manufacturing behind it, the *Yamaha NS1000* (£750) still performs well in *HFC*, particularly on clean sweet amplifiers and good class programme. It is dynamic with good sensitivity and effortless 'fast' bass.

This compilation would not however be complete without some mention of other important developments which are not specifically represented on these pages. I have not assessed them personally but have heard that a well set up system based on *Linn Isobariks* (£1,380) can provide an authoritative standard of sound quality with fine extended bass and an open explicit nature. The Dutch company *Audiostatic* have developed a series of full-range electro-static models which could be worth investigating (£1,200-£2,000) while the American *Acoustat* company now have a strong performer in their *2+2* (£3,000). Reviewed some years ago now in *HFC*, the *ProAc Studios* have been further refined since, and set a very fine standard in terms of price and size (£1,200-£1,600).

Finally, last but by no means least, I recently tried out a pair of *Apogee Scintillas* (£5,000). At the outset, it must be said that they pose serious problems, not the least of which is their cost, and there are also matching difficulties, as only a few amps will drive them — indeed even fewer will drive them well. Nonetheless, they provide a truly magnificent sound of realistic scale, fine depth, wide bandwidth and low coloration. Voice reproduction is a revelation, with the treble bass and mid all excellent. True, it is bass heavy as well as a little distant in the presence range but these criticisms pale beside its overall performance.

SELECTED DEALER DIRECTORY

Choosing a good hi-fi dealer is the most vital step in acquiring the system that is right for you. This unique directory gives full information on dealers in your area whose demonstration facilities and dedication to customer satisfaction meet the very highest standards.

Conventional technical specifications, admirable though they may be, do not tell you how hi-fi will sound. Plenty of equipment can be made to jump through the technical hoops, and sounds 'very hi-fi'; but will still reproduce music in a way that is inaccurate, coloured, tiring, and subtly unsatisfying.

Such equipment offers an insidious long-term disincentive to music listening. Ask people who have recently bought a new hi-fi system whether they are pleased with it, and they will almost always say yes — after all, they felt it was the right decision at the time, and it may have sounded 'impressive' in a very brief, loud demonstration. Ask the same people whether they now spend more time listening to music than before, and you will find out if the system is really any good.

The split between 'mass market' audio and 'specialist' hi-fi has now become almost total. All-in-one 'rack' and 'midi' systems now tend to compete on looks, features and price rather than on sound quality, though claiming adequate technical performance; on the other hand, the specialist manufacturers have tried to make products that sound better, leaving out superfluous facilities and paying attention to aspects of the design which they find have audible effects on the sound, not just those which produce better paper specifications.

Of course, anything which can be heard must ultimately be technically explicable, even if the explanation is not currently to hand, and the *Hi-Fi Choice* reviewers have always led the way in developing new measurements which really do relate to the audible performance of the equipment. But the quality of any hi-fi component is determined by the balance of many more or less measurable factors, in what the designer judges to be the best possible compromise. When components are put together, the interactions and subtle blendings of their characteristics contribute to the overall system sound in extremely complex ways. And in any case, the final quality of the music played through the system will depend fundamentally on the room it is being used in! There really can be no substitute for listening to the system for yourself.

This is why *Hi-Fi Choice* has always insisted that the hi-fi buyer should never rely uncritically on equipment reviews — even its own! — but should seek the fair unpressurised demonstration which is available only at a good dealer. It is not

merely coincidence that the dealers who offer this kind of service are usually those who stock a good range of equipment from the 'specialist' manufacturers, and they will be ready to demonstrate the audible superiority of a carefully-chosen 'separates' system to the run-of-the-mill rack or midi system.

Of the dealers who are genuinely dedicated to hi-fi excellence, a growing number are members of BADA, the British Audio Dealers Association. BADA was established in 1982 on the premise that the retailing of quality hi-fi products is a specialist service which requires more expertise than the selling of less sophisticated goods. BADA recruits dealers who are 'serious about hi-fi' and who have been in business for at least three years. Member retailers are committed to offering the best possible demonstration facilities and advice; to offering (with certain conditions) exchange or refund on goods that prove unsatisfactory in use at home; and to providing a two-year labour and parts guarantee, transferable to any other BADA dealer if the customer moves home more than 30 miles after purchase. Virtually all BADA members are included in the Directory.

Make an appointment

Before visiting any shop, check whether an appointment is necessary — so that the dealer will be able to give you his full attention when you arrive for a demonstration. Take some of your own records along — they will save you wasting time getting used to strange material and wondering how it would have sounded on your old equipment. Don't worry if you feel you are ignorant of technicalities — just take your ears along with you, and don't be afraid to believe them. Don't go in with fixed ideas about equipment, which may make you pre-judge what you hear. Realise that any system will sound different in your home listening room — do use home trial facilities, remembering that this service costs the dealer time and trouble but also be aware that it may put just a little more pressure on you to buy. Don't worry if you have only a limited budget — 'real' hi-fi certainly need not always be more expensive than a package system.

A good system will make all your records sound better and give years of pleasure. The first step is to seek out the genuine hi-fi specialists in your area. With the Selected Dealer Directory, you will find them.

SELECTED DEALER DIRECTORY

AVON

ABSOLUTE, 65 Park St, Clifton, Bristol. (0272) 24975. A&R, Denon, Dual, Meridian, Mission, NAD, Quad, Rotel, Technics, Yamaha, etc. (cl. Weds)

BADAMEMBER 

AUDIO BRISTOL LTD, 8 Park Row, Bristol 1. (0272) 291931. AKG, Beyer, Dual, Mordaunt-Short, Revox, Sansui, Tannoy, Toshiba, Trio, Quad. Open Mon-Fri, 9-5.30, Sat 9-4.30 Home trial facilities, free installation, credit facilities, service dept.

PAUL GREEN HI-FI LTD., Kensington Showrooms, London Rd, Bath. (0225) 316197. A&R, Creek, Dual, Heybrook, Linn, Musical Fidelity, Rotel, Systemdek, Wharfedale. Dem facilities available, ring for appointment. Open Tues-Sat, 9-5.30. Home trial facilities, free installation, instant credit up to £1000. Credit cards: Access, Barclaycard.

BERKSHIRE

FRASERS, HI-FI & VIDEO, 67 Dedworth Rd, Windsor, (07535) 59662. Aiwa, Dual, Mitsubishi, Mordaunt Short, Pioneer, Sansui, Trio, Wharfedale, Sharp. Dem facilities available. Open 9.30-6p.m. Home trial facilities, free installation, credit facilities. Credit cards: Access, Barclaycard, Visa. Service dept.

READING HI FI CENTRE, 4-6 Harris Arcade, Friar St, Reading. (0734) 585463. 'The best equipment, advice and service from Berkshire's premier Hi Fi emporium'.

BADAMEMBER 

BUCKINGHAMSHIRE

AUDIO INSIGHT LTD, 53 Wolverton Rd, Stony Stratford, Milton Keynes. (0908) 561551. A&R, Audiolab, Heybrook, KEF, Linn, Mission Cyrus, Musical Fidelity, Nakamichi, Nytech, Rotel. Dem facilities available. Open Tues-Sat. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

AYLESBURY HI FIDELITY, 98 Cambridge St, Aylesbury. (0296) 28790. Dual, Heybrook, Linn arms, Musical Fidelity, Mission, NAD, Nakamichi, Quad, Rotel. Dem facilities available, ring for appointment. Open 10-6 Mon-Fri, 9.30-5.30 Sat. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Amex, Diner, visa. Service dept.

CHILTERN HI-FI, 146 High St, Aylesbury, Bucks. (0296) 31020. A&R, Aiwa, Akai, A.R., B&W, Bang & Olufsen, Dual, Nakamichi, Technics, Yamaha. Dem facilities available. Open 9.30-5.30 Mon-Sat, Fri 9.30-7.00 closed thurs. Home trial facilities, free installation, instant credit up to £2,000. Credit cards: Access, Barclaycard. Service dept.

JCV HI-FI SUPER STORE, 1 Viscount Way, Dukes Drive, BI (0908) 36734. Everything from specialist hi-fi to midi-systems all at the best prices.

BADAMEMBER 

CAMBRIDGESHIRE

CAM AUDIO, 110 Mill Road, Cambridge. (0223) 60442. A&R, Creek, Linn, Mantra, Mission, Naim, Nakamichi, Rega, Revolver, Teac. Dem facilities: 3 single speaker rooms. Appointment required for one not for 2. Open 9.30-6.30 Mon-Sat 9.30-3.00 Thurs. Free installation, interest free credit. Credit cards: Access, Amex, Barclaycard, Diners.

HI-FI PEOPLE, 42 Cowgate, Peterborough. (0733) 41755. 'Shop and home demonstrations from friendly people'.

BADAMEMBER 

STEVE BOXSHALL AUDIO, 41 Victoria Rd, Cambridge. (0223) 68305. Audiolab, Gale, JBL, Marantz, Mission, Nakamichi, Quad, Rogers, Rotel, Tannoy. Dem facilities 2 rooms, ring for appointment. Open 10-6. Mon-Sat. Free installation, credit facilities. Credit cards: Access Barclaycard. Service dept.

CHESHIRE

ASTON AUDIO, 4 West St, Alderley edge. (0625) 582704. Celestion, KEF, Musical Fidelity, Opus, Pink Triangle, Quad, Robertson, Spendor, Sondex, Tannoy. Dem facilities: 4 dem rooms, appointment required. Open 10-6 Tues-Sat. Home trial facilities, free installation. Instant credit up to £1,000. Credit cards: Access, Amex, Diners, Visa. Service dept.

BADAMEMBER 

DOUG BRADY HI-FI, Kingsway Studios, Kingsway North, Warrington. (Hadgate 0925) 828009. 'Largest choice of specialist Hi-Fi in N.W. £100-£20K'. All c.cards. dem.rooms.

BADA MEMBER 

CHRIS BROOKS AUDIO, 29 Gaskell St, Stockton Heath, Warrington. (0925) 61212. Single speaker pair dems. Specialising in Linn, Rega, etc. Sytems from £350.00.

BADAMEMBER 

NEW DAWN HI-FI, 1-3 Castle St., Lower Bridge St., Chester. (0244) 24179. Linn, Quad, Technics, National Panasonic, Denon, Rotel, Dual, Meridian, Aiwa, Philips. Dem facilities: 2 dem rooms. Open 9.00-5.30 Mon-Sat, closed Wed. Free installation, instant credit. Credit cards: Access, Barclay card, trustcard.

SWIFT OF WILMSLOW, 4-8 St Annes Parade, Wilmslow, (0625) 526213. A&R, Aiwa, Denon, Dual, Marantz, Mission, Monitor-Audio, Pioneer, Yamaha, NAD. Dem. facilities available. Open Mon-Sat 9.15-5.45. Closed 1-2 Lunch. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard. Service dept.

CORNWALL

TRURO HI-FI, ETS Ltd, 25 King St, Truro (0872) 79809. A&R, Denon, Dual, Heybrook, Mission Cyrus, Quad, Rotel Teac/Tascam, Thorens. Dem facilities: Single speaker studio. Open Mon-Sat 8.45-5.30. Home trial facilities, free credit up to £1,000. Credit cards: Access, Barclaycard, ETS. Service dept.

DERBYSHIRE

ACTIVE AUDIO 12 Osmaston Rd, The Spot, Derby. (0332) 380385. 2 studios. Open Mon-Sat 9.30-6.00. All major credit cards. Finance available.

BADAMEMBER 

DORSET

BLACKMORE VALE, The Square, Gillingham Dorset. (07476) 2474. A&R, Ariston, Boston, Dual, KEF, Marantz, NAD, Nagaoka, Sennheiser, Yamaha. Dem facilities available. Open Mon-Sat 9-5.30 Closed for lunch 1-2. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access Barclaycard. Service dept.

ESSEX

A.T.LABS, 442/4 Cranbrook Rd, Gants Hill, Ilford, (01) 518 0915. Open Mon-Sat, 10-6. Two single speaker dem. rooms. Access, Amex, Barclaycard.

BADAMEMBER 

BEECHWOOD AUDIO, 6 Market St, Braintree., (0376)

SELECTED DEALER DIRECTORY

29060. A&R, B & W, KEF, Maridian, Musical Fidelity, NAD, Nakamichi, Pink Triangle, Quad, Sondex. Dem. facilities 2 single speaker rooms. Open Mon-Sat, 9.30-6.00. Home trial facilities. Free installation, instant credit up to £1,000.

Credit facilities: Access, Amex, Diners, Visa
BRENTWOOD MUSIC CENTRE, 2 Ingrave Rd, Brentwood. (0277)221210 Acoustic Research, B&W, Dual, JBL, Marantz, Nakamichi, Quad, Sansui, Tannoy, Yamaha. Dem. facilities available. Open Mon-Sat 9.30-5.30. Home trial facilities, free installation. Credit cards: Access, Visa. Service dept.
RUSH HI-FI & VIDEO, 5/6 Cornhill, Chelmsford (0245) 57593. Akai, Aiwa, JVC, Marantz, Nad, Quad, Rotel, Sansui, Sony, Technics. Dem. facilities available, ring for appointment. Open Mon-Fri 9.30-6.00 Sat 9.00-5.00. Home trial facilities, free credit. Credit cards: Access, American express, Barclaycard, Diners. Service dept.

GLOUCESTERSHIRE

ABSOLUTE, 40/42, Albion St, Cheltenham. (0242) 583960. A&R, Denon, Dual, Linn, Meridian, Mission, NAD, Rotel, Technics, Yamaha, etc. (Cl. Wed)

BADA MEMBER 

ETTLES AND BUMFORD, Brewery Court, Cirencester (0285) 3946. ADC, Aiwa, Ortofon, Celestian, Grundig, Harman-Kardon, Hitachi, JBL, Teac, Trio. Dem. facilities: One single speaker dem. room. Open Mon-Sat 9.00-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards Access, Visa. Service dept.

HAMPSHIRE

ANDOVER AUDIO, 105 High St, Andover. (0264) 58251. Bang & Olufsen, Fisher, Aiwa, Marantz, NAD, Philips (CD), Proton, Rotel, Trio, Yamaha. Open Mon-Sat 9-5.30. Weds 9-1.00. Fri 9-8.00. Home trial facilities, free installation, credit facilities available. Credit cards: Access, Amex, Diners, Visa. Service dept.

HAMPSHIRE AUDIO Ltd, 2-12 Hursley Rd, Chandlers Ford, (04215)2827/65232. Quality CD and analogue agencies, 5 Dem. studios. Large free car park.

BADA MEMBER 

TRU-FI SOUND AND VISION, 10/12 Grosvenor Rd, Aldershot. (0252) 26390. Akai, Aiwa, B & W, Nakamichi, Hitachi, JPV, Mission, Mordaunt-Short, Nagaoka, Sony Technics. Dem. facilities available. Open 9.30-6.00 Mon-Sat. Free installation, instant credit up to £1,200. Credit cards accepted. Access, Barclaycard. Service dept.

HERTFORDSHIRE

ACOUSTIC ARTS Ltd, 101 St. Albans Rd, Watford Herts. (0923) 45250. A&R, Audiolab, Beard, Conrad-Johnson, Denon, Heybrook, Magneplanar, Mission, Quad, Rogers. Dem facilities: 2 dem studios, ring for appointment. Open Mon-Sat 9.30-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

RADLETT AUDIO, 141 Watling St, Radlett, WD7NQ. (09276)6497. Audio Innovations, Audio Research, Creek, Krell, Linn, Magnepan, Musical Fidelity, Monitor Audio, ProAc, Rega. Dem. facilities: single speaker dem. room. Open Mon-Sat, 9.30-5.30. Home trial facilities. Free installation, instant credit up to £1,000. Credit cards: Barclaycard, Visa.

KENT

JOHN MARLEY HI FI CENTRES, 2 Station Rd West, Canterbury. (Canterbury) 69329. B&W, Heybrook, Magnum, M.Y.S.T. Nakamichi, Pink Triangle, Rotel, Sansui, Technics,

Quad. Dem. facilities available. Open Mon-Sat, 9.00-5.30 cl. Wed. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard, Creditcharge. Service dept.

PHOTOCRAFT HI-FI, 40 High St, Ashford Kent (0233) 24441/2. Open Mon-Sat 9.00-5.30. Wed-1pm. Free delivery. Int. free credit. Access, Visa.

BADA MEMBER 

LANCASHIRE

MONITOR SOUND, 54 Chapel St, Chorley. (02572) 71935. A & R, Dual, Mission, Quad, Rogers, Rotel, Spendor, Thorens, Nakamichi, Yamaha. Dem. facilities. 2 dem. rooms. Open Mon-Sat, closed Weds. Home trial facilities, free installation, instant credit up to £1,000. Credit cards Access, Visa. Service dept.

PRACTICAL HI-FI, 198 Church St, Blackpool, (0253) 27703. 'Free five year guarantee on all systems. Buy with confidence'.

BADA MEMBER 

PRACTICAL HI-FI, 84 Penny St, Lancaster. (0524) 39657. '14 days option of exchange available. Buy with confidence'.
BADA MEMBER 

LEICESTERSHIRE

MARKWELL ELECTRONICS Ltd, 76 Leicester Rd, Wigstone (0533) 882758. Akai, Celestion, JVC, Hitachi, Marantz, Ortofon, Sansui, Sennheiser, Sony, Toshiba, Open Mon-Sat 9.00-8.00. Free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

SOUNDADVICE, The Sound Factory, Duke St, Loughborough LE11 1ED (0509) 218254. A&R, Creek, Linn Products, Manticore, Naim Audio, Nakamichi, Nytech, Rega, Revox, Yamaha. Dem. facilities: 2 studios-domestic size and furnishings. Appointment required. Open Mon-Sat, 9.30-6pm. Free installation, credit facilities available. Credit cards: Access, Barclaycard. Service dept.

LINCOLNSHIRE

YATES & GREENHOUGH, 11-14 Emery Lane Boston, Lincs PE21 8QA (0205) 55755 B&W, Castle, Dual, Monitor Audio, Mordaunt short, Nakamichi, QED, Quad, Technics, Yamaha. Dem. facilities available. Open 9.00-5.30, closed Thurs. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Creditcharge, Visa. Service Dept.

LONDON

A.T. LABS, 159 Chase Side, Enfield Middlesex. (01) 367 3132. Open Mon-Sat, 10am-6pm. Two single speaker dem. rooms. Amex, Barclaycard, Access.

BADA MEMBER 

ANALOG AUDIO, 849 High Rd, London N.12. (01) 445 3267. NAD, Denon, Pioneer, Yamaha, Rotel, Sansui, Dual, Thorens, Tannoy, Marantz. Dem. facilities available. Open Mon-Sat 9.45-6.00. Free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

AUDIO T, 190 West End Lane, London NW6. (01) 794 7848. Open Mon-Sat, 10-6.00 Two single speaker dem rooms. Access, Amex, Barclaycard.



BADA MEMBER 

BARTLETTS HI-FI, 175-177 Holloway Rd, London N.7. (01)607 2296 / 607 2148. 'Large range of British & Japanese products available'. 2 bookable single spk dem. rooms. Service dept. Mail order dept. Export worldwide. Access, Amex, Diners, Visa.

BADA MEMBER 


SELECTED DEALER DIRECTORY

BARTLETTS HI-FI, 19 High St North, London E.6. (01) 552 2716.
BADA MEMBER 
BILLY VEE, 248 Lee High Rd, Lewisham, London SE13 5PT. (01) 318 5755/852 1321. Aiwa, A&R, Creek, Dual, KEF, Linn, Haybrook, Quad, Naim, Rega. Dem. facilities: 2 single system studios, ring for appointment. Open Mon-Sat. 10am-7pm, closed Thurs. Home trial facilities, free installation, interest free credit up to £750.00. Credit cards Access, Visa. Service dept.

BADA MEMBER 
GRAHAMS HI-FI, 86-88 Pentonville Rd, London, N1. (01) 837 4412. FBA Dealer of the year 1985. Linn, Naim, Rega etc. £300-£3,000-£13,000.
BADA MEMBER 


H.L.SMITH & CO. Ltd, 287-289 Edgware Rd, London W2 1BE (01) 723 5891. Aiwa, B & W, Denon, Dual, KEF, Ortofon, Panasonic, Sony, Technics, Yamaha. Dem. facilities available. Open Mon-Sat, 9-5.30, Thurs 9-1pm, instant credit up to £1,500. Credit cards: Access, Visa. Service dept.
MUSICAL IMAGES, 45 High St, Hounslow, Middlesex. (01) 570 7512. A.R., Denon, Dual, Heybrook, Nakamichi, Proton, QED, Quad, Tannoy, Yamaha. Dem. facilities, ring for appointment. Open Mon-Sat 9.30am-6.00pm. Free installation, credit facilities. Credit cards: Access, Amex, Barclaycard, Diners. Service dept.
MYERS AUDIO, 6 Central Parade, Hoe St London E.17. (01) 520 7277/8. Bang & Olefson, NAD, Nakamichi, Sansui, Technics, Hitachi, Panasonic, A&R, B&W Mission. Dem. facilities one dem. room. Open Mon-Sat 10am-6pm. Free installation, instant credit up to £1,000. Credit cards Access, Visa, Amex, Diners. Service dept.

WRBI HOME DEMONSTRATIONS/SOUND INFORMATION. 13 St Johns Hill, London SW11 1TN (01) 228 7126. Alphonson, Audiostatic, Beard, Castle, Celestion, Decca, Ear, Elite, Jordan, Pink Triangle. Home demonstrations only. Appointment required. Open Tues-Thurs 10-6pm, Fri 10-7pm, Sat 10-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Amex, Diners, Visa.

SUBJECTIVE AUDIO 2-4 Camden High St., London NW1 OJA, 387 8281. A.R., Burmester, krell, Magnerplanner, Meridian, Linn, Nakamichi, John Bowers. Dem facilities: 3 single speaker dem rooms, appointment required. 10.00-6.00 Tues-Fri, 9.00-5.00 Sat. Home trial facilities, instant credit up to £10,000. Credit cards: All. Service dept. 

TELESONIC Ltd, 92 Tottenham Court Rd, London. (01) 636 8177. A&R, B&O, B&W, Halfer, Luxman, KEF, QED, Quad, Nakamichi, Rogers. Dem. facilities available. Open Mon-Fri, 9.00-6.00pm, Sat, 9.30-4.00pm. Home trial facilities, free installation, credit facilities available. Credit cards Access, American Express, Diners, Visa. Service dept.

THE SOUND ORGANISATION Ltd, No 1, Cathedral St, London Bridge, London SE1 9DE (01) 403 2255/3088. Akroyd, Creek, Dual, Exposure, Linn, Manticore, Mordaunt-Short, Naim, Nyltech, Rega. Dem. facilities available, ring for appointment. Open Tues-Sat, 10am-7pm. Home trial facilities, Free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard. Service dept.

BADA MEMBER 
UNILET PRODUCTS Ltd, 14 Bute St, London SW7. (01) 5892586. Mon-Sat 9-6. Dem facilities. Large stock. C.cards. Access, Amex, Diners, Visa.

BADA MEMBER 

MANCHESTER

CLEARTONE HI-FI, 62 King St, nr. Kendals, (061) 835 1156. Best makes Linn, Creek, NAD, etc. Dem. studio.

Compact disc centre, video and T.V.

BADA MEMBER 

THE MUSIC ROOM, 50 Bridge St, Manchester. (061) 835 1366. Friendly advice and service. Choose from the widest range in Manchester.

BADA MEMBER 

CLEARTONE HI-FI, 235 Blackburn Rd, Bolton. (0204) 31423. Best makes, Linn, Creek, NAD, Etc. Dem. studios. Laser vision and compact disc centre.

BADA MEMBER 

LLOYD PATON (LPM Ltd), 34 Moorfield Walk, Urmston, Manchester. (061) 747 9722. B&W, Dual, Hitachi, Marantz, Pioneer, Quad, Rogers, Tannoy, Technics, Trio. Dem. facilities, 1 dem. room. Open Mon-Sat, 9am-5.30pm, Tues-Thurs 9am-7.30pm. Home trial facilities. Free installation, credit facilities available. Credit cards: Access, Visa. Service dept

MERSEYSIDE

ABOUT SOUND 116 Bold St, Liverpool. L1 4JA (051) 709-4865. Meridian, Mordaunt-Short, Musical Fidelity, Quad, Revox, Sansui, Sugden, Thorens, Walker, Yamaha. Dem. facilities single speaker room. Ring for appointment. Open Tues-Sat, 9.00am-5.30pm. Free installation, instant credit up to £1,000. Credit Cards: Access, Diners, Visa. Service dept.

W.A. BRADY & SON, 401 Smithdown Rd, Liverpool. (051) 733 6859. 'Largest choice of specialist Hi-Fi in N.W. £100-£20K'. All c.cards. 3 dem. rooms.

BADA MEMBER 

WEST MIDLANDS

ALTERNATIVE AUDIO Ltd, 95 Hobs Moat Rd. Solihull, (021) 742 0254. A. & R., Audiobal, Denon, KEF, Marantz, Meridian, Mission, M.A., Pink Triangle. Dem facilities available, appointment required. 10.00-6.00 Tues-Sat, closed Mon. Home trial facilities, free installation, instant credit. Credit cards: Access, Visa, Amex.

FIVEWAYS HI-FIDELITY Ltd, 12 Islington Row, Edgbaston Birmingham. (021) 455 0667. A&R, Creek, Dual, KEF, Meridian, Philips CD, Quad, Revox, Rogers, Spendor, Etc. Dem facilities. Single speaker dem. room. Open 9.30-6.00 Tues-Sat. Home trial facilities, free installation, credit facilities. Credit cards: Access, Visa. Service dept.

GRIFFIN RADIO LTD, 94 Bristol St, Birmingham. (021) 692 1359. Creek, Dean, Denon, KEF, Linn, Mordaunt Short, Nakamichi, Rega. Dem. facilities 2 single speaker rooms. Open Mon-Sat, 9.30-6.00. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard.

SOUND ADVICE, 162 Alcester Rd, Mosley, Birmingham. (021) 449 3328. A&R, Creek, Linn, Manlicore, Naim, Nakamichi, Nyltech, Onix, Rega, Revox. Dem. facilities 2 studios, ring for appointment. Open Mon-Sat, 9.30am-6.00pm closed wed. Free installation, credit facilities available. Credit cards: Access, Barclaycard. Service dept.

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
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ABR: Auxiliary bass radiator; a reflex type bass-loading for loudspeaker systems, which uses a speaker-like 'cone' without motor, instead of a port.

Active: Speaker systems which contain electronic crossovers and where the drive units are connected directly to power amplifiers.

Amplitude: Size or magnitude; hence the amplitude/frequency response, known normally simply as the frequency response, which describes the relative loudness of the system at different frequencies with a constant input voltage.

Anechoic: Without echo; a special room or 'chamber' with thick sound absorbing materials on all surfaces to prevent reflections.

Balance: 1) The overall relative loudness perceived at different frequencies (eg bass, treble) 2) the accuracy of the match between the two channels of a stereo transducer (eg cartridge or headphone).

Bandwidth: A range of frequencies with presumed defined upper and lower limits.

Bass: Lower part of the frequency spectrum, typically below 150Hz.

Bextrene: A plastics material frequently used for bass and midrange cones.

Binaural: Closed system recording/replay technique using headphones and 'dummy head' microphones.

Bituminous damping: A cabinet damping technique whereby heavy impregnated felt pads are attached to the internal cabinet surfaces.

Capacitance: An element of electrical impedance that is particularly important when matching pickup cartridge, arm leads and amplifier input characteristics to achieve a flat frequency response from discs.

Clipping: This is reached when a circuit is overloaded and overdriven, resulting in bad waveform distortion and audibly unpleasant effects.

Coloration: A general term used to describe the audible effects of distortions, particularly in loudspeakers and record players. These are usually caused by frequency response irregularities and/or resonances.

Compatibility: The selection of interdependent components to achieve optimum system performance; notably arm/cartridge mass/compliance matching, cartridge electrical loading, or headphone compatibility with amplifiers.

Crossover: An electrical circuit which uses combinations of inductors, capacitors and resistors to divide the signal from the power amp into the required frequency bands and with

any necessary equalisation for feeding to the individual drive-units of the speaker system.

Decibel (dB): A logarithmic unit that is convenient for expressing ratios that span a wide range on a linear scale. For simplicity it can be regarded as a measure of relative loudness.

Distortion: Literally this can mean any deviation from the original, but usually refers to harmonic rather than intermodulation distortions when not specified.

Doping: A technique involving the application of damping to a loudspeaker driver cone in order to assist in controlling resonances.

Drive unit (Driver): The term used to distinguish the loudspeaker unit itself, be it bass, midrange, treble or fullrange in application, from the complete loudspeaker system which combines drive units, cabinet and crossover into a total design.

Dynamic range: The ratio in dBs between the quietest sound that can be successfully recorded and the loudest which can be accepted without serious distortion on an average programme.

Ferro-fluid: A magnetic fluid which is introduced into the voice-coil gap to provide damping and/or improved cooling.

Frequency range or spectrum: Can refer to any particular group of frequencies, but commonly applied to the audible band from 20 to 20,000 cycles per second (Hz), extending from the deepest bass to the highest audible harmonics.

Frequency response: The variation in output over a frequency range, particularly of a transducer; can be expressed as a range with decibel limits, or depicted graphically.

HF: High frequency.

Hz (Hertz): 1 Hz = 1 cycle per second and is a measure of frequency which corresponds to musical pitch (the higher the frequency the higher the pitch.)

Harmonic: Harmonics are the whole number multiples of a base frequency called the *fundamental*.

Harmonic distortion: The addition of unwanted harmonics to a signal.

Impedance: Measure of resistance (and reactance) in alternating (ie audio) signals; this is of some importance in the compatibility of both cartridges and headphones with amplifiers. For convenience's sake is measured in ohms.

Integration: Used to describe the success with which the output from two drive units combine to give smooth output through the crossover region.

Intermodulation (IM): A form of distortion

GLOSSARY

arising from two or more signals producing non-harmonic signals that correspond to the sum or difference of the two frequencies.

Kilo (k): prefix meaning one thousand.

LF: Low frequency.

Linear: A transducer that produces an output that exactly portrays its input over the required operating range is described as linear, and is hence distortion free. Hence also nonlinearities (distortions).

Load or loading: The impedance (including resistive and reactive components, ie ohms, mH, pF) seen by one component looking back to its interconnected component; of importance in compatibility of cartridge/amp, and amp/headphone.

Midrange, Midband: The central part of the audible frequency range where the ear is most sensitive.

Octave: Two-to-one ratio of pitch or frequency.

Ohm: Unit of electrical impedance (including reactance) or resistance; also kohm, where 1 kohm = 1,000 ohms.

Port: An opening in a cabinet which is tuned to characteristics of the bass driver and the en-

closure volume to provide reflex type bass-loading.

Presence: A quality of forwardness or immediacy in a sound balance, generally related to an upper-middle frequency response boost.

Q: A measure of the magnitude and shape of a resonance; the higher the Q, the sharper and more severe in amplitude the resonance.

Reflex: A system of bass loading (using port or ABR) which offers improved efficiency and bass power handling at the expense of subsonic control compared to a sealed box.

Sensitivity: The volume of sound output for a specific electrical voltage input.

Subsonic: Below audible range, ie below 20Hz.

THD: Total harmonic distortion.

Transient: Signal of very short duration.

Treble: Upper part of frequency spectrum, typically above about 3kHz.

Tweeter: A small drive unit designed to operate over the high frequency range.

Ultrasonic: Frequencies above audibility, ie greater than 20kHz; also *supersonic*.

Woofer: A drive unit that operates over the bass portion of the audio range.

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