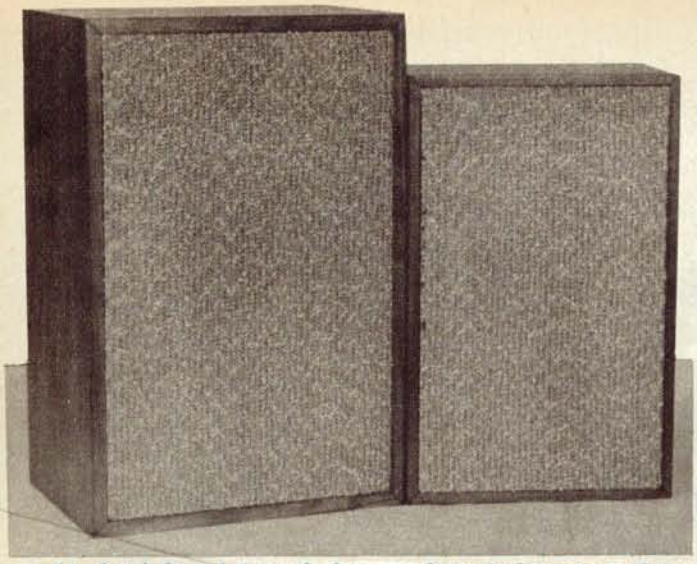


At the left a 1.6 cu ft free-standing enclosure; at the right a 1 cu ft enclosure, well suited to resting on its side on a shelf. Both have a power rating of 30W RMS.

TWO COMPACT HIGH POWER VENTED ENCLOSURES

A new, high performance 8-inch louspeaker recently announced by Magnavox (Aust) Pty Ltd makes it possible for hi-fi enthusiasts to build up complete loudspeaker units which exhibit an exceptionally wide and level frequency response, with a steady-tone power rating of 30 watts. Alternative enclosure designs are suggested in the following article.

The new loudspeaker, designated as Magnavox type 8-30, has been designed primarily to operate as a bass driver in small to medium-sized vented enclosures. When so mounted, it can accommodate amplifier outputs of the order of 30 watts RMS.

For a loudspeaker of this kind, it is certainly not expensive; the retail price, subject to normal trade discount, is quoted as $25.50.

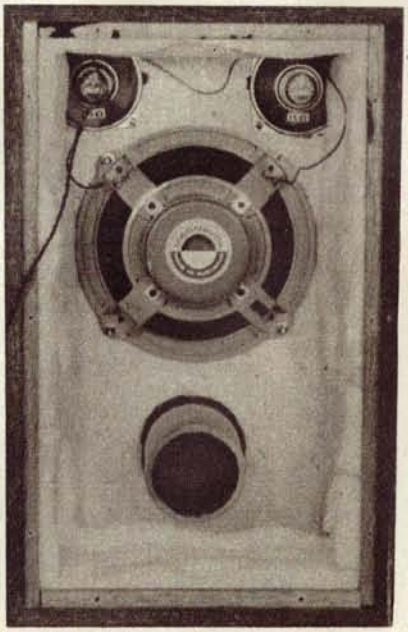
Built around a rigid diecast aluminium housing, which permits either front or back mounting, the 8-30 loudspeaker uses a 3.25lb barium ferrite magnet system and a 1.5in diameter voice coil, wound on a high tensile aluminium former.

The cone is of curvilinear configuration, to inhibit break-up at high power levels, and the edge uses viscous damping to aid suspension and to terminate standing waves which might be developed along the cone surface. The manufacturers claim that the system can "accommodate excursions of .007in, while remaining linear". The nominal system resonance is at 45Hz and the nominal frequency response 40Hz to 8000Hz. For wide-range applications, the loudspeaker should be used with a pair of Magnavox 3TC tweeters.

Three versions of the 8-30 loudspeaker are referred to in the manufacturers' literature, having minimum impedance figures of 4, 8 and 15 ohms respectively, at 350Hz.

The manufacturers claim that they have designed the 8-30 loudspeaker specifically to meet the requirements imposed by compact vented enclosures, the criteria involving both the natural resonance of the cone system and its acoustical "Q". The aim has been to take advantage of the bass-end reinforcement which a vent can offer, while avoiding or minimising the lumpiness which is so often evident in vented systems.

The accompanying composite diagram gives details of alternative enclosure designs suggested by Magnavox (Aust) Pty Ltd. Both provide for the use of two type 3TC tweeters, with a simple capacitive feed from the source, energising them at frequencies above about 5KHz. A crossover effect is achieved in part by the series capacitor and in part by the natural roll-off of the main driver.



Interior view of the smaller enclosure, showing the tweeters, the port and the Magnavox 8-30 main driver, for which the enclosures have been expressly designed.

Two 3TC tweeters are necessary to match the 30-watt power rating of the larger loudspeaker, the tweeters being selected and connected either in series or in parallel to provide the same nominal impedance as that of the main driver. The 3TC matches the 8-30 in basic sensitivity and is preferred to the 3UC on that account.

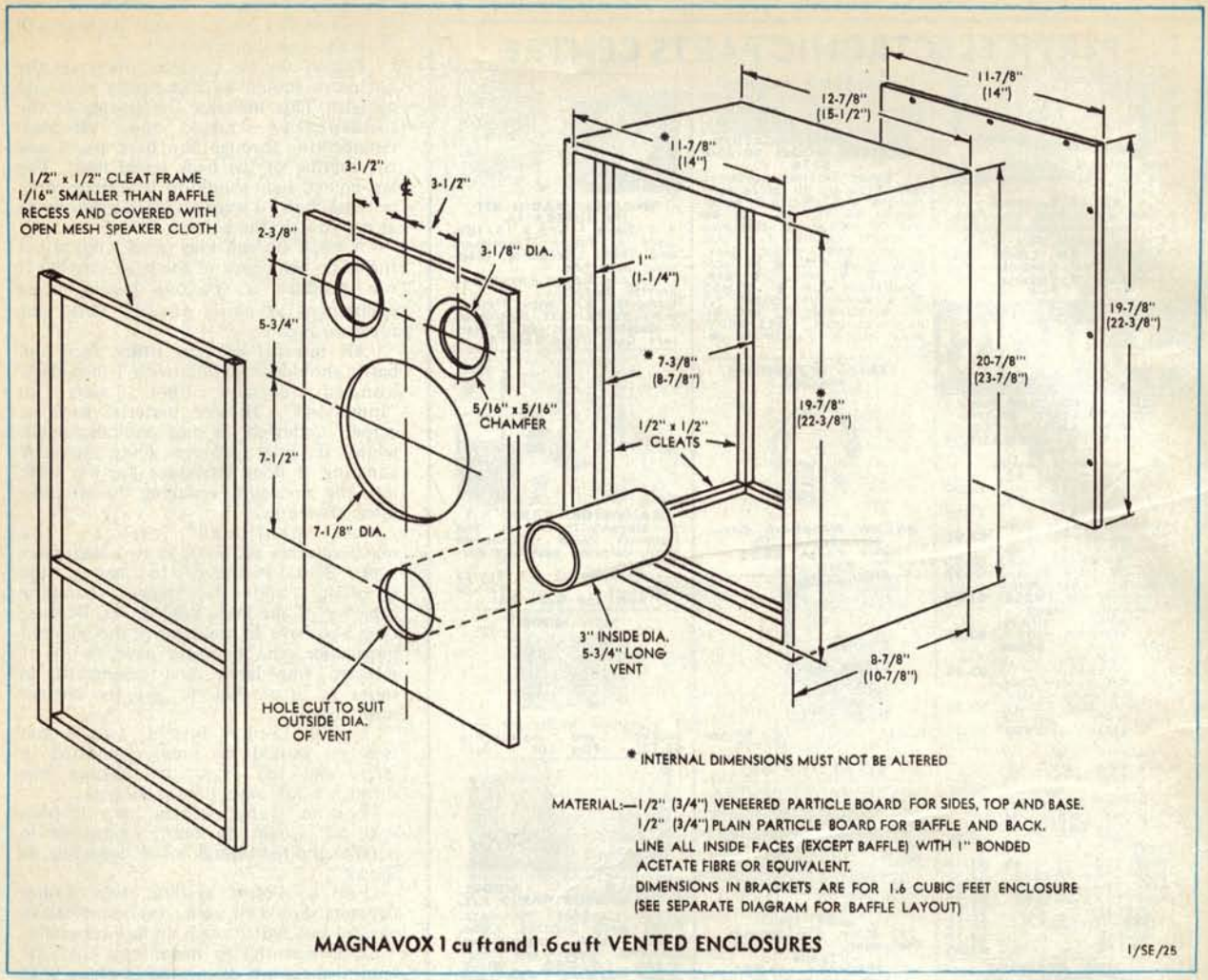
The smaller enclosure allows for an internal volume of about 1 cubic foot and, as indicated in the accompanying curve, shows a modest peak at 80Hz and a bass "corner" frequency of 50Hz, below which the response tapers at about 12dB per octave. It may be built from lighter material than the large unit and, used on its side, would qualify as a "bookshelf" system, even if a rather large one and more husky than most. Normally, a stereo pair of the enclosures would be arranged with the tweeters remote from the centre line of the room, to increase the effective stereo spacing.

At a nominal 1.6 cubic feet, the larger enclosure is more appropriate as a free-standing unit and, for this purpose, individual constructors may elect to elevate it slightly on some kind of ornamental base, in keeping with the rest of the furniture. It may be used vertically, with the tweeters to the top, or horizontally with the tweeters furthest from the stereo centre line, as before.

Magnavox suggest that the arrangement of the tweeters in the larger enclosure could be varied according to whether the box is to be positioned vertically or horizontally. If horizontally, the tweeters should ideally be as shown in the main drawing so that, with the enclosure on its side, they will be one above the other. This will give a "line source" effect for the tweeters, tending to project the higher frequencies in a broad, fan-like beam throughout the room.

If the enclosure is to be used vertically, the tweeters should ideally be mounted in a single line with the main driver. There will be no great penalty if the suggestion is not followed but it is a nicety which can easily be observed during the construction.

The composite drawing gives essential dimensional details for the alternative



MAGNAVOX 1 cu ft and 1.6 cu ft VENTED ENCLOSURES 1/SE/25

Shown above are composite plans for two enclosures. Dimensions for the larger enclosure are shown in brackets. If, as normal, the larger enclosure is to stand vertically, the loudspeakers are best mounted in line as indicated in the drawing overleaf.

enclosures. Particle board is the obvious material to use, but plywood, solid wood or rigid composition board could be substituted if a supply is ready to hand. The material may be equal to or thicker than the specifications for the respective boxes, but it should not in any circumstances be thinner. If thicker material is used, the internal dimensions should be preserved and the external dimensions increased as necessary.

The proportions represented in the drawings are in line with current enclosure practice and, with an eye to duplicating the original test results, it would be wise to adhere to the suggested dimensions. This will ensure duplication of various incidental dimensions as, for example, the distance between the rear end of the port and the back of the cabinet.

However, if circumstances dictate a change in proportions, something very close to the measured performance will probably be achieved provided that the internal volume and the port dimensions are preserved.

This means that the exact internal volume of the preferred size should be calculated, with due allowance made for cleats but not for the acoustic wadding. The new shape would have to be proportioned to have precisely the same internal volume. It could be taller, wider or thicker, or of triangular plan but extremely tall tube-like shapes should be avoided, or very thin sandwich shapes.

Furthermore, if a modified shape involves substantially larger unsupported panel areas than the original, internal stiffeners may have to be added to minimise drumming effects. These will have to be allowed for in the calculation of internal volume.

Certain other points warrant special mention.

The internal cross-sectional area of the port and its length, lip to lip, is no less critical than the cabinet volume and, in fact, interacts with the cabinet volume to establish a deliberate acoustic resonance. A composition tube has been specified because it provides a mechanically simple and rigid means of meeting the requirement.

Composition tube of the required type is often used as a winding piece for rolls of paper, and may possibly be picked up without charge from a local printery. Those not so fortunately placed need not despair, however. Magnavox have advised that they expect to be able to make suitable tube available to their distributors for a modest cost.

A rectangular port could conceivably be constructed from particle board having the same internal area and the same length as specified for the tube. However, any additional space it might occupy within the enclosure, by reason of extra bulk, would have to be allowed for in calculating the enclosure volume.

Note that the holes for the tweeter loudspeakers are shown as being tapered outwards, so as to minimise interference with the radiation from the cone. In tapering the holes, however, make sure to leave enough thickness to accept the tweeter mounting screws.

An important point to note is that the grille cloth is mounted on a frame which supports it ½-inch away from the front surface of the baffle. This is done for a very good reason.

If the grille cloth is too close to – or in contact with – the baffle, there is a very strong chance that it will flap against it and produce a spurious noise output. While this can be prevented by glueing the cloth to the baffle, the presence of cloth directly across the vent can seriously modify its behaviour.

By supporting the cloth well clear of the vent and of the loudspeaker cone, the cloth can move freely over a fairly large area, without flapping against anything and without interfering too much with the low frequency behaviour of the system. Needless to say, it should also be as transparent as possible at the higher frequencies, so as not to absorb radiation from the tweeters.

The grille cloth frame can be held in place in a number of ways. In the prototype enclosures, small nylon combs attached to the cloth frame "grabbed" small pads of nylon cloth, when the frame was pushed home.

Note that the baffle, the edges of the cutouts and the inside of the port should

be painted flat black, so that nothing will show through the grille cloth.

Except for the intended openings, the enclosure should be completely rigid and airtight. This includes the seating of the loudspeaker rims, the electrical connections through the back panel and the seating of the back panel itself. The last-named item should be held in place by not less than 10 screws, driven carefully so as not to strip the holes.

A small air leak may or may not affect the basic behaviour of the enclosure but it can produce a spurious hissing noise component as air is pumped back and forth through it.

All internal surfaces other than the baffle should be padded with 1-inch thick bonded acetate fibre, such as "Innerbond". Heavier material such as carpet underfelt is not recommended; while it may achieve some acoustic damping it does introduce particle bulk into the enclosure, reducing the effective internal volume.

As mentioned earlier, the manufacturers recommend two Magnavox type 3TC tweeters, to match the sensitivity and the power handling capacity of the main 8-30 driver. Because they also have to conform to the required impedance, the tweeters have to be of selected impedance and connected in series or in parallel, to give the correct resultant.

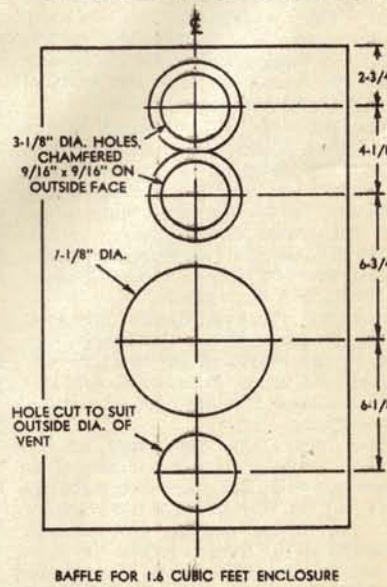
For a 15-ohm system, two 8-ohm tweeters should be used, connected in series and fed from the 15-ohm line through a 2uF capacitor, as shown.

For an 8-ohm system, two 15-ohm tweeters should be used, connected in parallel and fed though a 4uF capacitor, as shown.

For a 4-ohm system, two 8-ohm tweeters should be used, also connected in parallel but fed through an 8uF capacitor.

It is essential to make sure that the loudspeakers are connected in phase with the connections marked with a red washer connecting to (or towards) the active lead and the other connections to (or towards) the earthy lead, as shown in the accompanying diagrams.

It is necessary to observe polarity



BAFFLE FOR 1.6 CUBIC FEET ENCLOSURE

Preferred arrangement of loudspeakers for the larger enclosure, if used vertically. The line-source effect tends to project the higher frequencies as a fan-shaped horizontal beam.

within individual systems but, by treating the loudspeakers uniformly, a stereo pair of systems can be connected directly to a suitably marked amplifier, knowing that the phasing of the system as a whole will be correct.

Magnavox specifically state that the tweeter coupling capacitor should not be an electrolytic type, whether polarised or non-polarised. They specify paper, polyester or lacquered paper capacitors of not less than 50V rating.

Reproduced herewith are response curves taken of the respective systems taken on the manufacturer's automatic curve tracing equipment. As loudspeaker curves go, they show a commendable uniformity of response and, in this respect, are above average, even for high quality systems.

However, while such curves are interesting as evidence, an experienced audiophile is almost certain to ask: "Do they sound that way"?

The answer is: "Yes, they do".

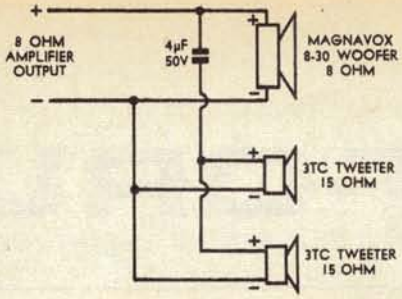
In the laboratory, we compared them at modest levels to our earlier "bookshelf" and "Point-Four" systems. We do not regard these as any kind of an ultimate but we know them pretty well and regard them as a kind of "2ft rule" – longer than some rules, shorter than others but very useful to measure things by!

We know that they are reasonably well balanced, though perhaps a trifle lacking in middle "presence", a trifle bright at the top and, being compact enclosures, in need of some bass reinforcement.

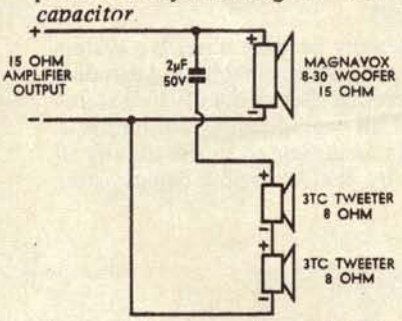
By comparison, the Magnavox enclosures had a little more "presence", a little less brightness by comparison, and more body at the bass end. In short, the differences in sound were all as we felt that they should have been, lending credibility to the claim for a level overall response.

As for power handling capability, the issue was never in doubt. In our laboratory, the two new systems combined to produce an ear shattering output from a solid-state stereo amplifier, without the slightest signs of distress.

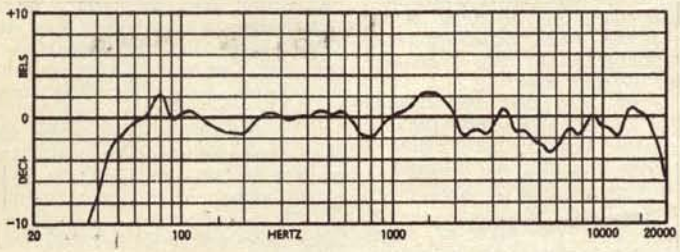
What of the difference between the two Magnavox systems, the larger and the smaller?



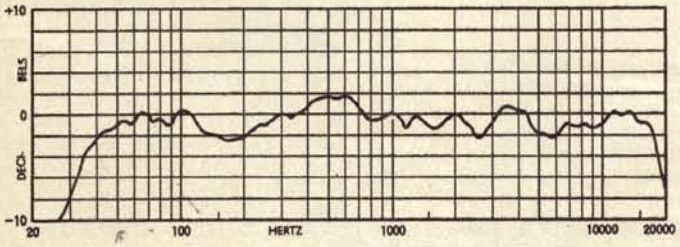
Connections for an 8-ohm system. For a 4-ohm system the 8-30 driver would be of 4 ohms impedance; 8-ohm tweeters would be used, connected in parallel and fed through an 8uF capacitor.



For a 15-ohm system, 8-ohm tweeters need to be connected in series, as shown. It is essential that correct polarity be observed in all cases.



Response curve of the 8-30/3TC system in a 1 cu ft vented enclosure. The relatively even output across the spectrum is reflected in a notable lack of colouration of the sound.



Response curve of the 8-30/3TC system in a 1.6 cu ft vented enclosure. Main difference from the curve above is an extension of the response over the 40Hz region.

Frankly, the difference is quite small. The general balance and sound is identical and the extra coverage below 50Hz is only apparent if you listen for it with music which has components in the particular region.

In short, if you face any kind of a space problem, the smaller enclosure can be selected, in the knowledge that very little will be lost by so doing, and with virtually no sacrifice in power handling capacity. However if space is no object, the larger enclosure would be the one to prefer.

In assessing the performance, however, it is necessary to observe that, because the bass is level and "tight", it tends to sound less prominent than the bass from systems where the low frequency energy is coloured by resonance peak(s) and under-damped cone movement.

In fact, in a home situation, the smaller enclosure tended to sound very like a high quality, imported but fully sealed system which is currently in use. Our tip is that the average audiophile will like the Magnavox systems best with a modest amount of bass boost in operation.

It is difficult to describe sensitivity in general terms but it is "about average" in terms of present-day concepts. The 8-30 systems could therefore be used with lower-powered amplifiers – say 2 to 3 watts – but their power handling capacity would be wasted.

As a matter of interest, we tried the systems with an electronic organ and found the bass from the pedals to be very smooth. The 8-30 would therefore seem to be a very good choice as an external loudspeaker system for an organ in homes, where space is any kind of a problem. In such an application tweeters, if used at all, would need to be controllable, because organ voicing is usually arranged on the assumption of loudspeakers with a not-too-prominent treble.

FOOTNOTE: Having read the foregoing article, readers may well be prompted to ask whether the enclosures described above could be used with some other 8-inch loudspeaker which they happened to have on hand. In fact, the enclosure designs inter-relate with the characteristics of the 8-30 loudspeaker and performance over the bass register will only be as represented with an 8-30 driver or with some other loudspeaker (if there is one) which has similar parameters affecting low frequency characteristics. Other 8-inch loudspeakers will "work" in the enclosures but only in the sense that a reasonable enclosure is better than none at all. A random combination might even work quite well but as a matter of good fortune rather than good management. ■