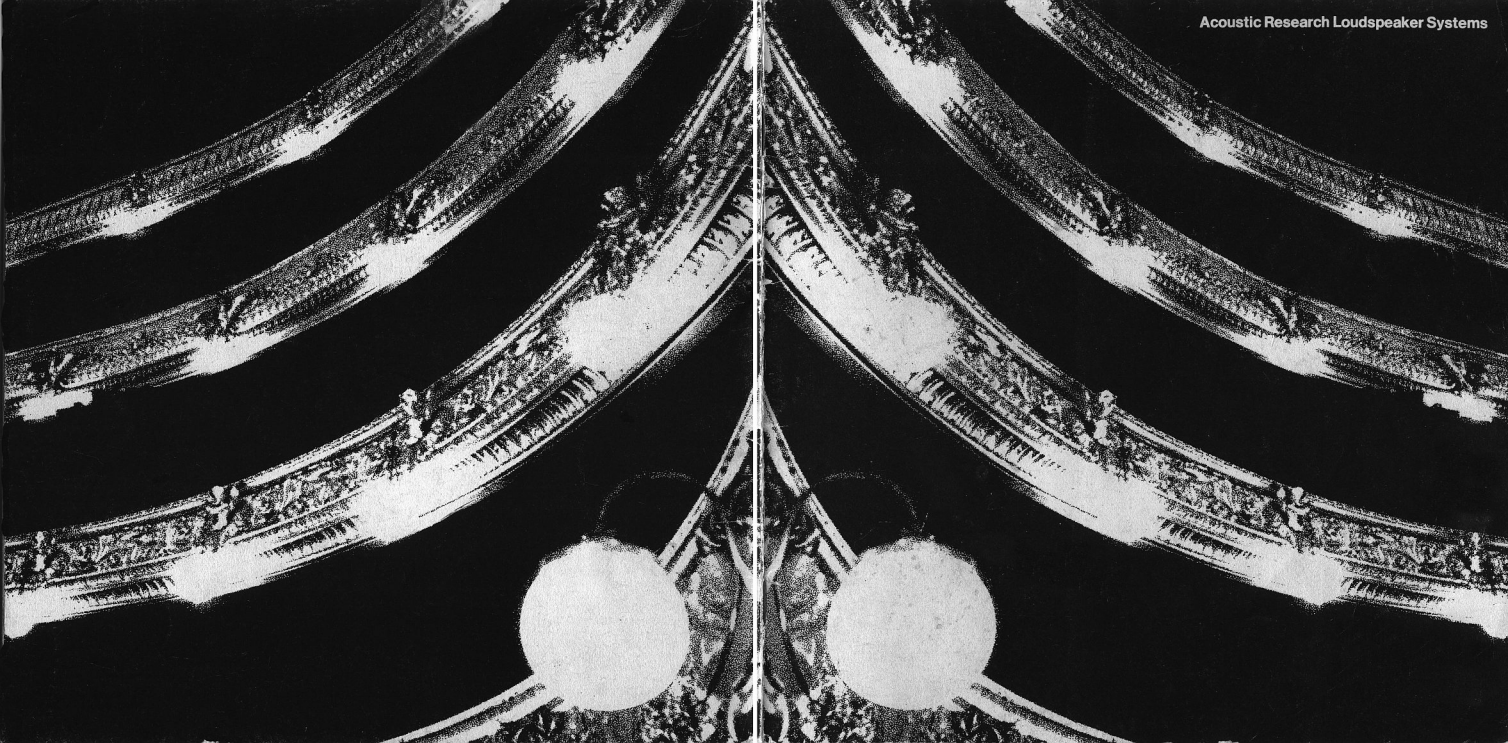


Acoustic Research

US office:
10 American Drive
Norwood, Massachusetts 02062

International office:
High Street, Houghton Regis,
Bedfordshire, England

A TELEDYNE COMPANY

Cover photo: the interior of the Royal Opera House, Copenhagen, where six AR-LST and twenty-four AR-6 speaker systems are constantly in use.

Introduction

AR and high fidelity
When music reproduction was truly a hobby, to be enjoyed by a lucky few, its practitioners coined the term 'high fidelity'. This meant that music coming from a loudspeaker should be as 'faithful' to the original performance as possible. The sound reproduction should be *accurate*.

The sound produced by musical instruments may or may not please an individual – and that is a matter of taste. Whether or not a loudspeaker has succeeded in accurately reproducing that sound, however, is a matter of fact, subject to measurement and control in accordance with the laws of physics.

At Acoustic Research we believe that a loudspeaker should be designed, not to sound either 'good' or 'bad,' but simply to sound accurate. It should have as little sound of its own as possible.

The contribution of the loudspeaker to the character or tone color of music should be zero. You should be aware of a speaker, not for its *brilliance* or its *presence*, but for its *absence*.

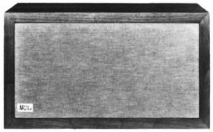
Was Stradivarius wasting his time?
After all, you are more interested in hearing what the composer (or the performer, the conductor, the instrument maker, or even the recording engineer) had in mind than what a speaker designer thought you ought to like.

The 'brilliant' or 'shimmering' sound of a loudspeaker – regardless of how pleasing it may sound at first – is certain to become a real annoyance much more quickly than the sound of, say, a Stradivarius violin or a Silbermann organ. In fact, when one thinks about it, the actual sound of music and the sound most likely to please the listener are, in the long run, one and the same.

On a number of occasions, AR has staged public concerts that were partly live and partly recorded. First, a tape recording would have been made of a musician or group of musicians. Later, portions of this recording would be played back over AR speakers, alternating with the same musicians playing the same music 'live'. In this way the audience could hear an entire piece of music from beginning to end and try to tell which portions were live and which were recorded. Most people – including a number of seasoned music critics – have not been able to hear any difference, much less say which was which.

The ultimate compliment
Many people who have dedicated their lives to shaping the sound of live music would seem to agree with the AR philosophy of accurate – as opposed to 'pleasant' – sound reproduction. The number of celebrated musicians who have chosen AR speakers for use in their homes is, AR believes, the most significant measure of the success of their approach.

A high fidelity speaker can receive no greater compliment than to be chosen by musicians of the stature of Karl Böhm, Herbert von Karajan, or Dietrich Fischer-Dieskau for listening to their own recordings.



AR-3a

The AR-3a is the best home speaker system we know how to make.
It has been designed to reproduce music as accurately as present-day knowledge of acoustics and electronics permits. In addition to incorporating the 305 mm (12 in) bass driver with which AR introduced its acoustic suspension systems to home listeners, the AR-3a was the first speaker system to use two miniature hemispherical speakers developed by AR to give better midrange and high-frequency response. The new miniature speakers offer an unprecedented degree of accuracy in their respective ranges.

The design of such small speakers – one is only 19 mm (¾ in) in diameter – although technically difficult, allows the laws of physics to operate to the listener's advantage. While larger speakers must beam high frequencies straight forward, AR's hemispheres instead spread these frequencies through a wide angle, considerably improving the realism of music reproduction for listeners in all parts of the room.

'. . . the best speaker frequency response curve we have ever measured using our present test set-up . . . virtually perfect dispersion at all frequencies . . . AR speakers set new standards for low-distortion, low-frequency reproduction, and in our view have never been surpassed in this respect'. *Stereo Review*

'On any material we fed to them, our pair of AR-3a's responded neutrally, lending no coloration of their own to the sound . . . the speakers sounded magnificent, filling the place with a lot of clean, musical sound and an excellent stereo image . . . Our tests of the AR-3a simply confirm the manufacturer's design aims and claims for this system'. *High Fidelity*

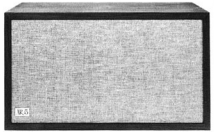
'The harmonic distortion at bass frequencies was outstandingly low . . . The high-frequency dispersion is the widest of any speaker we have tested . . . a new high standard of performance at what must be considered a bargain price'. *Audio*

'Acoustic Research have achieved what they set out to do – a first class loudspeaker by any standard'. *Hi-Fi News* (England)

'Finest bass performance I have heard or measured'. E J Jordan, *Wireless World* (England)

Few musicians have achieved the international fame of conductor Herbert von Karajan. He has directed the major symphony orchestras and opera companies of the world in their own concert halls. He listens to recorded music at home with AR-3a speaker systems.

AR-5



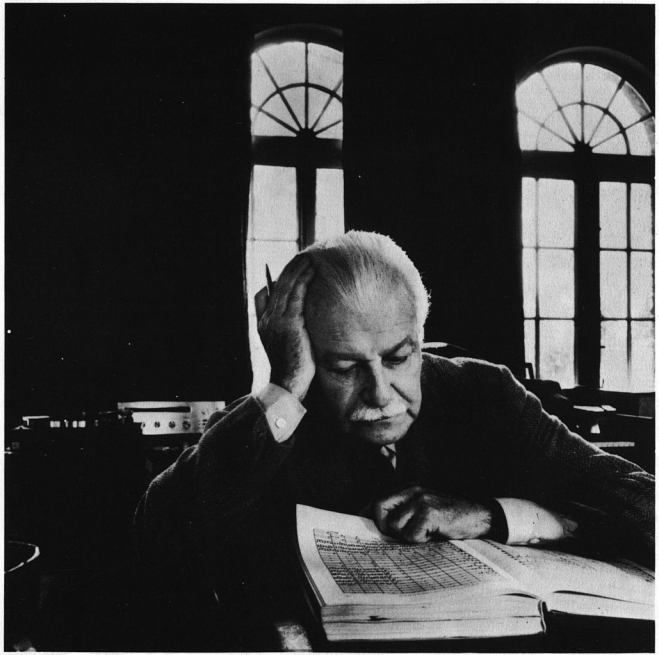
Inside the AR-5 are the two hemispherical dome speakers of the AR-3a, which provide uniquely accurate midrange and high-frequency reproduction, and a completely new 254 mm (10 in) woofer. The main differences between the AR-3a and the AR-5 are that the bass response of the AR-3a extends approximately ⅓ octave lower, and the price of the AR-5 is less.

The AR-5 pioneered several advances in materials technology that help make its performance possible. These advances have subsequently been incorporated into other AR speaker systems. The cone of the woofer, for example, is moulded by a low-vacuum process developed for AR, which greatly reduces the tendency to coloration heard in conventional cones of paper or polystyrene. At the cone's outer edge is a suspension of urethane polymer, which helps to achieve very low distortion at low frequencies. The AR-5, in fact, is one of today's most advanced speaker systems, the result of combining AR's years of experience with the newest processes and materials.

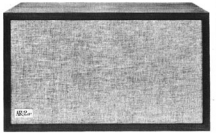
'I was immediately struck by its superb midrange to high-end smoothness and broad dispersion . . . the AR-5's bass line is solid and supremely clean, very deep . . . had a room-filling size to it; this is, of course, a function of the excellent high-frequency dispersion characteristics . . . if you like your music loud, you will doubly appreciate the AR-5. It is downright cheerful about accepting large amounts of power'. Larry Zide, *American Record Guide*

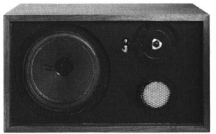
'Its sound was unquestionably 'AR' – which is to say that it had very clean, extended, low bass, exceptional dispersion of the higher frequencies, and an effortless, undistorted overall sound . . . [With level controls adjusted to the reviewer's preference] the sound quality of the AR-5 could then only be described as superb. We doubt that one could spot the differences between the AR-3a and the AR-5 on most program material.' Julian Hirsch, *Stereo Review*

'The AR-3a and AR-5 find themselves up in the lonely heights of perfection as far as dispersion and lack of distortion are concerned'. *Disk* (Holland)



For over 40 years Arthur Fiedler has been conductor of the Boston Pops Orchestra. In his Brookline, Massachusetts, home, he auditions his latest Polydor recordings over an AR music system consisting of two AR-5 speakers and an AR receiver and turntable.





AR-2ax

The AR-2ax is a lower-cost version of our basic acoustic suspension design. It contains the 254 mm woofer and 19 mm (¾ in) hemispherical dome, for very high frequencies, used in the AR-5. The midrange is covered by an 89 mm (3½ in) wide-dispersion cone unit. Separate controls on the back of the AR-2ax permit independent adjustment of the level of the midrange and high-frequency speakers.

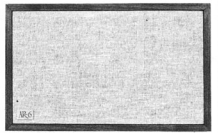
The performance standard in the design of the AR-2ax was the same as that for the AR-3a: natural reproduction of music without exaggeration or artificiality of sound. But where quality in the case of the AR-3a has been limited only by the state of the art and our own engineering skill, for the AR-2ax price was also a consideration.

'. . . a better-than-ever AR-2ax. And *I am nuts about it* . . . This new marriage of speaker drivers has produced a system that is as close to being perfectly balanced as any I have ever heard . . . No, the new AR-2ax is not the best speaker there is. But, it is very, very close . . . in fact, I will go so far as to say that you should not purchase *any* speaker . . . without first listening to this one.'
American Record Guide

'. . . here is an excellent new speaker system with all the clarity and open sound of its costlier namesakes, and very nearly all the clean bass power of the AR-5 or AR-3a too. It offers a smooth, well-balanced, uncolored, and amply dispersed response over the full musical range . . . The AR-2ax is, in sum, an eminently honest, musical reproducer'.
High Fidelity

One of America's most distinguished musicians, Miles Davis, is enthusiastically heard by listeners in every part of the world, live during his tours and recorded on Columbia Records. He listens at home with AR speakers.

AR-6



The AR-6 is designed to achieve the maximum performance available in a speaker of moderate cost. An indication of the success of the design is the unusually accurate bass response and lack of coloration of the AR-6, even when compared to systems that are more costly.

The most unusual characteristic of the AR-6 is the woofer, which has used the parameters of voice-coil size and length, magnetic circuit, diaphragm weight, and suspension to yield maximum theoretical performance. This technique permits the manufacture of a bass speaker with extended response and power-handling ability that occupies no more space than a conventional 203 mm (8 in) speaker.

The high-frequency speaker in the AR-6 is a 32 mm (1¼ in) design built especially for the AR-6. Its small size provides outstanding dispersion even at very high frequencies. The 178 mm (7 in) depth of the AR-6 adapts it ideally to shelf placement.

'It is noteworthy that the bass response measured for the AR-6 was almost identical to that we measured for the AR-5 . . . This is exceptional performance for a speaker of this size and price . . . As we have mentioned, the AR-6's polar response was very good . . . quite similar to that of the more expensive AR speaker systems. The tone-burst response was good at all frequencies, with no significant ringing or other anomalies at any frequency . . .

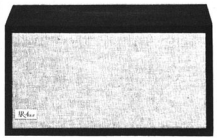
'All in all, the AR-6 acquitted itself very well in our tests. It was not quite the equal of the much more expensive AR models, whose sound it nevertheless resembles to an amazing degree, but on the other hand it out-performed a number of considerably larger and far more expensive systems we have tested in the same way. We don't know of many speakers with as good a balance in overall response, and nothing in its size or price class has as good a bass end.' *Stereo Review*

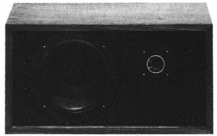
'Another great bookshelf speaker from AR . . . a really terrific performer. The AR-6 has a clean, uncolored, well-balanced response that delivers some of the most natural musical sound yet heard from anything in its size/price class, and which indeed rivals that heard from some speakers costing significantly more.

'The response curves taken at CBS Labs tell a good part of the story . . . across the largest portion of the audio spectrum and especially through the midrange the AR-6 responds almost like an amplifier'. *High Fidelity*

'They are superb'. *Popular Hi-Fi* (England)

Twenty-four AR-6 speakers, as well as six AR-LST's, are in constant use at the Royal Opera House, Copenhagen.





AR-4xa

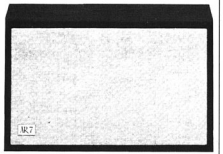
The AR-4xa is the improved version of the world's most widely used high fidelity speaker system, the AR-4x. The AR-4xa uses the same acoustic suspension woofer as its predecessor but incorporates a new tweeter and a modified crossover network. The 32 mm tweeter is the same as that used in the highly acclaimed AR-6 speaker system, giving the AR-4xa improved treble response and dispersion characteristics.

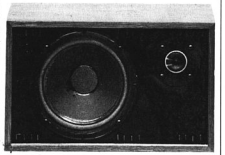
'There has been nothing like it, and the least I can write is that this speaker is astonishing . . . a model speaker in its class'. *La Revue des disques* (Belgium)

'This [frequency response] would be remarkable for any speaker, and in our experience is unique for any speaker in the price class of the AR-4x . . . We know of no competitively priced speaker that can compare with it'. *Stereo Review*

'Excellent performance . . . a steady frequency response which many more expensive systems would find it difficult to equal . . . this unit, measured objectively, confirmed fully what I expected to find after listening to it with a wide range of programme material. The AR-4x is a loudspeaker of very high quality, made and designed to high technical standards. It is not very often that one finds such a completely successful enterprise as this'. *Records and Recording* (England)

Singer Judy Collins's performances in concert and on Elektra Records are widely known and highly praised. The cabinet that holds her record and tape collection also contains a pair of AR-4x speaker systems.





AR-7

The AR-7 was developed by Acoustic Research to achieve accuracy of reproduction comparable to that of other AR speaker systems, but at a substantial saving in cost. A measure of the success of the new design is the small difference in sound that is apparent when the AR-7 is compared directly to even the most expensive AR speaker systems.

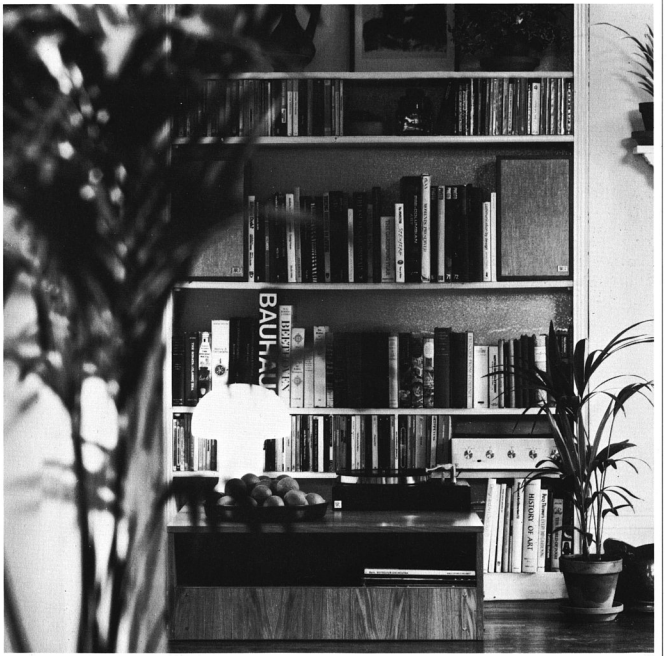
The secret of the AR-7's value is a new design of the woofer-enclosure system which offers a standard of low-distortion, extended bass response exceeding that of many systems of greater cost and size. The acoustic design required a small cabinet size, making the AR-7 unusually easy to find a home for. The AR-7 contains the same type of tweeter as the AR-6, providing a smooth and well dispersed energy output. The performance of the AR-7, in fact, is nearly identical to that of the AR-6, except for its less extended bass response.

The AR-7 is made and tested to exactly the same standards as other AR speakers. The cabinet size of the AR-7 makes it an ideal shelf speaker.

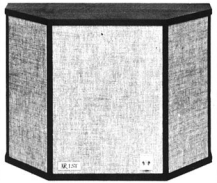
'We are not surprised at its excellent performance using our simulated 'live-versus-recorded' test technique . . . it compares with many speakers selling for twice its price or even more'. *Stereo Review*

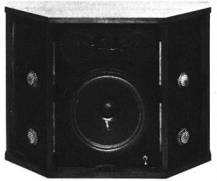
'. . . few can equal the AR-7 in clean bass power and transient handling in the size and price range. We can therefore confidently recommend them'. *Hi-Fi for Pleasure* (England)

The convenient size of the AR-7 makes it especially easy to live with. A high fidelity system, even of the highest quality, need not dominate the environment in which it is used.



AR-LST





The AR Laboratory Standard Transducer was designed for professional applications. It offers the recording engineer a quantitative standard for the monitoring of recording and mix-down operations. It is also used in scientific applications where the accuracy and repeatability of acoustical measurements is a prime requirement.

The AR-LST employs the same driver elements as the AR-3a, but four midrange and four tweeter units are used for increased power handling capability. In addition, the AR-LST offers a choice of six different energy output characteristics (spectral energy profiles), each accurately known and available at the turn of a switch. One of these profiles is as flat as the state of the art permits, from 30 to 20,000 Hz.

Although the AR-LST is designed for professional use in studios and laboratories, it is also available for those people who want such a precision instrument in their homes.

'Lab measurements and listening tests confirm that this is an outstanding reproducer, second to none in linear wide-range response and low distortion.

'The performance of the LST is truly prodigious. Its response was found to be among the most linear yet measured for a loudspeaker . . . virtually no directivity or coloration could be detected throughout the LST's range.

'It actually can handle power peaks up to 553.8 watts without distorting, while furnishing an output level of 112dB, which attests both to its ruggedness and dynamic capabilities'. *High Fidelity*

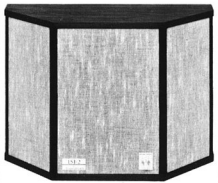
'To my ears, it can reproduce music from recordings with a verity I have never before experienced. For me, it is now the system against which others must be judged'. *American Record Guide*

'These speakers tell me more about the sound than any others I have ever listened to. They represent for me a reference standard that is the present-day state of the speaker art'. *Stereo and Hi-Fi Times*

'Some speakers always sound simply like themselves, but the LST sounds like the signals it is fed'. John Crabbe, *Hi-Fi News* (England)

A number of AR-LST's and AR-7's are in use at the Royal Opera House, Covent Garden, where the sound of electronically reproduced music must remain indistinguishable from its live counterpart.

AR-LST/2

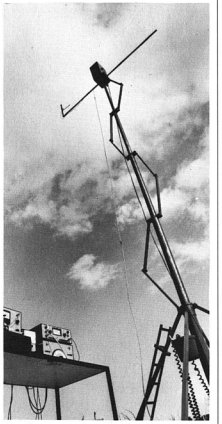


The AR-LST/2 has been designed to offer most of the special characteristics of the AR-LST, but at reduced cost. Three different spectral energy profiles are available, selected by a front-panel switch, including one flat power-response characteristic. Like the AR-LST, the AR-LST/2 also combines extremely uniform polar distribution with high power handling capability.

The 254 mm woofer of the AR-5 is used in combination with three AR-5 midrange and three AR-5 tweeter units. The primary differences between the AR-LST and the AR-LST/2 are that the AR-LST's bass response extends approximately ⅓ octave lower, and its power-handling capability is slightly greater, whereas the cost of the AR-LST/2 is less.

The AR-LST/2 is a new product from Acoustic Research. No press comment was available for publication at time of printing.

Neville Marriner is acutely familiar with the sound of live music, having conducted the Academy of St Martin-in-the-Fields and the Los Angeles Chamber Orchestra before audiences all over the world. At his London house, he listens to his own recordings with a pair of AR-LST/2 speaker systems.



Speaker systems under development must be measured under a wide variety of conditions. Anechoic measurements at extremely low frequencies are most reliably made in 'free space', as atop AR's hydraulic speaker lift.

AR speaker system specifications

On the following pages we give two types of frequency-response curves for each AR speaker system. The first shows on-axis anechoic response, and the second shows the speaker's total-energy response.

Anechoic curves
The anechoic curve for each speaker is a composite curve, made up of separate measurements of woofer, midrange, and tweeter. The separate traces are superimposed on one graph at their true relative levels. This technique presents a more realistic picture of the speaker system's on-axis response than conventional anechoic measurements taken with all drivers operating. The primary reason for this is that anechoic measurements of complete systems are affected by phase-cancellation effects in the crossover regions. These effects are extremely sensitive to the positioning of the test microphone, and they result in misleading information in the response curve. Because music listening is done in other than anechoic environments, the effects of these phase relationships are canceled out in practice and are inaudible.

Energy-response curves
The second curve for each speaker is made in a reverberant chamber, which collects together all the sound radiated by the speaker system in all directions. The response curve produced in this manner is especially relevant to normal music listening, which is usually done in a semireverberant environment.

In order to produce the same frequency balance in all parts of the listening room, a loudspeaker system must radiate sounds at all frequencies evenly in all directions – it should be as nearly omnidirectional as possible. An ideal speaker system therefore would have a reverberant energy-response curve and an on-axis anechoic curve of the same overall shape. This would indicate that the individual drive units do not become directional in their respective frequency ranges. In practice, when a unit does become directional, the energy response falls off at a greater rate than the on-axis response. Thus a comparison of these two types of curves gives a meaningful indication of a speaker's dispersion characteristics.

A drive unit begins to be directional when its circumference equals the wavelength of the frequency being reproduced. Thus the laws of physics dictate that the way to design a near-omnidirectional speaker is to develop drivers whose diameters are as small as possible. The small midrange and tweeter units made by AR are based on this principle.

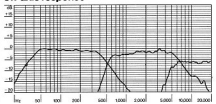
Measurement techniques
The anechoic curves were made of individual midrange and tweeter units being driven through their associated crossover circuitry. The microphone was placed at 1 meter on axis with each unit radiating into a 2 pi solid angle (a hemisphere), and an input of 1 watt (nominal) was applied. The 0dB reference level in each graph corresponds to a sound pressure level of 87dB relative to $2 \times 10^{-5} N/m^2$. Decorative molding around the cabinet edges was removed in order to avoid diffraction effects, which vary greatly with microphone position in an anechoic environment.

Woofer curves below 300 Hz were taken in an open field, with the system buried so that its front panel was flush with the ground. These curves were then combined with curves of the woofer above 300 Hz made in AR's anechoic chamber.

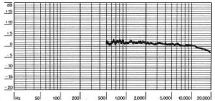
Energy-response measurements were made in a reverberant chamber with all drivers operating simultaneously (note the absence of phase-cancellation effects). Pink noise input was used, the frequency range being swept by ⅓-octave filters. These curves are given only from 500 Hz upward, since the woofers are essentially nondirectional below that frequency.

AR-3a

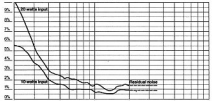
On-axis response



Acoustic power output



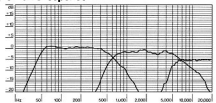
Woofer harmonic distortion



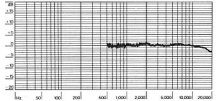
Drive units: 305 mm (12 in) acoustic suspension woofer, 38 mm (1½ in) midrange hemispherical dome, 19 mm (¾ in) high-frequency hemispherical dome
Crossover: 575 Hz, 5000 Hz
Impedance: 4 ohms nominal
Controls: Midrange and high-frequency driver level controls
Amplifier: Up to 100 watts per channel
Size: 356 x 636 x 289 mm deep (14 x 25 x 11⅜ in)
Weight: 24 kg (53 lb)
Woofer resonance: Free air 18 Hz, in enclosure 42 Hz
Volume of enclosure: 48.2 litres (1.7 cu ft)

AR-5

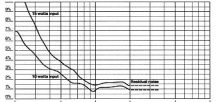
On-axis response



Acoustic power output



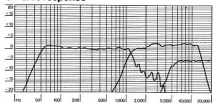
Woofer harmonic distortion



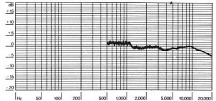
Drive units: 254 mm (10 in) acoustic suspension woofer, 38 mm (1½ in) midrange hemispherical dome, 19 mm (¾ in) high-frequency hemispherical dome
Crossover: 650 Hz, 5000 Hz
Impedance: 8 ohms nominal
Controls: Midrange and high-frequency driver level controls
Amplifier: Up to 100 watts per channel
Size: 343 x 610 x 292 mm deep (13½ x 24 x 11½ in)
Weight: 17.8 kg (39 lb)
Woofer resonance: Free air 26 Hz, in enclosure 56 Hz
Volume of enclosure: 38.2 litres (1.35 cu ft)

AR-2ax

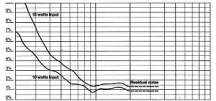
On-axis response



Acoustic power output



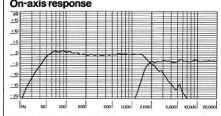
Woofer harmonic distortion



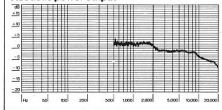
Drive units: 254 mm (10 in) acoustic suspension woofer, 89 mm (3½ in) midrange cone, 19 mm (¾ in) high-frequency hemispherical dome
Crossover: 1400 Hz, 5000 Hz
Impedance: 8 ohms nominal
Controls: Midrange and high-frequency driver level controls
Amplifier: Up to 100 watts per channel
Size: 343 x 610 x 292 mm deep (13½ x 24 x 11½ in)
Weight: 16.8 kg (36½ lb)
Woofer resonance: Free air 26 Hz, in enclosure 56 Hz
Volume of enclosure: 38.2 litres (1.35 cu ft)

AR-6

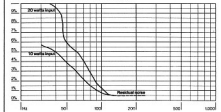
On-axis response



Acoustic power output



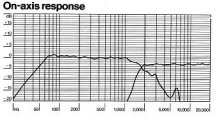
Woofer harmonic distortion



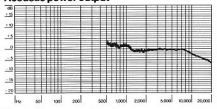
Drive units: 203 mm (8 in) acoustic suspension woofer, 32 mm (1¼ in) high-frequency cone
Crossover: 1800 Hz
Impedance: 8 ohms nominal
Controls: High-frequency level adjustment
Amplifier: Up to 100 watts per channel
Size: 305 x 495 x 178 mm deep (12 x 19½ x 7 in)
Weight: 9.1 kg (20 lb)
Woofer resonance: Free air 25 Hz, in enclosure 56 Hz
Volume of enclosure: 18.5 litres (0.65 cu ft)

AR-4xa

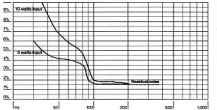
On-axis response



Acoustic power output



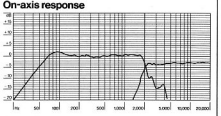
Woofer harmonic distortion



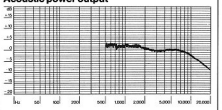
Drive units: 203 mm (8 in) acoustic suspension woofer, 32 mm (1¼ in) high-frequency cone
Crossover: 1600 Hz
Impedance: 8 ohms nominal
Controls: High-frequency level adjustment
Amplifier: Up to 100 watts per channel
Size: 254 x 483 x 229 mm deep (10 x 19 x 9 in)
Weight: 8.4 kg (18½ lb)
Woofer resonance: Free air 30 Hz, in enclosure 65 Hz
Volume of enclosure: 18.5 litres (0.65 cu ft)

AR-7

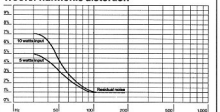
On-axis response



Acoustic power output



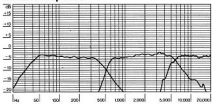
Woofer harmonic distortion



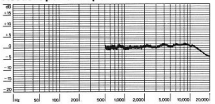
Drive units: 203 mm (8 in) acoustic suspension woofer, 32 mm (1¼ in) high-frequency cone
Crossover: 2000 Hz
Impedance: 8 ohms nominal
Controls: High-frequency level adjustment
Amplifier: Up to 100 watts per channel
Size: 247 x 400 x 146 mm deep (9¾ x 15¾ x 6¼ in)
Weight: 5 kg (11 lb)
Woofer resonance: Free air 25 Hz, in enclosure 68 Hz
Volume of enclosure: 9.77 litres (0.35 cu ft)

AR-LST

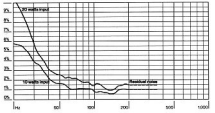
On-axis response



Acoustic power output



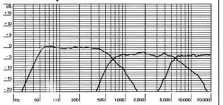
Woofer harmonic distortion



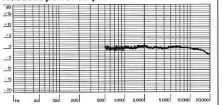
Drive units: 305 mm (12 in) acoustic suspension woofer, four 38 mm (1½ in) midrange hemispherical domes, four 19 mm (¾ in) high-frequency hemi-spherical domes
Crossover: 525 Hz, 5000 Hz
Impedance: 4-16 ohms nominal, depending on switch position
Controls: Spectral energy profiles, 6-position switch
Power handling: Data on request
Size: 689 x 508 x 248 mm deep overall (27⅛ x 20 x 9¾ in)
Weight: 40.5 kg (90 lb)
Woofer resonance: Free air 18 Hz, in enclosure 42 Hz
Volume of enclosure: 48.2 litres (1.7 cu ft)

AR-LST/2

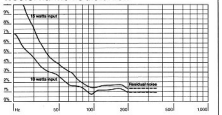
On-axis response



Acoustic power output



Woofer harmonic distortion



Drive units: 254 mm (10 in) acoustic suspension woofer, three 38 mm (1½ in) midrange hemispherical domes, three 19 mm (¾ in) high-frequency hemi-spherical domes
Crossover: 650 Hz, 5000 Hz
Impedance: 8-16 ohms nominal, depending on switch position
Controls: Spectral energy profiles, 3-position switch
Power handling: Data on request
Size: 648 x 470 x 248 mm deep overall (25½ x 18½ x 9¾ in)
Weight: 27 kg (60 lb)
Woofer resonance: Free air 26 Hz, in enclosure 56 Hz
Volume of enclosure: 38.2 litres (1.35 cu ft)

Choosing an amplifier

Choosing the right amplifier to use with AR loudspeakers is quite a simple matter, once the following questions have been answered:

1. What is the minimum amplifier power required?
2. How do published amplifier specifications relate to these requirements?
3. Is there a limit to the power the speakers will handle?

Minimum power requirements
For AR speakers, you can use this simple formula to determine the minimum amplifier power that would be required for satisfactory results: First, find the volume of your listening room in cubic meters by multiplying length x height x width. Then divide the answer by 4. This final answer will be the minimum amplifier power required, in continuous watts per channel, for suitable listening. (If you use feet instead of meters, divide by 150 rather than 4.)

For example: Suppose your room measures 3 m x 3 m x 9 m; its volume is therefore 81 cubic meters. Dividing by 4, you find that an amplifier capable of delivering approximately 20 watts continuous power per channel would meet your requirements. However, if the room is sparsely furnished and sounds rather 'live', or if you simply listen to music at relatively low volume, you can reduce the power requirements by as much as 50 per cent.

Conversely, if your room contains a great deal of drapery, carpeting, or padded furniture (all of which absorb sound), or if you like your music on the loud side, add as much as 50 percent to the power requirements. And, don't hesitate to add large amounts of power; small changes in loudness demand great changes in power.

Amplifier specifications
Using this formula, we have found the minimum continuous power (sometimes called 'RMS' power) per channel that would be required for a given situation. Unfortunately, not all amplifier manufacturers specify their equipment's power output in terms of continuous power. If the rated power is described as 'music' power, for example, subtract about 20 percent to arrive at an approximation of continuous power.

You must also make sure that the amplifier's rated power will be delivered to each channel, into the 'load' presented by the speaker (4 or 8 ohms in the case of AR speakers), and over the entire audible frequency range. Especially in the case of low-powered amplifiers, manufacturers tend to be optimistic about power ratings. This is not to say that there are no 10-watt amplifiers that can be used with AR speakers in rooms of modest size; there are some. But you must make certain that the amplifier manufacturer specifies that the rated power will be delivered at all audible frequencies. Otherwise, your system will not deliver its full potential, especially at low frequencies.

The upper limit
The penalty for too little power is distortion.
The penalty for too much power is costly damage to loudspeakers.

Any AR speaker system will accept the full output, up to the clipping point, of any domestic amplifier with a power output of up to 100 watts per channel, on normal speech and music signals. However, AR speakers are not invulnerable. They can be damaged, even by amplifiers of relatively modest power, if they are subjected to pure sine waves, electronically synthesized music, or 'hard rock' at sustained high average-power levels.

For such applications, fusing, *in addition* to the fuses normally found in amplifier output stages, is sometimes helpful. Complete fusing instructions are packed with every AR speaker system.

The AR guarantee

The workmanship and performance in normal use of AR speakers are guaranteed for 5 years from the date of purchase. This guarantee covers parts, repair labor, and freight costs to and from the factory or nearest authorized service station. New packaging if needed is also free.

This means no cost for parts, no cost for labor, no cost for 'service charges', and no cost for freight, whether to and from the nearest authorized service station or the factory. New cartons if needed are free. The only cost is inconvenience, which we greatly regret and try to minimize.

Consumers are urged to read guarantees covering high fidelity equipment in which they are interested. The AR guarantee expresses our confidence in the performance of AR equipment and our conviction that the consumer should not have to pay if the manufacturer is to blame for a fault in the product but, rather, that he should get what he expects the first time: a product that works as he has been told it will work, for the price he is asked to pay.

To make the guarantee of performance meaningful, AR offers complete, detailed technical data on every AR product free upon request. AR owners can then find out exactly what we guarantee.

Designed by HSAG Limited, London
Cover photograph by Jason Farrow
Printed in Holland by Drukkerij Meijer Wormerveer bv