

**Speakers that take  
music as seriously as you do.**



**L**isteners have gone to concerts to hear music for about a thousand years. For most of that time, live music has been something that a fortunate few could afford to enjoy at will. Only recently has technology made it possible for everyone to make music a part of daily life, as it is today.

As this development has taken place, composers and performers have shifted their attention from the concert hall to the home, where more listeners enjoy a musician's work in a day than may hear him perform in person in a lifetime. The true sound of music is no longer its sound in an auditorium, or other public place. It is the sound of music coming from loudspeakers.

We at AR have one simple objective: to bring *all* this music to everyone who wants to hear it. "All" means clearly, losing nothing, and adding nothing extraneous. To bring high fidelity to everyone means not only making loudspeaker systems that are nearly perfect, but working to make them as low in cost as possible, so that nobody is excluded from the enjoyment of music they help to provide.

Making loudspeakers that are both technically superior and affordable is a tradition at AR. It is probably our best invention. We will continue the research from which we have taken our name, the dedication to quality and reliability, and the commercial policies which have in our first quarter-century, made "AR" a household word.



"Truth in Listening"





The painting, *Hindu Besides* by Richard Carter is reproduced by permission of the Vorpel Galleries: New York, San Francisco, and Laguna Beach.

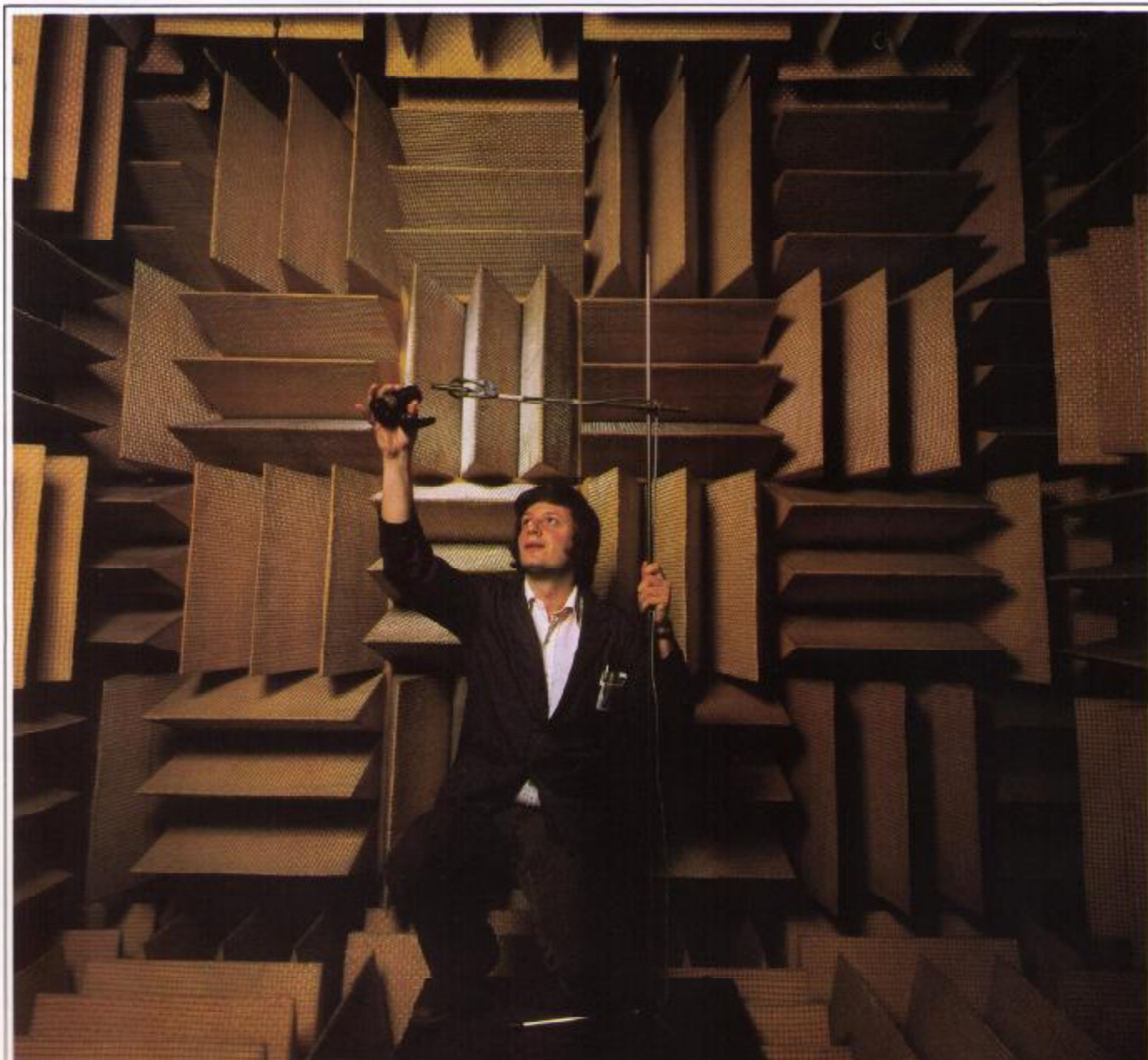
# AR in the 80's: Still the leader in speaker technology.

Our name is Acoustic Research, and that is what has been going on at our company for more than twenty-five years. We are primarily interested in making loudspeaker systems that reproduce recordings or broadcasts without changing the sound of music in any perceptible way. To do so, we have had to acquire an under-

standing of music and hearing, as well as the science of building loudspeaker systems. Much of what we have learned has come from our own research; some has been provided by distinguished scientists from various countries who have assisted us over the years; and, a great deal has come from study of the scientific journals,

journals to which we have occasionally contributed.

Computers do a great deal of our work for us, as in any modern research laboratory. We have used them to extend the capability of loudspeaker testing and to devise new systems of loudspeaker evaluation. Current work, for example,



concerns the apparent size, distance, and depth of the sound a listener hears; how can these qualities be measured, when only a listener can hear them? Our answer has been to develop a "Robot Listener," an artificial head with imbedded microphones for ears and a full-scale computer for a brain, capable of interpreting as well as hearing the sound a loudspeaker makes. After picking up the sound of a speaker, the system draws an intricately detailed picture of what it has heard, from which we can deduce an objective, scientific description of where the loudspeaker will seem to place the music it is to reproduce. By comparing test results to the reactions

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**We continue to study the advances in technology that are improving recording quality.**

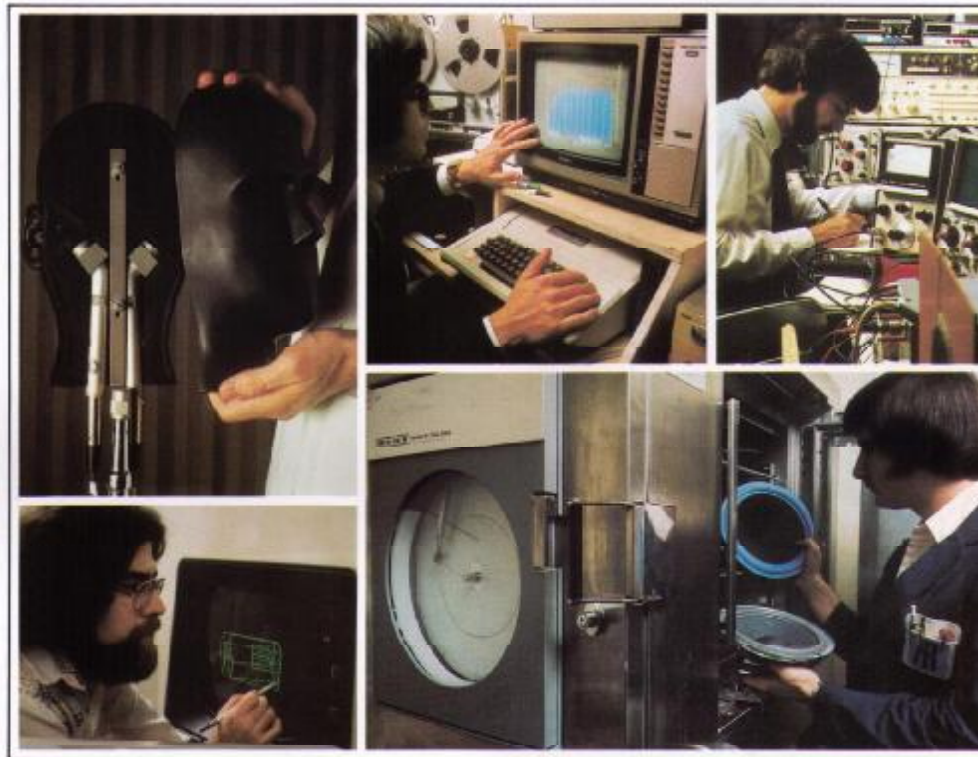
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of human listeners, we can learn more about designing a loudspeaker system that brings listeners exact reproduction of what is on their records.

To understand how to reproduce music, it is important to know how it is recorded. Years before the recording industry began to make digital studio

recordings, we made digital recordings of music with our research computer and used them to analyze commercial recording quality. With our own digital sound recording system we prepare master recordings for our own use in loudspeaker evaluation and psycho-acoustic experiments.

But it is not laboratory equipment that sets AR apart from other loudspeaker companies. The real difference, we think, is in the questions we ask, and in the ideas and answers to which these questions lead.



Left: One of the tools used to study the response of speaker systems at AR is our anechoic chamber. This acoustically 'dead' environment eliminates the effect of walls, ambient noise and other outside influences so that engineers can measure only the sound waves a speaker produces.

Above: The research staff at AR is continuously engaged in a number of different kinds of research. We investigate new materials as they come along. We examine new design concepts and validate improvements on existing designs. We conduct psycho-acoustic studies using rather sophisticated instruments, some of which we have designed ourselves. The ultimate goal is to continue to advance the art and science of speaker design. We have been doing that for more than 25 years and will continue to do so.

# Truth in Listening: accurate reproduction not just in the lab but in your home is the goal of AR design.

Various loudspeaker systems use different design methods and operating principles. Even the technically-minded listener can be confused when confronted by so many conflicting theories.

Why do AR loudspeakers sound different—better—to so many people? The answer can probably be traced to the consistently superior engineering of our



speaker systems. As a result, AR loudspeakers are owned by millions of listeners, and our design methods have been adopted by many other loudspeaker manufacturers. But acoustic suspension and dome radiators, while good ideas introduced by AR, are not enough to make great loudspeakers. Technical ideas must be woven together by a philosophy of product design and development relevant to users' needs.

We believe that our loudspeakers must be designed with primary emphasis on operation in home listening conditions, and that every possible design detail must be considered in light of its effect on music reproduction. By using our computers to help design drivers and systems we are able to examine many design alternatives, simulate in-home listening, and optimize performance of each system.

Here are a few examples of AR's approach to engineering.

We design and manufacture all our driver units ourselves, in our factory at Norwood, Massachusetts, USA. This allows the engineers who design AR loudspeaker systems to monitor and assist in the production of their designs.

Visitors to our factory are almost always impressed by the concern for quality throughout production; this concern is an extension of the care taken in planning the original design.

Good ideas are used wherever they can work effectively, in AR speaker systems at all price levels. Our AR93, AR90 and AR9 vary considerably in price, but all employ dual side-mounted woofers that provide extended, and unusually smooth bass performance in real listening rooms.

In principle, all amplifiers should work satisfactorily with all loudspeakers, provided that too much power is not fed to the speakers. However, this is only true if the loudspeaker system, especially its crossover network, has been designed to take phase as well as frequency response into account. This is done at AR with our own computer programs and in combination

## All AR driver units are designed and built in our own factory.

with close tolerance manufacturing, ensures that amplifier-loudspeaker compatibility will be of no concern.

A typical component of secondary importance to most manufacturers is the choke—a coil of wire, wound on a plastic spool—used in a crossover network. All AR loudspeaker systems use air core chokes, so called because they consist of the coil alone. Valuable copper—and money—could be saved by winding the coil on a core of iron compound, thus using less wire.

This short cut causes changes in the electrical properties of the choke, and can cause distortion when certain kinds of music are played. We work hard to reduce costs, but never at the price of music

reproduction quality. For that reason, we cannot trade iron which is cheaper for high quality copper.

The AR90 and AR9 shown here, represent the highest standard of performance we know how to build into a loudspeaker system. Both systems employ the same vertical array of mid-range and high-frequency components, for precise stereophonic images, AR's Acoustic Blanket™ to absorb accidental and unwanted reflections from cabinet edges, and the dual, side-firing low-frequency driver design that makes the system largely independent of wall reflection effects.

Both the AR90 and AR9 are able to deliver exceptional uniformity of frequency response into the near-ultrasonic region (25,000 Hz). At low frequencies, the AR9 has been designed to operate effectively to 28 Hz, the AR90 to 32 Hz, although both systems produce useful output below these frequencies. Both systems impressively reproduce new recordings mastered from digital tapes.

A special aspect of the AR9 is its unusual crossover network. In addition to separating the frequency ranges assigned to its five driver units, the AR9 crossover network maintains a suitably high impedance, with smooth frequency response, and bass extension with excellent damping (Q). Like the enclosure of the AR90, the AR9 enclosure exterior is oiled walnut veneer. The shape of both systems, with relatively small cross-section, contributes to panel rigidity.

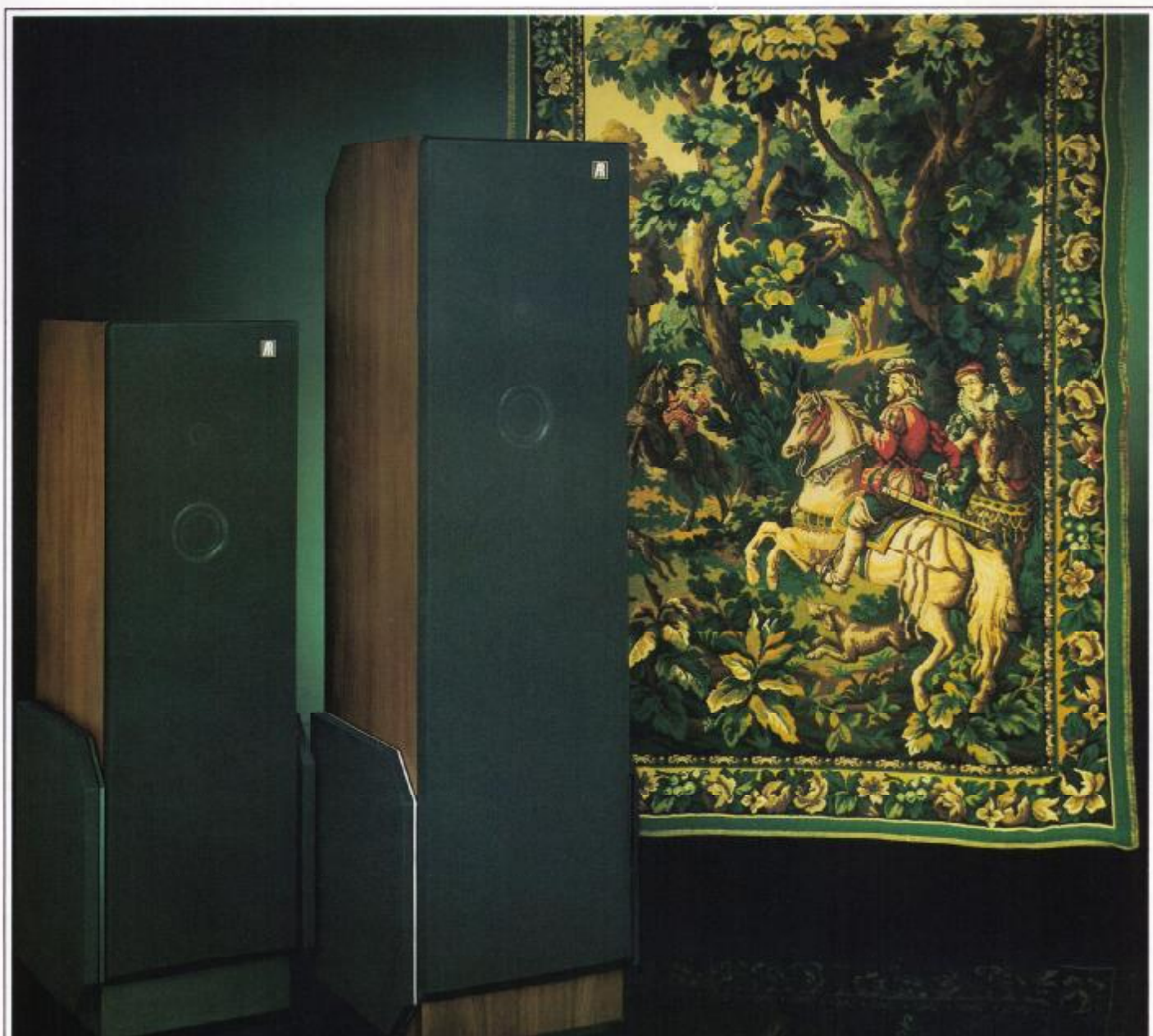
The AR9 and AR90 both use a 200mm (8-inch) mid-range driver to cover the 200Hz to 1200Hz range.

Left: An example of the air-core chokes used exclusively in AR systems. More expensive because they use more copper wire than chokes wound on ferrite cores. Better because they eliminate one possible cause of distortion. Opposite: left to right, the AR90 and AR9. 18th Century Brussels-style tapestry reproduced courtesy of Newel Art Gallery, New York

Both systems also employ a fully sealed, energy-absorbent 38 mm dome as upper mid-range driver. This unusual unit is able to handle the wide dynamic range of modern program material in its region of coverage (1200 Hz to 7000 Hz). A spe-

cially formulated high temperature magnetic fluid conducts heat away from the voice coil of the unit, without impeding the movement needed for sound reproduction. Heating is reduced, and accuracy and reliability improved. Both the 19 mm high-frequency unit, which covers the range 7000 Hz to 25,000 Hz, and the mid-

range unit are assembled using high-temperature materials and adhesives. This is a requirement for stable, accurate reproduction of modern program material at the high acoustic output levels of which both the AR9 and AR90 are capable.





# A speaker system can be no better than its components. And AR cuts no corners.

It is easy to become a loudspeaker manufacturer; that is why there are so many of them. It is difficult to make good loudspeakers; that is why there are so few of them. You can see what makes the difference if you take some loudspeakers apart. We do it frequently.

The first thing you see is the cabinet. With the exception of the AR18s, all AR loudspeaker system cabinets are made of 19 mm (¾ inch) panels which must meet specific tests of rigidity to assure an enclosure that is acoustically inert; the smaller dimensions of the AR18s allows us to use slightly thinner panels without affecting performance. The sound of AR speaker systems comes from the drivers, not the cabinets.

## We test everything to be sure it meets AR standards.

Inside the cabinet, there is usually some absorptive material, which helps to achieve optimum bass response. The material AR uses must not only be non-toxic and completely safe in all other respects, but the amount used must be weighed during manufacture, and put in exactly the right place in the cabinet for best performance.

Crossover networks consist of coils (the air-core chokes previously mentioned) and capacitors. Test samples of the components used are baked and beaten by overload voltages until we are sure that every one will work as well as we expect. Then, once they are assembled in speaker systems, every last crossover component is tested to assure that it will perform as it should.

Loudspeaker drive units are 100% tested after assembly, even after the thor-

ough testing they get throughout the process of building them.

Grille cloth used in AR speaker systems does not just cover up the driver units attractively. It must meet strict tests of acoustic transparency, so that not even the highest frequencies, most sensitive to absorption, will be audibly degraded by the presence of the cloth.

We test everything, not just to see whether or not it works, but to be sure that it meets AR specifications. As to the specifications, AR's own standards are considerably more stringent than existing international standards that define high-fidelity performance (IEC and DIN).

These are some of the reasons that prompt other manufacturers who want to praise their products to compare them to AR speaker systems. It is their way of saying that they believe they have met our standards; if they have, they are entitled to be proud of it.

The AR91 and the AR92 employ many of the design principles first used in the AR9. Both are 3-way systems designed to be placed on the floor. Placement of the bass driver in the cabinet, together with dimensions of the cabinet and the design of the crossover network, smooth out the low frequency dip in response which occurs in speakers less carefully thought out.



A specially designed AR Acoustic Blanket™ absorbs reflections which might otherwise bounce off cabinet edges and compromise high-end response. High-range drivers are vertically arrayed, as in the AR9, again with the objective of creating a precise stereo image.

## The walls of a listening room are part of AR design.

In selecting speakers, from AR or another maker, you should decide whether or not you will place your speakers on the floor before you buy, since the placement of your speakers has an important effect on performance. AR also builds speaker systems to be placed on bookshelves. The four walls of a listening room, and their effect on sound waves emanating from the speaker are taken into account in the design of all AR speakers. Bookshelf systems placed on a stand rarely perform up to their potential.

The AR91 and AR92 are designed to be placed vertically on the floor. They need not, indeed they should not, be placed on speaker stands. On the floor they will perform better than bookshelf designs placed on stands.

The drivers in both systems are the same as those used in our more expensive verticals, the AR9 and the AR90. The cabinets are equally rigid to eliminate resonance. In their price range you will find it hard to match the smooth response, and

Left: This dome mid-range driver, like all AR drivers, was designed, built, and tested in the AR plant at Norwood, Mass. It is designed specifically for the systems in which it is installed. Opposite: left to right, the AR92 and AR91. Late 19th Century French oil on canvas, artist unknown, reproduced by permission of Newel Art Gallery, New York.

the powerful bass reproduction these systems offer.

The most important difference between the two systems, aside from some details of cabinet styling, is that the AR91 uses a 300 mm (12") woofer which is also used in the AR9, while the AR92 uses a specially designed long throw 250 mm (10") woofer.



# Truth in Listening is the AR philosophy. Thus the emphasis on design and absence of frills.

Sound recording that is in any way practical is also necessarily imperfect. The reason is simple: a microphone can only pick up the sound passing one small point in space; even several microphones can give only an incomplete picture of the sound that spreads out from a musical instrument in all directions.

On the other hand, sound can be



reproduced in a way that deceives even expert listeners into believing that they are hearing live musicians. We know this because AR has produced concerts at which our loudspeakers shared the stage with guitarists, string quartets, percussionists, where pre-recorded tapes have been reproduced so realistically that audiences of critical listeners could not tell the difference between the players and the loudspeakers.

How can theoretically imperfect recordings yield such convincing reproduction?

One part of the answer is the skill of

the producer of the recording, who must know exactly how to place microphones, and in what proportion to combine their signals, to create the sound that the home listener expects to hear. Producers make their judgments using studio monitor loudspeakers which have usually been carefully equalized, often at considerable expense, to deliver smooth, uniform frequency response.

The second part of the answer is AR's business—the design and construction of loudspeakers for home use that meet (and often surpass) the performance of studio monitor loudspeakers. Not surprisingly, AR speaker systems designed for home use are frequently chosen for studio or laboratory applications, where accuracy is the most important consideration.

AR is not the only company that makes loudspeakers carefully and skillfully, although we believe that no other manufacturer uses more skill or care than we do. The differences between loudspeaker systems, however, are more likely to be found in the philosophies of their makers. The qualities of AR loudspeaker systems can be traced to our purpose—truthful reproduction of the recording or broadcast we are given in trust by the listener.

The AR93 and AR94 incorporate many of the technical characteristics of higher-priced AR speaker systems, but are carefully designed to make these features available to music listeners at lower cost. In addition to the exceptional value they offer, the AR93 and AR94 use contemporary materials to achieve a striking sculptured appearance in their outward form. At the same time these speakers do not have removable grilles and the decoration and finish details behind the grille cloth have been dispensed with; while this has been done mainly to reduce cost, it has also been turned to aesthetic advantage.

Both the AR93 and AR94 are based mainly on drive units which have already been made in very large quantities by the AR factory, reliably and uniformly. In the

AR94, the simpler of the two systems, two 200 mm (8-inch) woofers and an all new 32 mm (1¼ inch) tweeter are used unconventionally to create a unique three-way system. Below 350 Hz, the two 200 mm speakers operate in unison, functioning as a single large woofer with its radiating area distributed over a large part of the cabinet front panel, reducing floor reflection effects. At mid-range frequencies, only the upper 200 mm unit functions at an automatically corrected output level, eliminating wave interference between the drivers at these frequencies. The vertically-mounted driver array is completed by a 1¼ inch tweeter with its voice coil suspended in heat-conducting magnetic fluid.

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**These modestly priced systems can match or surpass ones costing much more.**

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The AR93, based on the same considerations as the design of the AR94, takes the approach a step further. It represents as nearly ideal a combination of cost and performance as we are currently able to produce. In the words of internationally known audio critic Julian Hirsch, after his engineering and listening evaluation of the AR93 in *Stereo Review*, the "AR93 can make it possible for a very modestly priced music system to match or even surpass the sound of one costing many times as much." We are content to say that we

Left: Acoustic suspension woofers use the air inside the speaker enclosure as a spring to help drive the speaker cone. A flexible ring which attaches the cone to the frame of the driver was part of the design first introduced by AR more than 25 years ago. Opposite: left to right, the AR94 and AR93. Duo, stainless-steel sculpture by Hermann Weimann reproduced courtesy of the Sculpture Center Gallery, New York.

know of no speaker systems in its price range that combine the characteristics or approach the performance of the AR93.

Side-mounted 200 mm (8 inch) woofers located near the floor, as in the AR9 and AR90, provide the same smoothness of bass response and relative freedom in room placement as in those systems. Vertical driver placement in the

AR93, as in other AR systems, gives crisp, clear placement of instruments in stereophonic recordings. Localization at high frequencies is improved by use of AR's Acoustic Blanket™ technique, a method of absorbing reflections to keep high-frequency response as uniform as possible.



# The art of building bookshelf speakers. AR built them first. We've built them longest. We still build them best.

The air inside the cabinet is an important operating component of an AR acoustic suspension speaker system. The amount of air needed to make the system work correctly determines the size of the cabinet used with a given low-frequency driver. That, in fact, is the difference between simply placing a loudspeaker in a box and designing a loudspeaker system in which every effect of acoustical importance is weighed, evaluated, computed until the result cannot be further improved. The convenient bookshelf format into which smaller AR speaker systems can be fitted is a direct result of their technical design. We quite naturally know a great deal about this because we introduced acoustic suspension speaker systems to the loudspeaker industry more than twenty-five years ago.

The other major component of the low-frequency portion of an AR speaker system is the woofer; the low-frequency

## Techniques worked out at AR decades ago are industry standards today.

driver. To exploit the acoustic suspension principle, we had to learn how to make high-compliance suspensions, fitted around the cone of the speaker; magnet structures and voice coils with the size and clearance required to move the large amounts of air that accurate bass reproduction requires. Many of the techniques worked out at AR several decades ago are industry standards today.

Of course, the speakers we make today incorporate further innovations, like the use of the exotic substance, magnetic fluid, as a coolant inside many of our loudspeakers. Magnetic fluid sticks to a magnet, although it runs like any other liquid when not in a magnetic field. This property makes magnetic fluid stay between

the voice coil and the pole piece of a loudspeaker's magnet structure. When the coil heats up because the system is played at high sound levels, the fluid conducts much of the heat away to the magnet structure. Nothing can protect a loudspeaker against deliberate abuse, but our use of magnetic fluid definitely increases the reliability of AR loudspeaker systems.

AR speaker systems have been praised so highly in the past that some listeners wonder what we are changing and why we are doing it. The answer is that we are forced to innovate by the constantly improving quality of the program material made available to listeners. Modern recordings are made with microphones and studio tape recorders with much better characteristics than were available even ten years ago. The use of synthesizers in music is increasing, as is the use of microphone placement techniques that place greater power demands on loudspeakers than in the past. Perhaps most important of all, we keep learning more about building better loudspeakers because we keep trying to learn more. That is why we started as a company; that is how we have kept going; and, that is what music listeners have learned to expect from AR.

The important advantage of the acoustic suspension principle is that it packs exceptional bass performance and

accuracy into a relatively small enclosure. This is probably one of the reasons that the AR18, which is only 244 mm (9 5/8 inches) wide and 419 mm (16 1/2 inches) tall became one of the most popular speakers AR has ever built. By any standard, price or performance, it represented outstanding value and it was, in fact, recognized as

## The best selling speaker in our history now has company.

such by several of the leading industry test authorities.

Today, however, the rapid pace of technological change means that things never stay the same for long. And since we at AR build nothing else but speaker systems we spend a good deal of time looking for ways to improve their performance and durability using the latest state of the art materials. Research in the laboratories showed ways to further improve an already outstanding unit. And research in the market place showed that there is a place for somewhat larger speakers in the two-way format designed along the lines of the AR18.

The result is a new family of bookshelf systems designated the AR18 s, AR28 s, AR38 s, and AR48 s which for quality, accuracy and overall smoothness are a match for any system in the AR range, and we believe offer superior listening qualities and performance to any comparably priced speakers we have heard, and we have heard most.

The styling of these speakers has been modified to give them a new and more traditional appearance. Foam grilles



Left: Magnetic fluid is used in AR's mid- and high-range drivers for its excellent heat-transfer properties. It acts like the coolant in a car's radiator to protect voice coils against overheating. Opposite: Left to right, the AR38 s, AR28 s, AR18 s, AR48 s. Portrait, oil on canvas by Wenzler, reproduced courtesy of J.N. Bartfield, New York.

have been replaced by grilles of acoustically transparent fabric.

Performance is improved, and the new AR18s is 2dB more efficient than its predecessor. The important differences between the three systems are few. The enclosures are of four different sizes, and since bass performance is in part a function of the size of the 'box,' the larger

systems offer slight improvements in that area over the smaller systems. Dome and cone tweeters used in the systems are liquid-cooled using the magnetic fluid mentioned earlier.

As with all AR systems, the drivers and crossover networks of these four systems have been designed, built, and thoroughly tested in our own factories.

And as with all AR systems they are backed not only by a tradition of craftsmanship and excellence, but also by a full 5-year warranty (not a limited one) with guaranteed performance within 1 dB of stated specifications.









# A full 5-Year Warranty not just on parts but on performance. Here is why AR offers a warranty no other leading maker offers.

We want you to be satisfied.

Although we do all we can to make the system you buy perfect we know that sometimes things can go wrong and a loudspeaker can fail through no fault of yours. We regret this when it happens and do everything in our power to solve your problem.

The warranty we offer is a full warranty, not a limited one as is often the case. It covers not only defects in parts and workmanship but also performance. That means, simply, that we promise the AR speakers you buy will perform to within 1 dB of their design specifications for five years from the time they are purchased. Warranties in these days of consumerism are legal documents and your AR dealer can show you our warranty and that of any other speaker you may consider. We encourage you to examine these documents before you buy ours or any other speakers. A quality speaker system is an investment that will not become obsolete. In fact as new recording and playback technology comes along you will be asking more and more of your speakers. With that in mind we build AR products to the very highest standards, using the very finest materials. If we did less we could not afford to offer you such a complete warranty.



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