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Julian Hirsch

Acoustic Research AR9 Speaker System



THE new Acoustic Research AR9 speaker system seems at first glance to follow traditional AR design philosophy (it uses an acoustic-suspension woofer, for example), but nevertheless it represents a departure from that company's previous practice. For one thing, this floor-standing four-way speaker system is *large* by today's standards (especially for an AR speaker), having an internal volume of 120 liters, or 4.24 cubic feet. AR designed the AR9 to have the flattest, widest frequency response and greatest power-handling capability of any speaker it has ever made. The company claims that the AR9 is "as close to the optimum speaker system as can be designed under the present state of the art."

The low-frequency portion of the AR9 consists of a pair of 12-inch acoustic-suspension woofers mounted on opposite sides of the columnar cabinet as close as possible to the floor and rear wall surfaces. The speaker is meant to be placed as close as possible to the rear wall in order to prevent the cancellation of

mid-bass response that occurs when a conventional front-facing woofer is used in a floor-mounted speaker system. (This is caused by out-of-phase reflected waves from the floor or wall boundaries.) At 200 Hz there is a crossover to a front-mounted 8-inch cone driver placed 28 inches above the floor on the center line of the panel. This is installed within its own sub-enclosure inside the main cabinet, and the reflections of its output from the wall and floor occur below its normal operating range.

Above the lower mid-range driver and on the same vertical line are two dome-type radiators at approximately ear height for a seated listener. The upper-mid-range unit, which takes over from the 8-inch driver at 1,200 Hz, is a fully sealed 1½-inch-diameter dome driver. Its diaphragm is surrounded by a metal ring that AR calls a "semi-horn"; they claim it provides better coupling to the air in the upper part of the driver's operating range (above 3,000 Hz). At 7,000 Hz there is another crossover, to the ¾-inch-diameter scaled dome-

type tweeter. Both of the high-frequency dome speakers employ high-temperature magnetic fluid for heat conduction and mechanical damping of their voice coils.

Below the 8-inch lower-mid-range driver are three small toggle switches that adjust, respectively, the output levels from the tweeter, upper-mid-range, and lower-mid-range speakers. Each has three positions and is able to reduce the output of its driver by either 3 or 6 dB from the maximum (0-dB) level, which is the nominally "flat" condition.

Behind the front grille of the cabinet is what AR calls an "Acoustic Blanket," which is an absorbent fiber sheet covering most of the area occupied by the three front-mounted drivers, with clearance holes for the drivers themselves. This "blanket" absorbs sound waves that would otherwise be reflected from the front surface of the enclosure and the grille edges. This smooths out the overall frequency response at different angles to the speaker axis and thus improves the stereo imaging.

The AR9 has a nominal system impedance of 4 ohms (3.2 ohms minimum) and is rated for use with amplifiers delivering up to 400 watts per channel. In spite of its high power-handling ability, the AR9 is actually slightly more efficient than some of the older AR speakers. It is rated to deliver a sound pressure level (SPL) of 87 dB at a distance of 1 meter when driven by 1 watt. The low-frequency response is rated to be down 3 dB at 28 Hz; the AR9 does not have the usual "20 to 20,000 Hz" frequency-response rating that is a meaningless appendage to many loudspeaker specification sheets.

The handsomely finished walnut-veneer cabinet of the AR9 has a black, snap-on cloth grille that covers almost the entire front surface of the cabinet and two smaller grilles that cover the woofers on the sides. In the rear are four binding posts, two for the woofers and two for the remainder of the system. This permits bi-amplified operation if desired; normally the two pairs of terminals are connected by jumpers. The AR9 is 52¾ inches high, 15 inches wide, and 15¾ inches deep. It weighs 130 pounds (excluding the shipping carton). Price: \$650.

● **Laboratory Measurements.** Measuring the frequency response of the AR9 in our test room gave us new insights into how uniform the acoustic output of a speaker can actually be at the listener's ears in a normally furnished room. Our measurements also correlated well with the reverberant-chamber response curves that AR had run on the particular units we tested. We were equally impressed by the perfect "splice" of our mid-range/high-frequency response curve to our close-miked bass-response curve.

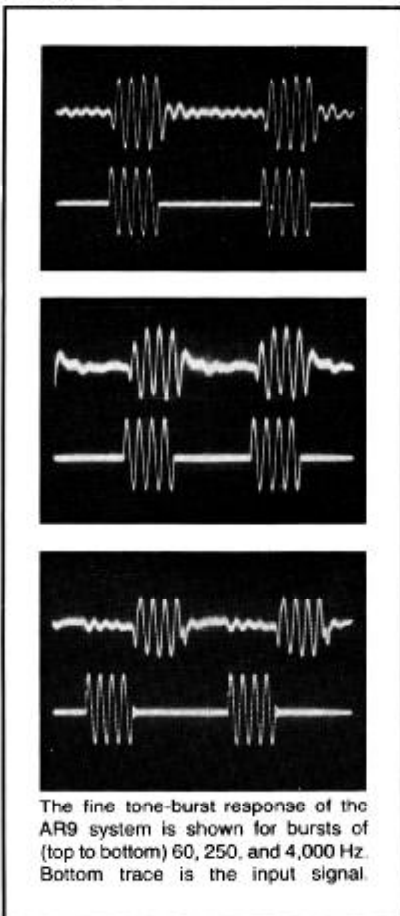
The frequency response of the AR9 was remarkably smooth—within ± 2 dB from 25 to 12,000 Hz—even measured by our unconventional test method. It rose slightly at the high end, to about +4 dB at 15,000 Hz (which is the upper limit of our microphone calibration). We are quite sure that this rise was caused by an imperfect correction on our part to the microphone and room response, and we have no doubt that the true response of the speaker would fall within the ± 2 -dB range shown on the AR reverberant-room measurements from 500 to 19,000 Hz (and, for that matter, down into the lowest audible octave).

The low-frequency distortion, as might have been expected from a pair of 12-inch acoustic-suspension woofers in a correspondingly large enclosure, was very low. At a constant 2.8-volt drive level (2 watts into the nominal 4-ohm impedance), the distortion was well under 0.5 per cent from 100 to 40 Hz, reaching 1.3 per cent at 25 Hz and 2.5 per cent at 20 Hz. With a 10-dB power increase (to the equivalent of 20 watts) the distortion was typically about 0.5 per cent down to 50 Hz, reaching 3 per cent at 30 Hz and 6.7 per cent at 20 Hz.

The AR9 delivered its rated 87-dB SPL at a 1-meter distance when driven by 1 watt of random noise in the octave centered at 1,000 Hz. The frequency-balance switches had approximately the rated effects. The tweeter switch controlled the output above 4,000 Hz, the upper-mid-range switch operated between 1,000 and 10,000 Hz with most of its effect between 1,500 and 5,000 Hz, and the lower-mid-range switch affected the output between 100 and 1,200 Hz. The tone-burst response was very good, especially considering that the AR9 is a four-way system and therefore has more than one driver operating over a considerable part of the frequency range, which usually causes acoustic-interference effects that can complicate a tone-burst response.

The impedance curve of the speaker shows evidence of the "tailoring" action of the crossover network. The maximum impedance values of 8 and 10 ohms were reached at 27 and 750 Hz, respectively. Elsewhere the measured impedance was between 3 and 5 ohms, the former value being the d.c. resistance of the speaker system as seen at the terminals. Incidentally, this points up the general futility of using amplifiers with extra-high damping factors to improve the sound of a speaker system. With an amplifier damping factor of infinity (and speaker cables having zero resistance), the effective damping factor of the AR9 speaker system would be approximately *one*! The usual precautions against paralleling two of these speakers apply (for the protection of the amplifier), but, frankly, we cannot imagine anyone's paralleling two sets of AR9's! On the other side of that coin, the low impedance of the AR9 will allow it to draw the maximum possible power from any amplifier.

● **Comment.** First, a note on the handling and installation of these massive speakers. Large and heavy as they are, they can be "rocked" and slid along on a carpeted floor with ease, so it is only the initial carrying and lifting of the speakers that will require two people. And, although they are supposed to be placed within a couple of inches of the rear wall if possible, we could not get them much closer than within a foot or so in our room. This did not seem to have any harmful effect on the sound.



The fine tone-burst response of the AR9 system is shown for bursts of (top to bottom) 60, 250, and 4,000 Hz. Bottom trace is the input signal.

That sound is perhaps best described as a distillation and refinement of the traditional "AR sound" familiar to most serious audiophiles. From the beginning, AR speakers have been noted for their smoothness, absence of harshness or other unpleasant colorations, and, most particularly, their low distortion in the deep bass. On the other hand, some listeners have criticized the earlier AR speakers (not the current models) for reduced energy in the upper octaves of the audio range, which made them sound somewhat dull or muted.

In the AR9, we think, these criticisms have been very effectively dealt with. Not only is the bass deeper, flatter, and cleaner than that of any other speaker we have tested, but there is definitely *no* lack of output in any part of the audible spectrum. The key adjectives that could be used to describe the AR9 sound (besides the usual "smooth," "musical," etc.) are *balance* and *unity*. There is literally no clue that the sound emanates from an array of drivers spanning a considerable physical area. It is simply *there*, with practically no indication that it comes from a loudspeaker. Even at

low volume levels the deep bass can be felt, rather than heard, and at times it seems almost subliminal in its effect. One can often sense that it is lurking down there at the bottom of the audio range, ready to be heard or felt if the occasion demands. When one switches to another speaker (almost any other) this sensation usually disappears. In this respect, the AR9 bass reminds us of the contribution a good subwoofer can make to the sound of a more modestly endowed speaker system, except that in this case the overall balance is inherently set at the correct value.

In view of the response we measured at our normal listening position, it occurred to us that we were probably hearing for the first time what a truly *flat* frequency response sounds like in our reasonably normal listening room. If that is so (and it is admittedly conjectural), we can report that "flat response" doesn't provide any special effects (just as a "flat" amplifier or phono cartridge has no sound of its own). This may seem anticlimactic, but it is really quite logical. This speaker gives the listener an opportunity to hear just what a particular record, radio broadcast, or other program source sounds like with a minimum of modification from the speaker or the listening room. Judging from our limited experience with the AR9, these program sources vary in quality from excellent to terrible—but we knew that before we started!

As is our custom, we used the AR9's for some time, switching between them and other speakers on hand for testing, as well as our old standby, the now-discontinued AR-LST. It should be no surprise that the latter came closest to sounding like an AR9, although it was noticeably less powerful in the deep bass. Although the AR9 can handle considerable power, one should bear in mind that it is a low-impedance speaker, so most amplifiers will deliver at least 50 per cent more power to it than to an ordinary 8-ohm speaker. It should be perfectly safe, at almost any listening level, to use a 200-watt amplifier, most of which can deliver 300 to 350 watts to a 3- or 4-ohm load. But be careful with the handful of giant amplifiers rated at up to 500 watts per channel into 8-ohm loads. They *can* damage this speaker (or any other) if used carelessly, and the cleanness of the sound from the AR9 tempts one to turn up the gain "just a little more." Fortunately, the AR9 is capable of delivering an awesome sound level without recourse to such power extremes.

Recalling the AR goal of an "optimum" design, we would like to point out that this means "best" in the sense of representing the most suitable compromise between the many mutually exclusive performance and cost factors involved in any given speaker design. The designers have certainly come very close to achieving their aim, even though not everyone would agree with *all* their choices (in our case, for example, we find the AR9 just too big and visually overpowering for our listening room—but that is *our* problem!).

The AR9 seems to us to be just about what AR claims it to be—a "state-of-the-art" speaker system in respect to frequency range, flatness, and distortion, yet one that can be driven effectively by almost any good amplifier or receiver. There are perhaps some exotic speakers that come close to rivaling the AR9 in one or more of its characteristics, but not in all of them—and certainly not at its price (although we doubt that AR built this speaker to fit a particular price category). This is unquestionably the finest speaker AR has ever built.