EDWARD M. LONG

KEF RDM ONE SPEAKER

In 1962, Raymond Cooke, who had worked for a number of years with G.A. Briggs of Wharfedale, started his own speaker company. Since his factory building was owned by the Kent Engineering Foundry, he called his company KEF. The company was a pioneer in the use of plastic diaphragms; the first KEF speakers had woofers with large, flat, polystyrene diaphragms and treble drivers with polyester domes. Now 35 years old, KEF has gained an enviable reputation for producing excellent loudspeaker systems.

The RDM One's small, sealed enclosure houses a single 6½-inch driver, yet it's a two-way speaker. The driver, which KEF calls Uni-Q, has a 1-inch tweeter mounted on the pole piece at the center of the 6½-inch woofer's magnet. This puts the treble diaphragm near the apex of the bass diaphragm. The Uni-Q driver is mounted off-center on the front baffle. The enclosure is made of ¾-inch medium-density fiberboard (MDF) and weighs 14.3 pounds. The bevelled sides have a beautiful red gloss finish, while the other four surfaces are finished in matte gray; high-gloss cherry veneer and charcoal gray finishes are also available. The enclosure's internal volume is 8.78 liters (536 cubic inches) and is filled with two rolls of polyester acoustical damping material; this absorbs sound from the rear of the driver that could be reflected back through the cone and color the sound.

The Uni-Q driver is recessed ⅜ inch into the ¾-inch-thick baffle and held by three Phillips-head sheet-metal screws, which are hidden by a decorative black-plastic ring that covers the rim of the driver.

The ½-inch-thick grille, covered with black cloth, is a solid panel except for a single hole in front of the driver; this allows the driver's sound to pass while effectively blocking baffle vibrations that could color the sound. The hole's diameter increases from 6¾ inches near the driver to 7¾ inches at the front of the grille; this reduces the chance that reflections from the edge of the hole could roughen the frequency response. The grille fastens securely by four pins that mate with rubber sockets in the baffle; the rubber also isolates the grille from enclosure vibrations.

Two pairs of gold-plated binding posts are mounted in a recess on a wide plastic plate that occupies nearly all of the enclosure's rear panel. One pair is connected to the crossover's high-pass filter, which feeds the tweeter; the other pair connects to the low-pass crossover filter that feeds the woofer. A gold-plated strap connects the positive terminals of the woofer and tweeter, and another connects the common terminals. The straps can be removed for bi-wiring; if the RDM Ones must be located far from the power amplifier, necessitating long cable runs, using separate cables for the bass and treble might help clarify the sound. The binding posts come with red and black plastic inserts in their end holes, to prevent some European AC power plugs from being connected to the speakers, but their ¾-inch spacing enabled them to hold dual banana plugs when I removed the inserts. Holes in the sides of the binding posts accommodate heavy-gauge speaker wire. There are also two threaded inserts, spaced vertically about 2¼ inches apart, in the rear panel; they appear to be for some kind of wall mounting, but the manual doesn't mention them.

Rated Frequency Response: 100 Hz to 18 kHz, ±2 dB; –6 dB at 75 Hz.
Rated Sensitivity: 87 dB at 1 meter, 2.83 V rms applied.
Rated Impedance: 6 ohms.
Recommended Amplifier Power: 30 to 125 watts.
Dimensions: 11⅞ in. H x 9¼ in. W x 8¾ in. D (30 cm x 23.4 cm x 22 cm).
Weight: 14.3 lbs. (6.5 kg).
Price: $900 per pair.
Company Address: c/o Adcom, 11 Elkins Rd., East Brunswick, N.J. 08816; 908/390-1130.
For literature, circle No. 91

Photos: Michael Groen

The crossover, behind the rear-panel plate, consists of three inductors, four capacitors, and five resistors. Three of the resistors are rated at 5 watts while two large, 1-ohm resistors are rated at 11 watts each. The high-pass filter, which feeds the tweeter, is a third-order design with two series capacitors and a shunt inductor; a two-resistor pad attenuates the tweeter's level to match the woofer's. The low-pass filter, which feeds the woofer, is a modified fourth-order design with two series inductors and two shunt capacitors, a 12-ohm resistor (between the first shunt capacitor and the junction of the negative binding post and the negative woofer terminal), and the 1-ohm, 11-watt resistors mentioned above. The 1-ohm resistors are paralleled with each other, for a resistance of 0.5 ohm, and connected in series with the positive woofer terminal.

THE KEF RDM ONES HAD A FORWARD SOUND AND PRODUCED CLEAR, PRECISE IMAGING.

The series resistance acts as a kind of equalizer by interacting with the woofer impedance. In the bass range, where that impedance is highest, the 0.5-ohm resistance appears relatively small and the output is reduced very little. In the lower midrange, where the impedance is much lower, the resistor reduces the output, so the bass will be louder by comparison.

Use and Listening Tests

I'm presenting this section before "Measurements," to better correlate my test results with the comments from my listening panel. For the panel's evaluations, I placed the KEF RDM Ones on Tekna Sonic speaker stands, which have Tekna Sonic C5 absorbers attached under their top plates. Each stand is 27 inches high, which placed the RDM One's Uni-Q driver at the same height as my reference speaker's midrange and treble drivers. (Those drivers cover the range from 150 Hz to 20 kHz; frequencies below 150 Hz are reproduced by the speaker system's woofer, which is down only 3 dB at 32 Hz.) The RDM Ones and the reference speakers were toed in so that centered listeners would be on axis.

Most of the listening evaluations were done by one panel member at a time; this is more time-consuming, but I think it gives each listener a better opportunity to sit in the best spot when evaluating the loudspeakers' stereo reproduction of instrument positioning and space. Each panel member was asked for written comments on how the KEFs' reproduction of various instruments' sound and the spatial effects of different recordings compared to that of the reference speakers.

I began each listening session with the Sheffield recording of Toccata, by Alessandro Piccinini, performed by the Newman & Oltman Guitar Duo on *Passions* (Sheffield Lab 10058-2-F). The comments were: "fingering sounds brighter," "slightly more forward," "less body to guitar sound," and "guitar sounds slightly clearer and more precise."

The next selection was Franz Doppler's "Duettino Américain," Opus 37, played by Jean-Pierre Rampal, Claudi Arimany, and John Steele Ritter on *Romantic Music for Two Flutes and Piano* (Delos DE 3212). This caused panel members to comment: "less breath sound on flutes," "flutes are slightly forward," "piano well centered but back in space," "piano sounds smaller," "good instrument placement," and "slightly less spacious."

The comments for "Horse and Rider," by the Steve Miller Band on *Wide River* (Polydor 314 519441), were: "voice is very good but less articulate," "voice is brighter," "voice is more forward," "harmonica is more prominent," "bass not as deep," and "much less bass."

When I played the Allegro non Troppo movement from Dimitri Shostakovich's Symphony No. 8 (performed by the Dallas Symphony Orchestra conducted by An-

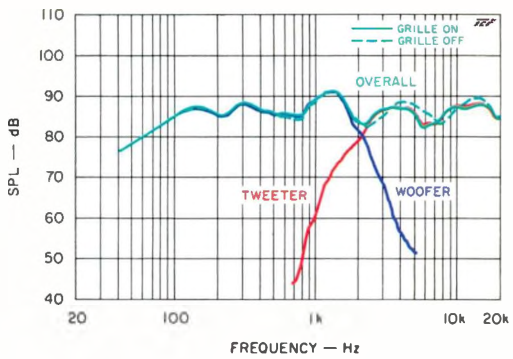

Fig. 1—Frequency response.

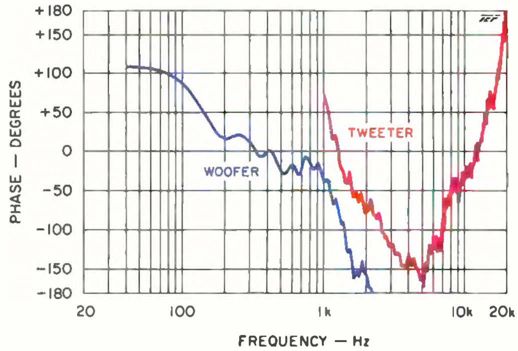

Fig. 2—On-axis phase response.

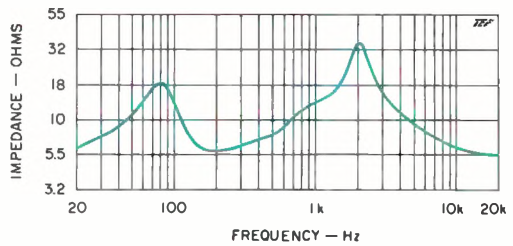

Fig. 3—Impedance magnitude.

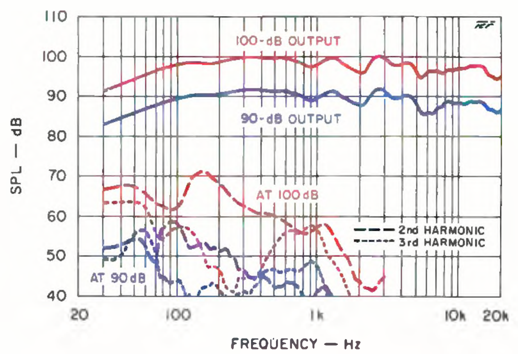

Fig. 4—Ground-plane frequency response and second and third harmonics, for output levels of 90 and 100 dB.

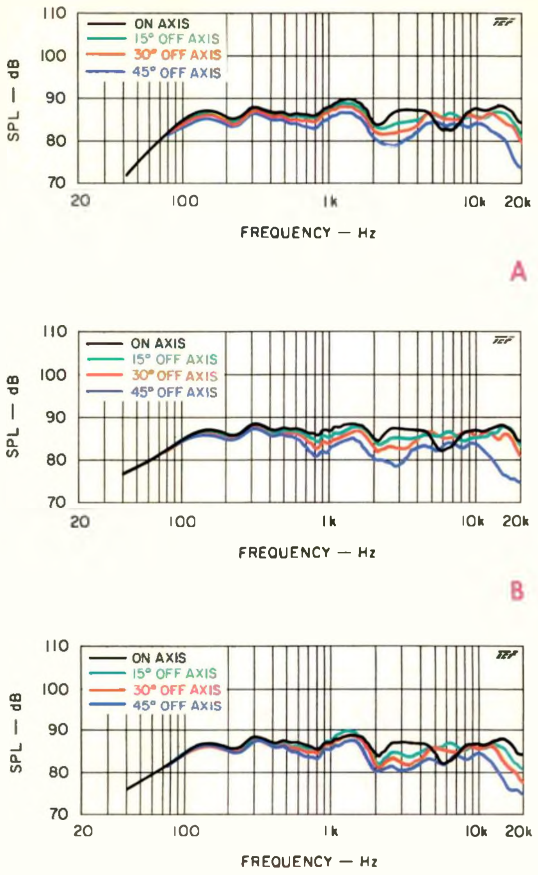

Fig. 5—Horizontal on- and off-axis responses for upright speaker (A), speaker on its side, measured from driver end (B), and speaker on its side, measured from other end (C).

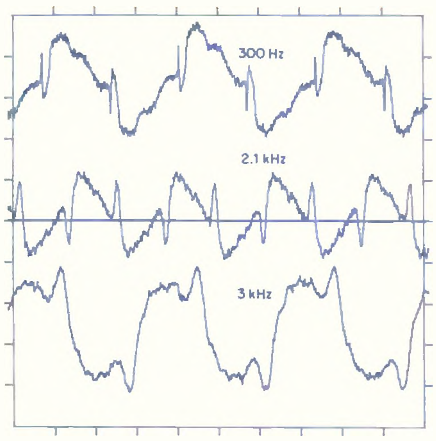

Fig. 6—Square-wave response at 300 Hz (top), 2.1 kHz (middle), and 3 kHz (bottom).

drew Litton, Delos DE 3204), the comments were: "trombones bright but less body," "trumpets brighter," "brass sounds sharp," "strings slightly zingy," "strings more forward," "less upper sheen on strings," "snare drums similar," "snare drums very good but with slightly duller attack," "a little more congested on loud passages," "bass not as deep," "instruments are easy to place," and "slightly less spacious."

The KEFs' reproduction of Mozart's "Ave Verum Corpus" (performed by the Daughters of Mary on *De Profundis*, available from Daughters of Mary at 518/622-9833) elicited the comments: "voices are brighter," "voices are clearer and more pleasant," "voices slightly less articulate," "fricative sounds are less hissy," "oboe is clearer," "less deep bass," and "a little less sense of space."

Measurements

As an example of how measurements can explain the panelists' comments, note the bump between 800 Hz and 2 kHz in the frequency response (Fig. 1). This bump explains why the panel members consistently called the RDM One's sound "bright" and "forward." My measurements indicate that the crossover frequency is at 2.1 kHz (as specified) and that output is very well controlled above and below this point. It's common for grilles to roughen a speaker's response, but the RDM One's grille seems rather to smooth it above 2 kHz. I therefore kept the grille on for all other measurements and the listening evaluations. All my lab tests, with the exception of harmonic distortion, were made with the speaker and microphone away from all reflecting surfaces, a 4-pi-steradian measurement.

At the crossover frequency, the woofer's phase is –172.7° and the tweeter's is –75.6°, a difference of 97.1° (Fig. 2). This amounts to a time offset of about 128 microseconds, equivalent to a displacement of 1¾ inches between the woofer and tweeter. The comments about the RDM One's slightly less articulate rendering of voices and the slightly duller snare-drum attack may be partly due to this offset.

The terminals' plastic inserts prevent the use of banana plugs but can be removed.

The impedance (Fig. 3) never drops below about 5.8 ohms, so the RDM One should be easy to drive by any reasonably designed power amplifier. The maximum impedance, 34 ohms (reached at the crossover frequency), is 5.9 times the minimum, enough variation for the resistance of your speaker cables to affect the frequency response. The cable resistance will act as a resistive dividing network that can attenuate the signal more where the RDM One's impedance drops low and less where its impedance is high.

Figure 4 shows the RDM One's output and its second- and third-harmonic distortion at sound pressure levels of 90 and 100 dB. These curves were made with the microphone and the RDM One on a cement surface; this is called a 2-pi-steradian, or half-space, measurement. With equal input power, the sound output from the RDM One is approximately 6 dB greater than in the 4-pi-steradian measurements of Fig. 1. At the 100-dB level, the second harmonic at 50 Hz is 4.5% and the third harmonic is 3% at that frequency, both very good for a 6½-inch woofer. At 150 Hz, however, although the third harmonic drops to a very low 0.5%, the second harmonic bumps up to 4%. The only comment by the listening panel that might relate to this was the one about congestion at loud levels, but this could also have been caused by the KEF speaker's second- and third-harmonic distortion in the range between 500 Hz and 1.6 kHz, which measured a little less than 1%. At 90 dB SPL, the distortion dropped to 2.5% second and 3.2% third at 50 Hz. At 900 Hz, there was about 0.8% third-harmonic distortion and the second harmonic dropped to less than 0.3%.

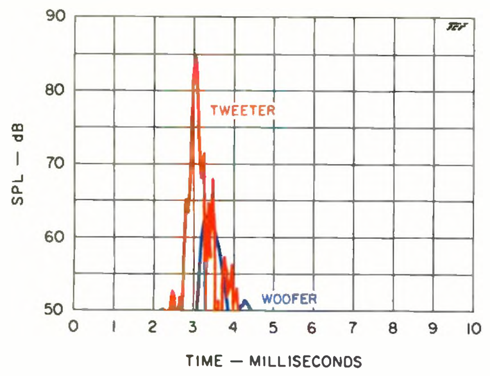

Fig. 7—Energy-time responses. Woofer response has been raised 10 dB for clarity.

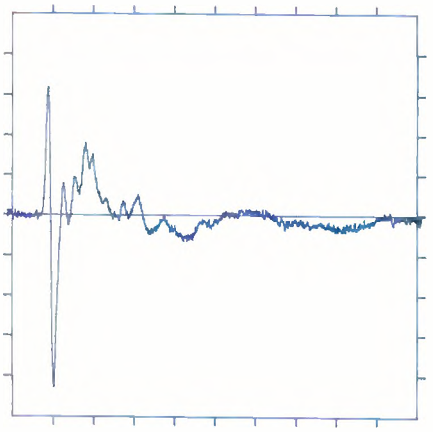

Fig. 8—Response to a 20-kHz cosine pulse.

The panel members were each seated on the listening setup's center line, equidistant from the RDM Ones (sometimes called the sweet spot), but your listening position may not always be as ideal. The curves in Figs. 5A, 5B, and 5C give some indication about how the RDM Ones perform when you listen to them while seated off their central axis. The three graphs are almost identical, which demonstrates the advantage of having the tweeter mounted in the center of the woofer. Figure 5A shows horizontal dispersion with the speaker in its preferred orientation, upright and with the Uni-Q driver toward the top. Figures 5B and 5C show horizontal dispersion but with the speaker lying on its side (equivalent to vertical dispersion with the speaker upright). If you must place the RDM One on its side—on a bookshelf, for instance—you'd probably get slightly better response if you place it with its Uni-Q driver toward the outside of the array, away from you (Fig. 5C), rather than with the driver facing toward the inside (Fig. 5B). But try both orientations before deciding which is better.

The RDM Ones reproduce square waves reasonably well (Fig. 6). The shape of the 300-Hz square wave attests to the time offset between the woofer and tweeter that is seen in the phase plots of Fig. 2. The initial positive spike confirms that the woofer's output lags the tweeter's by about 128 microseconds. This doesn't seem like much, but once you are used to listening to speaker systems that have much less time offset between drivers, you can hear how it affects voice articulation and the attack of transient sounds such as rim shots, cymbals, and brass instruments.

The energy/time responses for the bass and treble drivers (Fig. 7) show the energy and its time spread for the frequency range. This data, too, indicates that the woofer's output lags the tweeter's. Depending on which points on these curves you use as references, the delay is 250 to 350 microseconds, equivalent to an air-path delay of 3.4 to 4.75 inches.

When fed a positive-going cosine pulse, the RDM One initially responds with a positive output, but this is followed by a negative-going output of even greater amplitude (Fig. 8). Ideally, the output should be a positive acoustical output that returns to zero and stays there (like the input waveform), with no further output in either direction; unfortunately, the characteristics of real-world loudspeaker drivers and crossover networks don't allow this, so loudspeaker designers must choose between various compromises. Because I made my measurements before I began the listening sessions with my listening panel, I was aware of the RDM One's response to this test. I therefore used familiar CDs to determine that the RDM Ones sounded more realistic when connected in opposite polarity to my reference systems and wired the KEFs with this reversed polarity for the listening tests.

I also measured the RDM One's near-field bass response with a B&K 4133 microphone close to the woofer. As the input frequency was lowered from 1 kHz down to about 150 Hz, the output gradually rose and then rolled off slowly below 150 Hz. The RDM One's maximum output, which was reached at 150 Hz, was about 7 dB higher than at 1 kHz.

To measure the KEF RDM One's enclosure vibration, I placed an accelerometer in the center of a side panel; vibration was greatest between 720 and 900 Hz, and there were lesser peaks at 290, 1,100, and 1,600 Hz. Some of these vibration peaks correspond to the distortion maxima seen in Fig. 4; it might be possible to reduce the RDM One's distortion and make its sound even clearer by judiciously placing vibration absorbers on the inside cabinet walls, but I didn't try this.

After all the lab tests and the listening sessions were completed, something jogged my memory about the sound of the Rogers version of the famous BBC LS3/5a monitor. (The LS3/5a was jointly developed by the BBC and KEF, and though other companies built these speakers, KEF made all the drivers and most of the crossovers for them.) I pulled out some measurements that I had performed years ago on this loudspeaker, and I was struck by the similarity of its frequency and square-wave responses to those of the RDM One. Although I no longer have the LS3/5a for sound comparisons and know that I can't rely on my long-term auditory memory, I am convinced that there would be similarities between the two systems. In any case, I'm sure that the KEF RDM One sounds as clear and precise as the Rogers LS3/5a did but can do so at much higher SPLs; it also goes deeper in the bass. For music like the first two selections used in the listening-panel sessions, the RDM Ones are excellent. For movie soundtracks and for more dynamic music that covers a broad frequency range, you will need a subwoofer. Either way, the KEF RDM Ones are an excellent value—and very good looking, too. A

THE RDM ONE REMINDED ME OF THE CLASSIC BBC LS3/5a, BUT WITH DEEPER BASS AND HIGHER OUTPUT.