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ENGINEERING STAFF REPORT

The JBL Model L40 Loudspeaker System

Author: Mark R. Gander, Design Engineer

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System Performance

Frequency response measurements at JBL are made on a large flat baffle, essentially into half space. Figure 1 shows the swept sine wave response of the L40 system on-axis at 6 feet, 5 W nominal input power. Above 500 Hz, similar response is obtained in an anechoic environment.

Figure 2 shows the frequency response under the same measurement conditions, but with an input of pink noise, band limited on ISO-preferred 1/3-octave center frequencies. This corresponds more closely to the integrating qualities of the ear.

Figures 3-A through 3-D show the dispersion characteristics of the L40 in the horizontal and vertical planes. The consistency of angular response results in accurate stereo imaging and perspective.

Figure 4 shows the second- and third-harmonic distortion characteristics of the L40 system at a 1-W drive level. Throughout the usable response region, distortion products are more than 40 dB down, or less than 1%.

Figure 5-A shows the voltage drive characteristic of the frequency dividing network when terminated with the loudspeaker loads. This electrical drive, in combination with the acoustical response of the transducers, yields the desired individual contributions from each device, which is shown in Figure 5-B. These curves, as with all the others, were taken with the high frequency level control in its nominal mid-rotation position. Figure 5-C shows the family of curves resulting from various positions of control rotation.

Figure 6-A shows the electrical impedance magnitude and phase of the L40, which together indicate the load which the system presents to the amplifier. The load characteristic shows smooth transition slopes and avoids both capacitive and inductive extremes. Figure 6-B shows the effect of the acoustic resistance shell. Without the shell there is a large-magnitude, sharp impedance peak with its attendant steep slope phase transition. With the shell in place, the impedance magnitude curve goes through a low, smooth rise and the phase slope is much more gradual. This damping effect results in smooth, controlled amplitude response in the cut-off region and improved transient response characteristics.

Figure 7-A and 7-B display typical tone burst response of the system, indicating the degree of transient accuracy.

The nominal sensitivity of the L40 system is 88 dB SPL (1 W at 1 m). In a free field, an input of 10 W will produce a level of about 89 dB SPL at 10 feet (about 3-4 dB higher in a typical indoor environment). Normal music levels, even for pop or rock, are in the 90-100 dB SPL range; thus the 35-W per channel continuous program nominal power rating of the system is sufficient to meet these demands. A pair of L40 systems driven by a 35-W per channel amplifier in an average listening room is capable of levels in excess of 100 dB SPL.

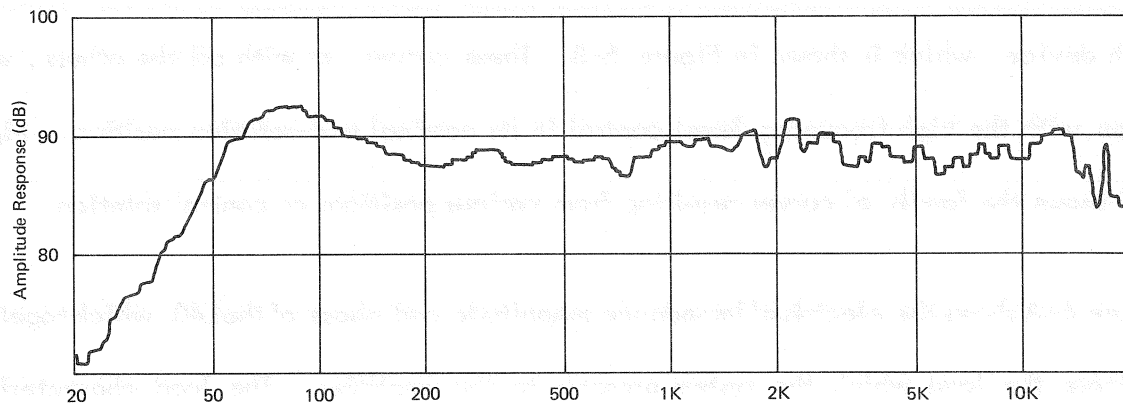


Figure 1

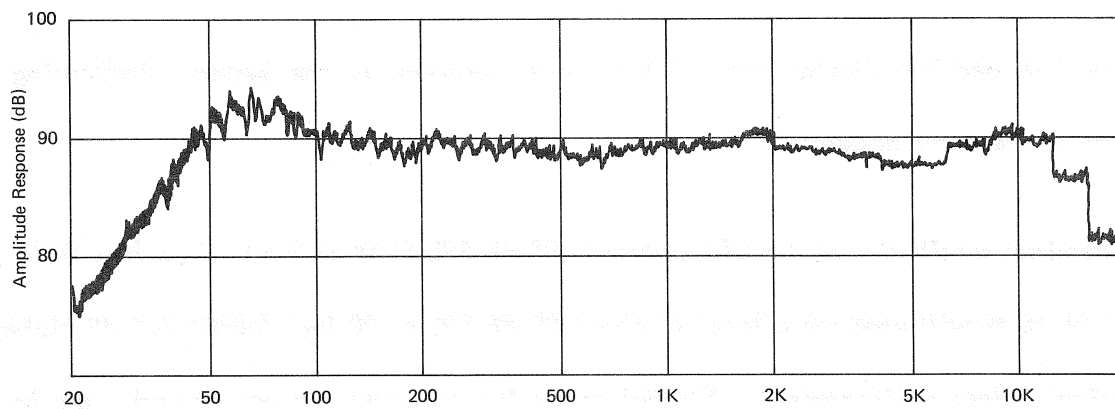


Figure 2

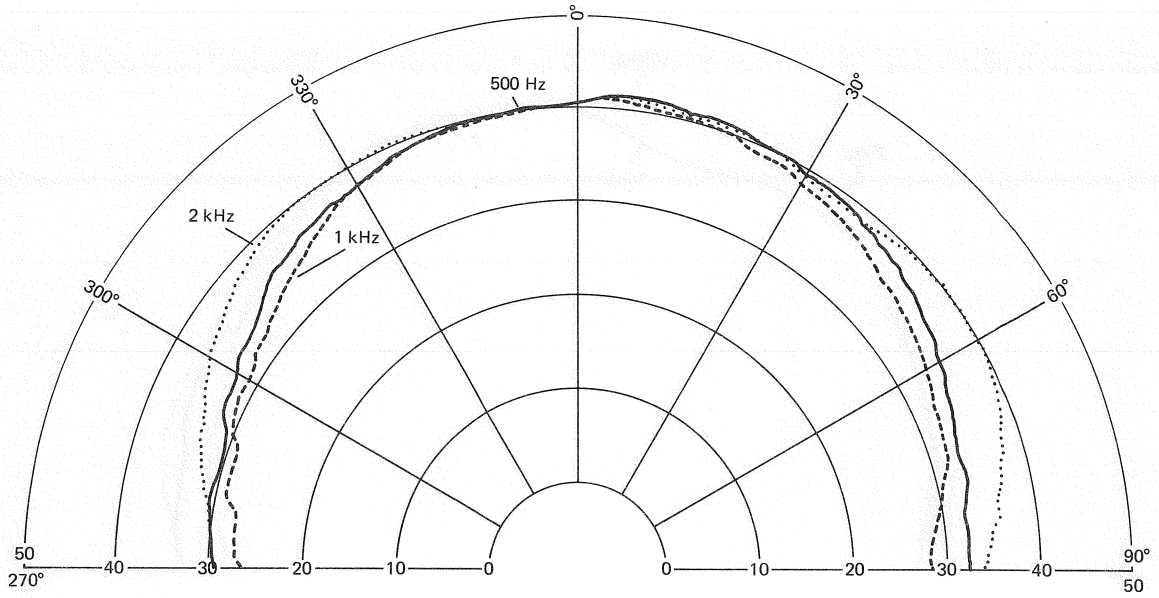


Figure 3a

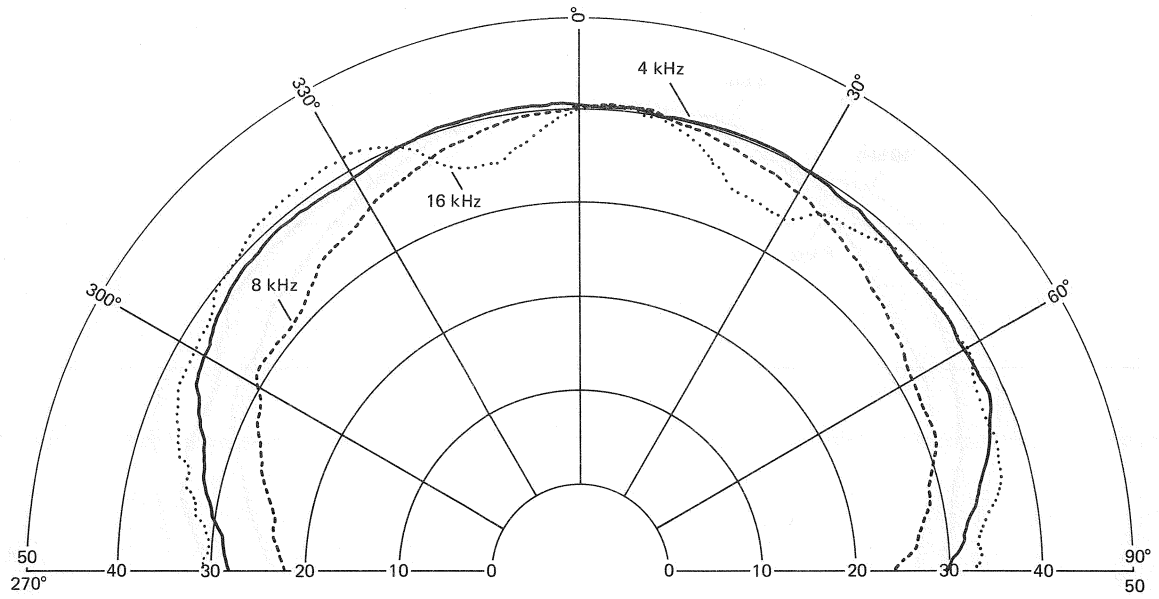


Figure 3b

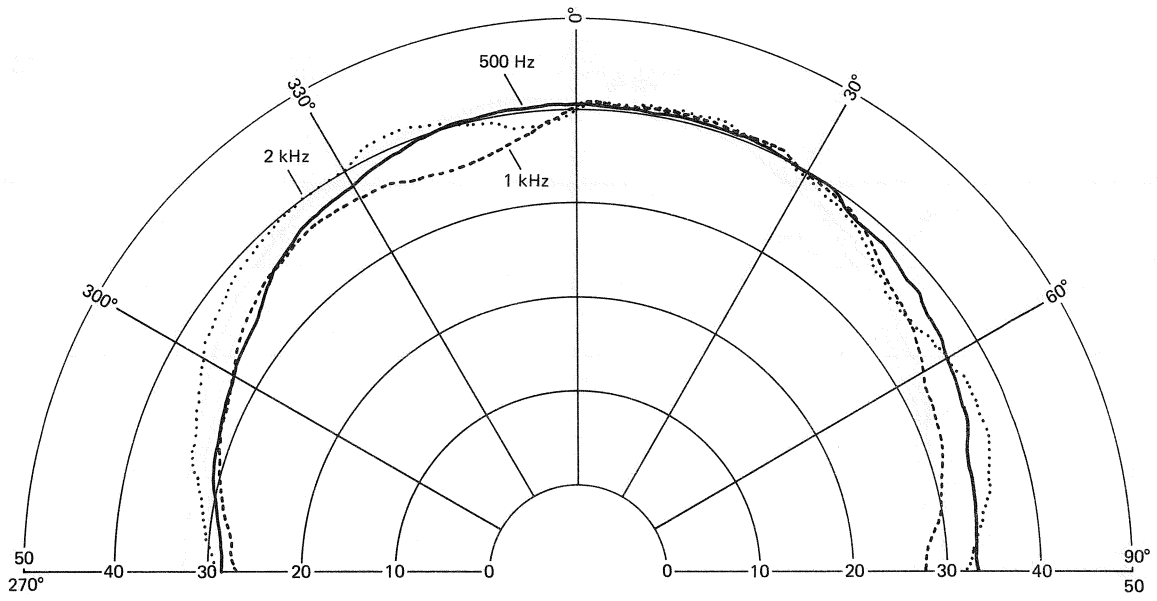


Figure 3c

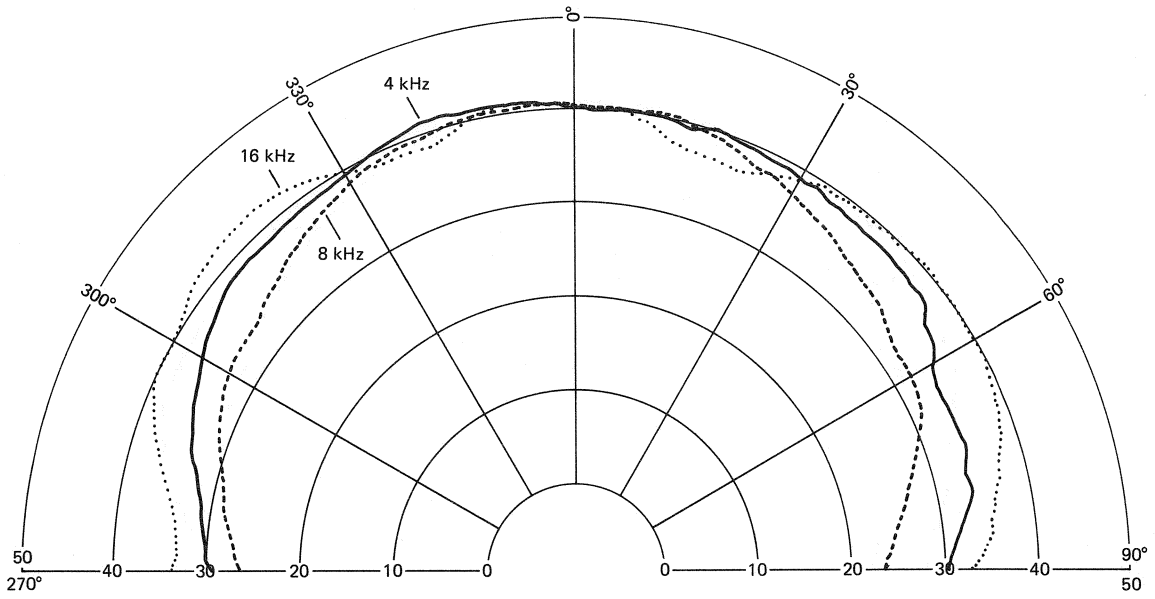


Figure 3d

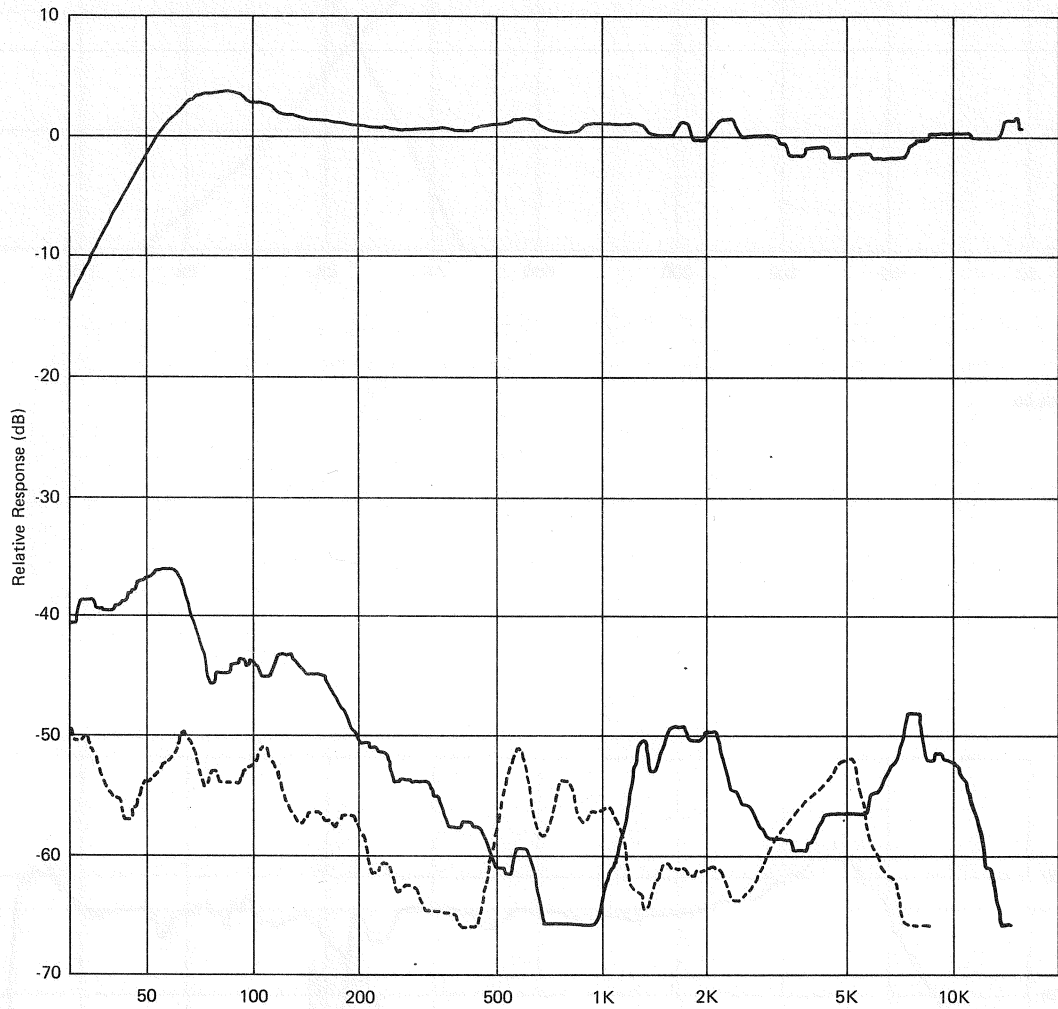


Figure 4

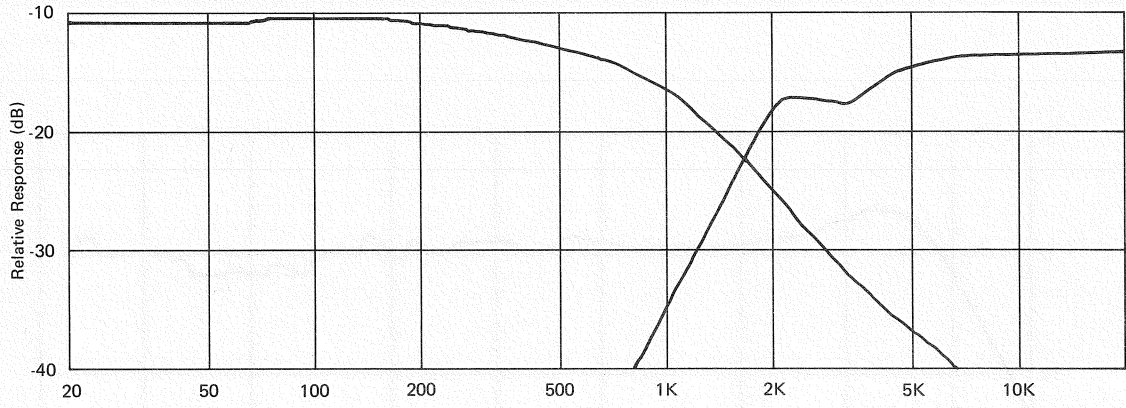


Figure 5a

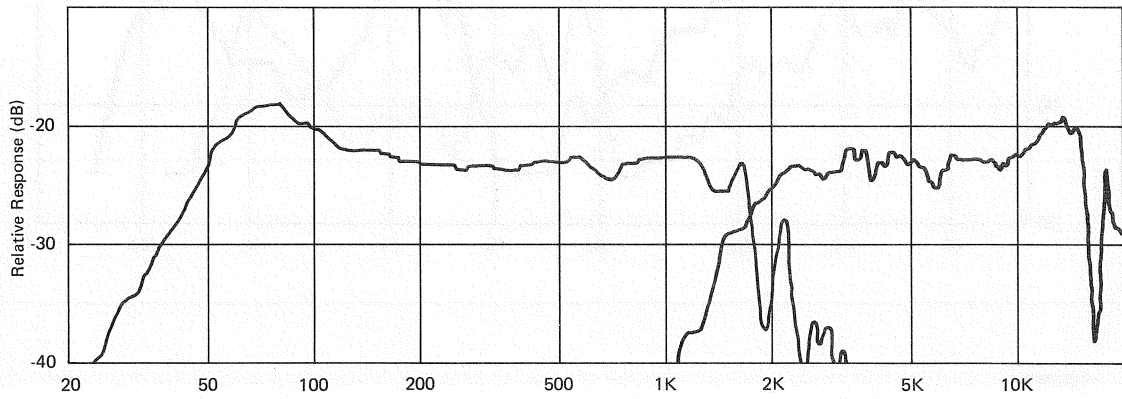


Figure 5b

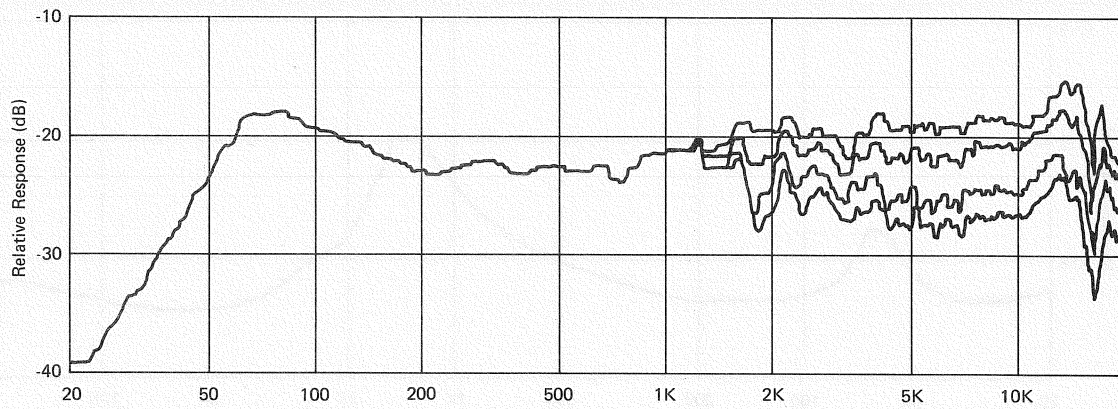


Figure 5c

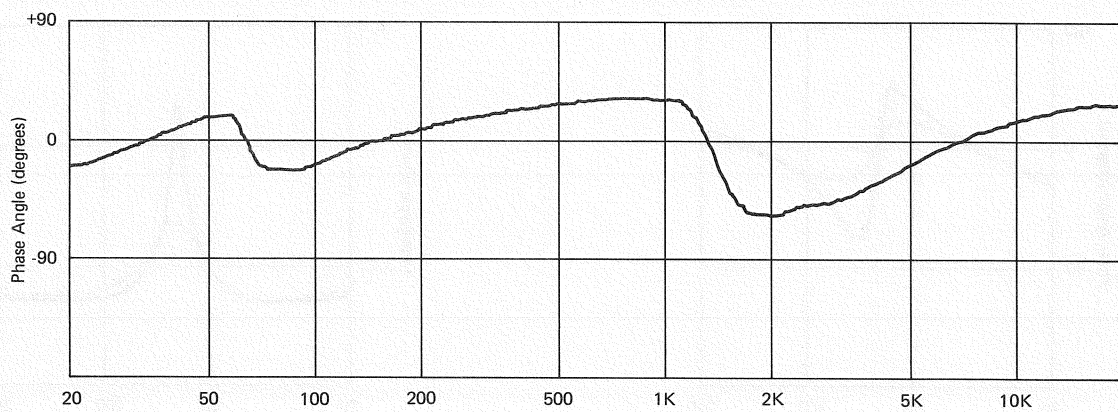


Figure 6a

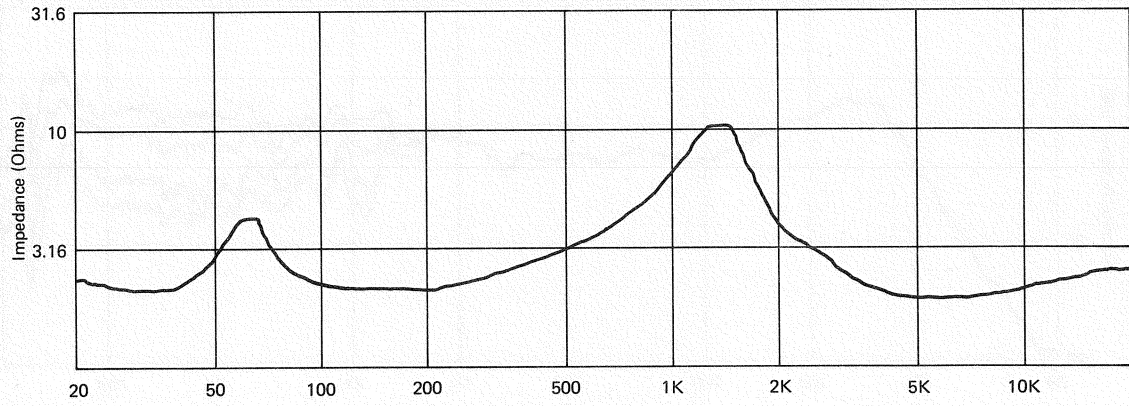


Figure 6b

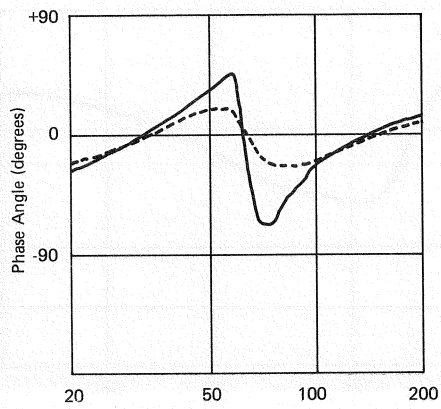


Figure 6c

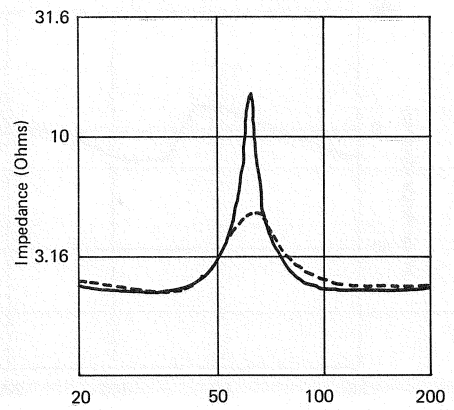


Figure 6d

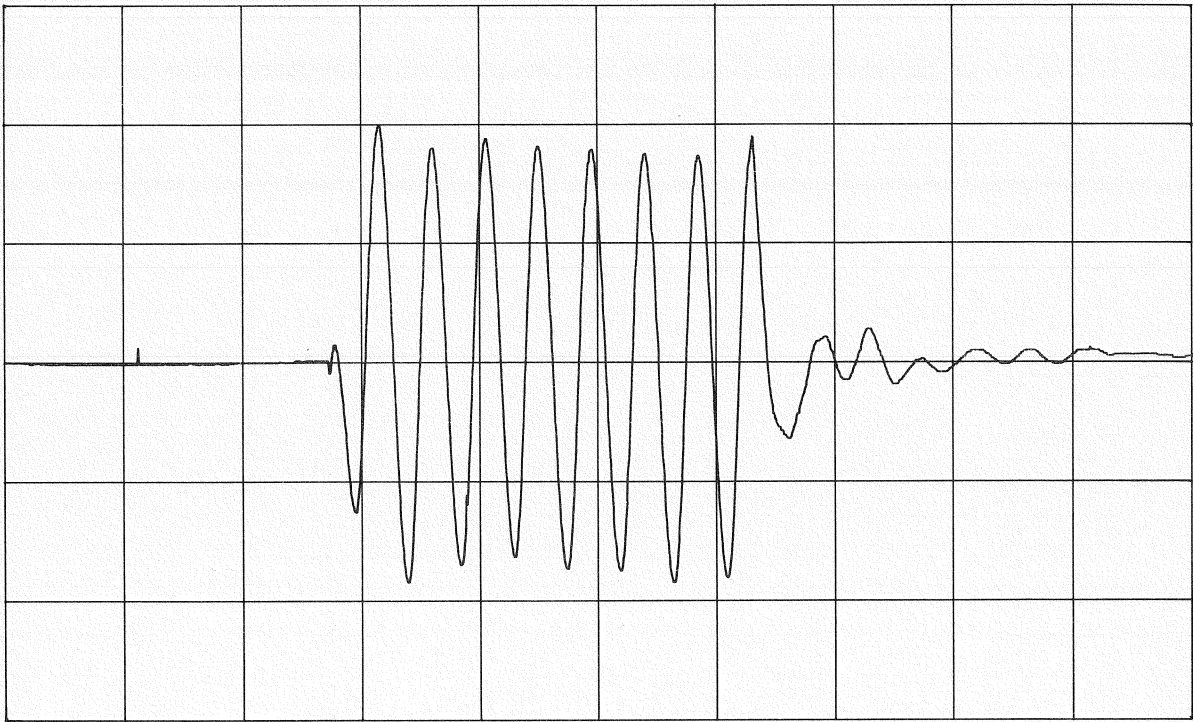


Figure 7a

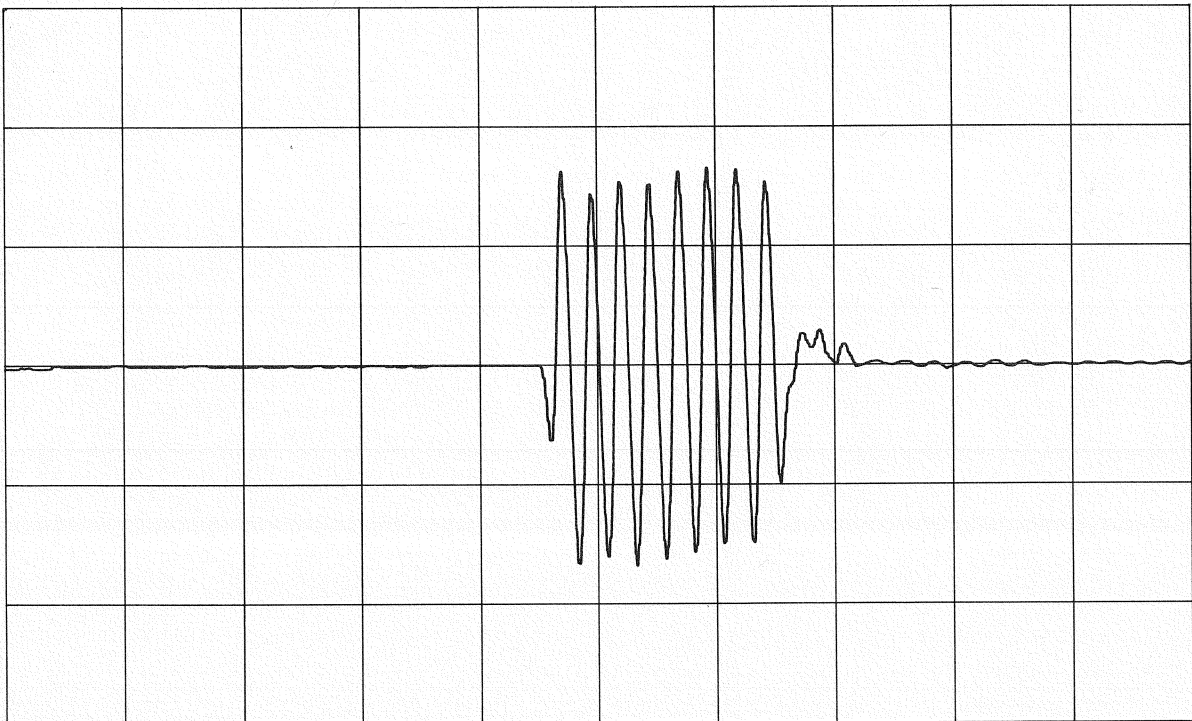


Figure 7b

L40 Engineering Staff Report

Errata

We sincerely regret that several errors in editorial processing were discovered immediately prior to the production of this report. We have prepared this errata sheet in the interest of timely publication.

1. Pages 5, 6: Figures 3a and 3b represent horizontal dispersion, and Figures 3c and 3d represent vertical dispersion.
2. Page 7: In Figure 4, the lower solid curve represents second-harmonic distortion, and the dashed curve represents third-harmonic distortion.
3. Pages 9, 10: The graphs of Figure 6 are labeled incorrectly. The correct graphs are shown below and on the reverse.

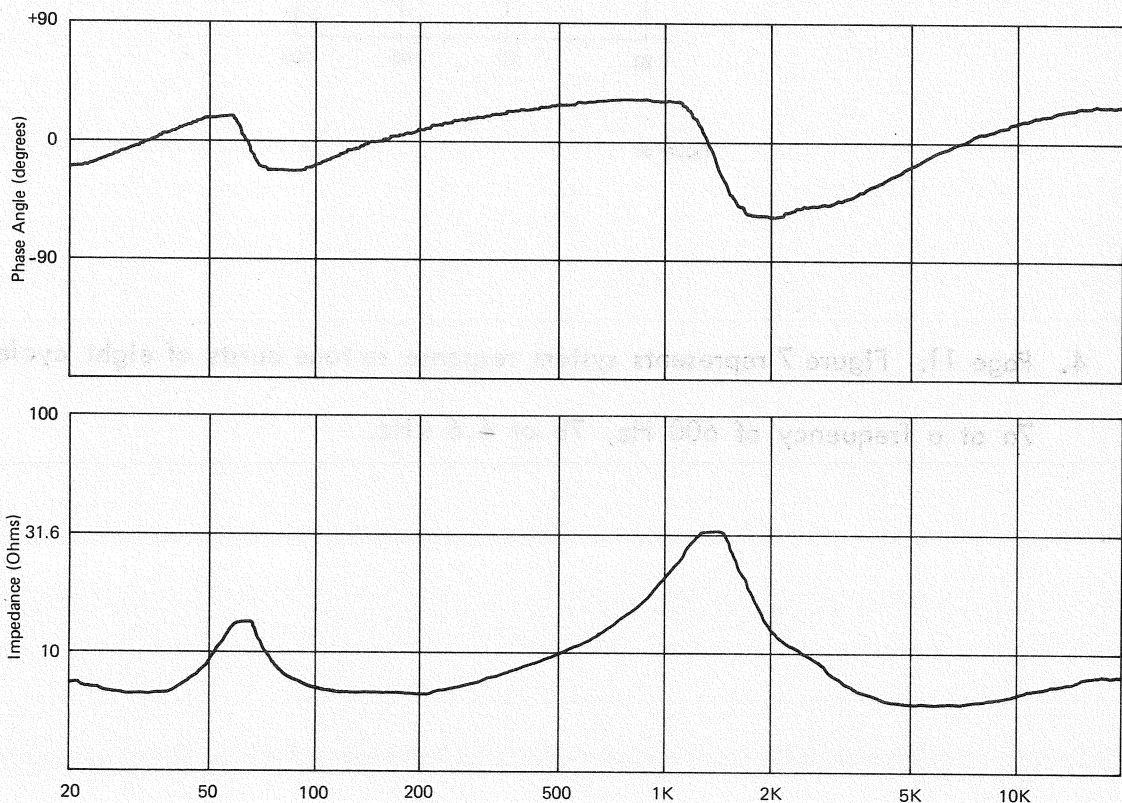


Figure 6a

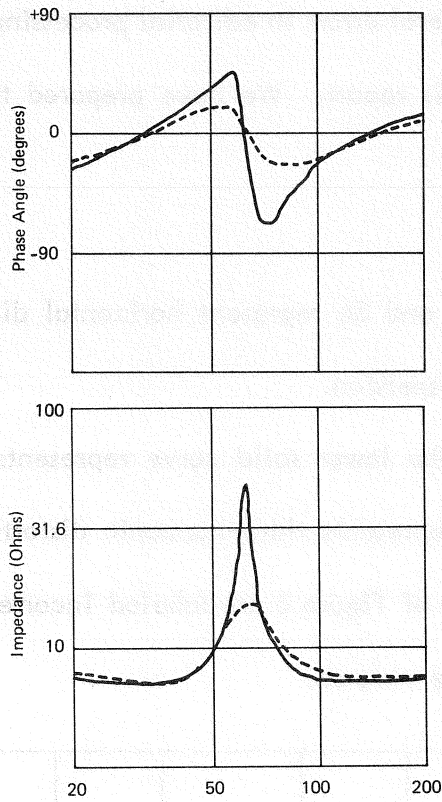


Figure 6b

4. Page 11: Figure 7 represents system response to tone bursts of eight cycles duration, 7a at a frequency of 600 Hz, 7b at 6.6 kHz.