is more than dramatic; it's like comparing live music to a big garbage can. Of course, I'm sure you've heard many such acoustic garbage trucks roll by, and the type of "music" often played belongs in one.

6. *Photo 5* shows my personally designed audio analyzing equipment, consisting of a low-distortion sine/cosine sweep oscillator, tracking bandpass filter (for ambient-noise suppression and spectral analysis), true-RMS log (dB) detector, and mike preamp using Panasonic WM-60AY capsules (used in Mitey Mike).

For transient responses, I used an HP8116A pulse/function generator, Tektronix 475 oscilloscope, and Tektronix C-4 camera, while for response plots I used a Mosely Model 135 X-Y chart recorder (*Photo 6*).

7. *Figs. 17, 11,* and *18* are, respectively, idealized second-, third-, and fourth-order CO transient responses. The upper traces are the responses to a 70Hz square wave (lower traces) fed through a first-, second-, and third-order all-pass circuit with ±0.2dB amplitude flatness, DC –100kHz, but with a phase shift of 0° at DC and approaching –180°, –360°, and –540° at high frequencies. On a log-frequency scale, phase shift is centered at 200Hz, corresponding to the CO frequency being simulated.

Although the amplitude/frequency spectra of these responses are identical to those of the input square waves ±0.2dB, the sound is not. Time smear (delay of low-frequency components versus high ones) is 1.6, 3.2, and 4.8ms, respectively, whereas in a letter by Dick Crawford regarding my article "Waveform Phase Distortion" (*SB* 1/97), he mentions 100µs (0.1ms) as the lowest accepted threshold of phase-dispersion audibility.

This is why I used a true noninverting, first-order CO for

PHOTO 4: "Omni-Focus"; home speaker with Focal 10" and bipolar pair of coincident mid/tweeter units.

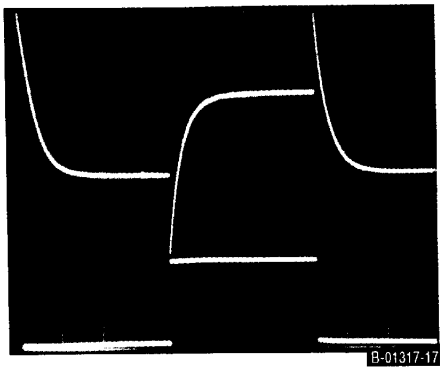

FIGURE 17: Ideal second-order CO square-wave response.

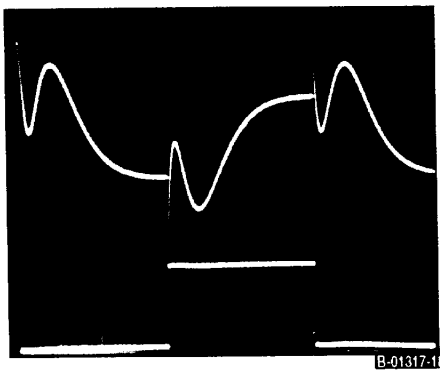

FIGURE 18: Ideal fourth-order CO square-wave response.