

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

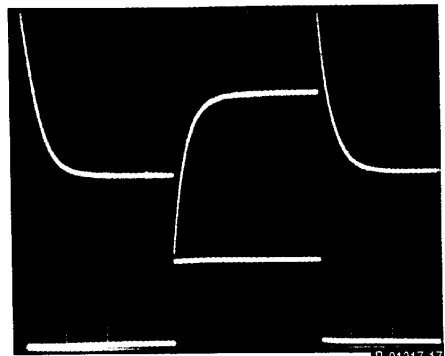


**PHOTO 4:** "Omni-Focus"; home speaker with Focal 10" and bipolar pair of coincident mid/tweeter units.

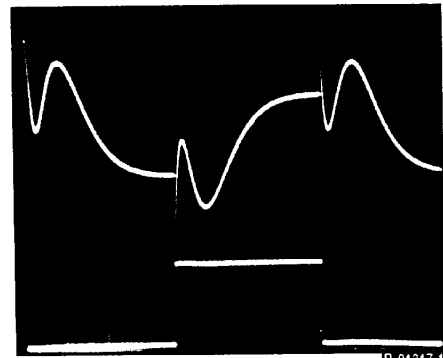
(lower traces) fed through a first-, second-, and third-order all-pass circuit with  $\pm 0.2$ dB amplitude flatness, DC  $-100$ kHz, but with a phase shift of  $0^\circ$  at DC and approaching  $-180^\circ$ ,  $-360^\circ$ , and  $-540^\circ$  at high frequencies. On a log-frequency scale, phase shift 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  $\pm 0.2$ dB, 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  $100\mu$ s (0.1ms) as the lowest accepted threshold of phase-dispersion audibility.

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



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



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

# MCM Electronics®

The Comprehensive Source For All of Your Electronics (and Speaker) Needs!

- Over 200 Different Woofer Types
- Pre-assembled Crossovers and Crossover Components
- Enclosure Design Reference Books and Software
- Huge Assortment of Cable and Interconnect Products

## MCM AUDIO SELECT™

### 12" Polypropylene Cone Woofer

Ideal for band pass and closed box enclosures. Features: •Rubber surround •Vented pole piece •2" voice coil •42 oz. magnet  
 Specifications: •Power capacity 100W/200W RMS/peak •Frequency response 26Hz-3KHz •SPL 91dB •Qes .340 •Qms 2.33 •RE 6.8W  
 Xmax 2.25mm •Qts .30 •Vas 6.18 cu. ft. •Fs 26Hz •Impedance 8ohm

Order #55-1220



Reg. Price \$35.95

Only \$24.50

You must provide code when ordering: **CODE: SB50**



For over 20 years, MCM has been a leading supplier to audio enthusiasts, professional autosound installers and repair centers. Our broad selection, competitive prices and huge inventory make us the best source for speaker components. Discover the MCM Difference, Call today for your free catalog!

Prices effective from November 16 to December 28, 1998



**MCM ELECTRONICS®**  
 850 CONGRESS PARK DR.  
 CENTERVILLE, OH 45459  
 A PREMIER FARNELL Company

**FREE CATALOG!**

**1-800-543-4330**

www.mcmelectronics.com

**SOURCE CODE: SB50**

Reader Service #11