

EX-18

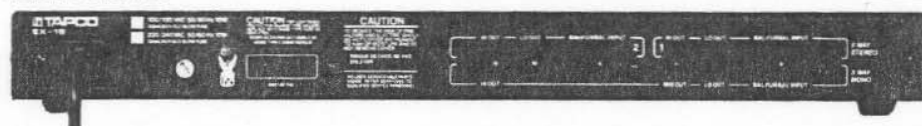
STEREO 2-WAY/MONO 3-WAY ELECTRONIC CROSSOVER

NEW

FRONT PANEL:



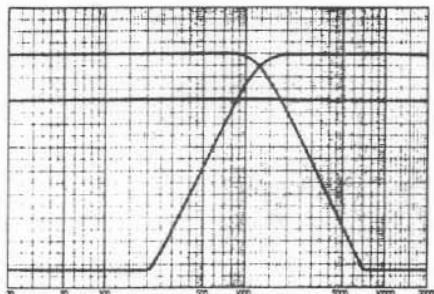
REAR PANEL:



18dB/OCTAVE MAXIMALLY FLAT BUTTERWORTH FILTERS

The most fundamental prerequisite for good quality sound is reasonably flat frequency response. To end up with flat response any acceptable electronic crossover must exhibit smooth passband response, the right phase relationships at the crossover point, and filters sharp enough to keep extraneous signals from the various components in the system. If all the criteria are met, the resultant acoustical information will closely resemble the original electrical signal that was delivered to the crossover.

Of the available filter configurations, Butterworth 18dB/octave complementary types offer the best combination of desirable characteristics, which is why they are used in the EX-18. The 18dB/octave slopes produce just the right phase relationships so the composite frequency response stays flat even when the filters are recombined. And the shape of the Butterworth filter is perfect for electronic crossover use so that with the 18dB/octave slope there's no problem with too much of the wrong frequencies leaking over into the drivers. With the EX-18, you get the best possible combination of desirable characteristics, so you get the best possible sound (at the best possible price).



EX-18 18dB/OCTAVE BUTTERWORTH FILTERS. Note the rapid rolloff at the crossover point, very smooth passband response, and flat combined response.

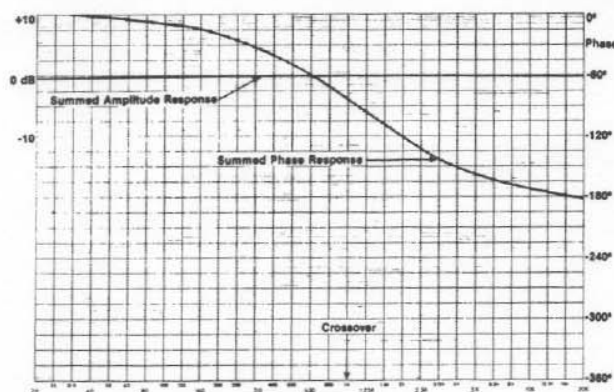


Fig. 3: Tapco EX-18: Amplitude and phase response when the high and low outputs are summed ("reverse" polarity).

We found the crossovers slew rate limit to be 11 volts per microsecond which is consistent with the observed power bandwidth of about 135 kHz. This works out to a normalized slew rate limit of 0.85 volts per microsecond per volt which is well above the minimum of 0.5 recommended³ for freedom from slewing induced distortion.

The frequency response curves for the Hi and Low output signals are shown in Figure 1 for the case of a 1 kHz crossover point. Note the cutoff slopes of 18 dB/octave. Figure 2 shows the frequency response that results when the Hi and Lo output signals are accurately summed with the polarity reversal switch in the "normal" position. The amplitude response is absolutely flat as it should be for a properly designed 18 dB/octave Butterworth filter pair. The phase response is also as expected for this filter pair. Depressing the polarity reversal button on the front panel provides the summed response shown in Figure 3. Again, the amplitude response is absolutely flat but now the crossover exhibits half the total phase shift of the non-inverted case. Because of the better phase characteristic, operation with the polarity button depressed is recommended. In either case the crossover exhibits an accurate amplitude response when the outputs are summed. This puts the EX-18 far ahead of many crossovers on the market which do not exhibit an accurate summed response. Good work Tapco!

Conclusion: The EX-18 electronic crossover from Tapco was evaluated both in the lab and in the listening room and found to perform excellently in both situations. This is one of the few crossovers available that provides an accurate summed amplitude response. Considering the ease of operation and modest price, the EX-18 could well become a classic audio tool. We recommend the unit highly.

References

1. A.N. Thiele, "Loudspeakers in Vented Boxes," *Journal of the Audio Engineering Society*, Vol. XIX, No. 5, p. 382; no. 6, p. 471 (May, June 1971).
2. R.H. Small, "Closed-Box Loudspeaker Systems," *Journal of the Audio Engineering Society*, Vol. XX, p. 798 (December 1972); Vol. XXI, p. 11 (Jan./Feb. 1973).
3. W.G. Jung; M.L. Stephens; C.C. Todd, "An Overview of SID and TIM, Part II," *Audio*, 38-47 (July 1979).

LAB TEST SUMMARY

(Note: 0 dBV is referenced to 0.775 Vrms)

Input/Output Levels

Maximum input level before clipping:	+ 21.3 dBV
Maximum output level:	
20 k ohm load:	+ 21.3 dBV
600 ohm load:	+ 14.5 dBV

Noise Performance

(Note: 20 kHz filter; unweighted;
Hi level attenuator full clockwise)

Noise at "Hi" output (CH 1):	- 88.3 dBV
Noise at "Lo" output (CH 1):	- 88.0 dBV
Noise at "Hi" output (CH 2):	- 85.5 dBV
Noise at "Lo" output (CH 2):	- 87.8 dBV

Distortion Performance

(+ 10 dBV output level)

Frequency	THD plus Noise
100 Hz	.002% (measurement limit)
500 Hz	.002%
2 kHz	.002% (.0026% w/phase rev.)
10 kHz	.0027% (.0095% w/phase rev.)
20 kHz	.0031% (.0195% w/phase rev.)

Small Signal Bandwidth:	(- 3 db) 3 Hz to 290 kHz
Power Bandwidth:	135 kHz
Slew Rate Limit:	11 volts per microsecond
Normalized Slew Rate Limit:	0.85 volts per microsecond per volt

CIRCLE 33 ON READER SERVICE CARD

