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Application Note

M2B Version 2 Crossover Configuration Suggestions

The M2B Version 2 loudspeaker offers user flexibility by allowing both full-range and bi-amplified operation. A switch on the unit's input panel allows the operating mode to be selected. In the full-range mode a single amplifier channel will correctly drive the unit. An internal crossover divides the frequency band so as to correctly drive the low-frequency (LF) and high-frequency (HF) components. When selected to operate in the bi-amplified mode, the M2B Version 2 loudspeaker requires separate amplifier channels for the LF and HF sections. Through performance testing and field listening experience, suggested crossover and equalization parameters were established.

Crossover: A symmetrical crossover configuration provides good performance. The slope of both the low-pass and high-pass filters should be 24dB per octave, with a Linkwitz-Riley filter implementation preferred. For both the LF and HF channels the –6dB crossover point should be selected for 1.5 kHz.

Equalization: For best performance one "notch" filter in the LF output path is suggested. The center frequency of the filter should be approximately 460Hz. The Q should be 5 with a depth of –3dB. For additional LF impact a 1/3 octave "bass bump" at approximately 80Hz can be implemented. Depending on the taste of the listener, anywhere from +2 to +6dB of equalization (bump) can be effective. Listeners who liked "mongo" bass selected +6dB as their preference. The author feels that +3dB is more reasonable

The HF output would also benefit from including a notch filter. The center frequency of the filter should be approximately 4kHz. The filter's Q should be 3 and the depth –2dB. No high-frequency horn compensation ("CD horn EQ") is required. Adding some if desired should not pose a problem.

Sensitivity Compensation: The difference in relative output sensitivities of the LF and HF components make a level compensation adjustment useful. If this is to be done in the electronic crossover then the level of the HF output should to be –9dB relative to the LF output. (LF output at unity gain; HF output attenuated 9dB.) This then allows the LF and HF amplifier channels to be set to identical input sensitivities. It may also be desirable to operate the electronic crossover channels at unity gain. In this case sensitivity adjustment can also be made using the input attenuator control on the audio amplifier's HF channel.

Additional Filtering for Loudspeaker Protection: Applying a high-pass filter to the LF channel can provide significant loudspeaker protection. When using a filter whose slope is 24dB per octave, a –6dB point in the range of 50 to 65Hz would be appropriate. This will prevent the M2B Version 2's woofer from receiving energy in a frequency band where it is not capable of generating significant acoustic output. Almost all of the energy at this low a frequency would simply be dissipated in the voice coil as heat. Give your amplifier and loudspeaker a break and apply a high-pass filter!

Practical Implementation: This paragraph describes how to configure an XTA Electronics Ltd. DP224 Speaker Management System for good M2B Version 2 bi-amp operation. The unit was set for 2 x 2 way crossover mode. A low-pass setting of 1.47kHz for the LF output and a high-pass setting of 1.53kHz for the HF output worked very well. The filter types were set for Linkwitz-Riley at 24dB per octave. A notch in the HF output of –2dB, 4kHz, Q=3 was implemented. In the LF output a notch of –3dB, 463Hz, Q=5 was included. Setting the LF output to have a high-pass filter frequency of 60Hz provides protection for the woofer. In the LF output, a "bass bump" of +4dB at 80Hz, bandwidth 0.32 (Q=3.125), created heightened LF performance. With these settings the overall sonic performance of the M2B Version 2 was quite good. Other fine loudspeaker management systems, such as from BSS or Ashly Audio, can be similarly configured.

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