Telephone (847) 674-3535
sales@macpherson-inc.com
www.macpherson-inc.com

Application Note

AXIA Crossover and Equalization Suggestions

Although available from the factory in either a bi-amplified or tri-amplified configuration, AXIA loudspeakers are typically selected for bi-amp use. The following paragraphs relate to the bi-amplified configuration, which requires a separate amplifier channel for the LF and MF/HF sections. Through testing and field experience, suggested crossover and equalization parameters have been compiled. These should be used only as a starting point toward reaching the goal of excellent audio performance. Each specific application will benefit from a carefully selected configuration.

Crossover: For optimum performance an asymmetrical crossover configuration is desired. This should prove simple to implement using virtually any DSP-based speaker processing system. The processor should be configured for 2-way operation, providing LF and HF outputs. The processor's LF output will connect to the input of the amplifier channel associated with the AXIA's LF input. The processor's HF output will connect to the amplifier channel associated with the AXIA's MF/HF input. Configure the LF output channel's –6dB point to be in the range of 170 to 200Hz. The HF output channel's –6dB point should be in the range of 275 to 350Hz. The slope of both crossover filters should be 24dB per octave, with a Linkwitz-Riley filter implementation preferred. The final values for the low-pass and high-pass filters should be determined after performing listening, and possibly measurement, tests.

Equalization: Unless required to deal with room-specific issues, no notch or shelf filters are typically required to achieve excellent sonic performance. For additional low-frequency impact a 0.7 octave (Q=1.4) "bass bump" at 50Hz can be implemented. Depending on the taste of the listener, anywhere from +3 to +10dB of equalization can be very effective. The test listeners who liked to hear lots of bass energy selected +10dB as their preference. No high-frequency horn compensation ("CD horn EQ") is necessary. But adding some if desired will not cause a problem if carefully selected.

Loudspeaker Protection: Implementing a high-pass filter in the LF channel will provide protection for the AXIA's 15-inch woofer. This filter will prevent the woofer from receiving low-frequency energy in the range where it is not capable of generating significant acoustic output. If not removed by filtering, essentially all of the energy in this range would be dissipated in the voice coil as heat. Using a high-pass filter whose slope is 24dB per octave, with a –6dB point at 55Hz would be appropriate. If subwoofers are to be used with AXIA loudspeakers, selecting a higher –6dB point, such as 80Hz, will offer additional protection. It will also allow the subwoofers to perform better in their intended role.

Practical Implementation: In this example, MacPherson loudspeakers were selected to provide reinforcement for a 300-seat club that specialized in live music. Two AXIAs, one on each side of the stage, were used in a stereo configuration. Two SCHOLAR Model 118 subwoofers, arranged in a line array and driven in mono, provided additional low-frequency reinforcement. An XTA Electronics DP226 speaker processor was selected.

The DP226's subwoofer output was configured to have its high-pass filter –6dB point at 35Hz and its low-pass filter –6dB point at 80Hz. The DP226's LF output had its high-pass filter –6dB point configured for 80Hz. The LF output's low-pass filter was set for 198Hz. The HF output's high-pass filter was configured for 321Hz. The HF output's low-pass filter was left in its default setting of 22kHz. All the filters were selected for 24dB per octave, Linkwitz-Riley.

No filters were used in the DP226's subwoofer or LF outputs. To account for interaction between the AXIA cabinets and the club's physical space, three filters were used in the HF output channels. The first filter was centered at 606Hz, had a bandwidth of 0.71 (Q=1.4), and a depth of –2.7dB. The second filter had a center frequency of 3.11kHz, a bandwidth of 0.36 (Q=2.8), and a depth of –1.5dB. The third filter was centered at 5.88kHz, had a bandwidth of 0.38 (Q=2.6), and a depth of –3.3dB.

With the aforementioned configuration, the overall sonic performance of the system was excellent. Club management and guests have been uniformly pleased with the sound.

October 2, 2001