The Satellite/Subwoofer Solution

Three-way Systems for Extended Frequency Range

Think of it as removing the LF source from a conventional 3–way system and playing it back through a separate box (a subwoofer). Although still part of an "integral system", the subwoofer can be placed away from your "mid/hi" speakers to provide the best bass response the room can offer.

In small acoustics spaces (generally defined as rooms of less than 12,000 cubic feet in volume, with a more common room volume being approximately 3000 Cubic Feet, such as 16'H X 9'W X 21'L) the frequency response of a speaker system in the region below 100Hz is dominated by the modal response of the room. Room modes, also known as standing waves, occur in all rooms at frequencies where the wavelength of sound is an integer fraction (i.e. 1/1, 1/2, 1/3, 1/4, etc.) of the distance between two walls, or the distance between the ceiling and floor (this is a slightly over simplified explanation). This means that invariably, some frequencies are reinforced and some frequencies are canceled, resulting in peaks and dips in the frequency response at the listening position. These peaks and dips are affected by the relative position of the speakers to the boundaries in that room. Because of this, it is virtually impossible to get consistent bass response from multiple full-range speakers located around a "small" room (such as in a Stereo or 5.1 monitoring setup).

One solution to this problem is to employ a method called Bass Management, also referred to as bass redirection. Bass Management uses electronic filters to extract the low frequency information (typically below 80Hz) from the main channels and then reroutes that information to a single subwoofer channel (reproduced by one or more subwoofers). Since the low frequencies will now originate from a single source (a subwoofer) this source can be placed in the optimum location for bass reproduction in that room. And, because the main speakers are not required to handle frequencies below 80Hz, they can be reduced in size and easily placed for best imaging and coverage. The end result is that the overall frequency response of the entire audio system is considerable improved, without any sacrifice in performance or imaging.

One might ask, won't I perceive a difference in imaging if the sound of one channel originates from two sources (subwoofer and satellite)? The answer is actually no. Bass Management works by taking advantage of the ear's inability to determine the direction of frequencies below approximately 150Hz. Provided there is no audible distortion or sonic artifacts at higher frequencies (port noise etc.), and the sound emanating from the subwoofer is limited to below 100Hz, it will be impossible for the listener to identify the location of the subwoofer in the room.

This lack of auditory acuity is based on the fact that the wavelengths of frequencies below 100Hz are much greater in length than the distance between the listener's ears. However, our ears can easily identify the source of high frequency information as coming from the main speakers. Because the sound of the main speakers is the listener's primary audio location cue, the listener's brain believes that the bass is actually emanating from the main speakers and not from a separate subwoofer (even when it is behind the listener).

With a properly designed satellite/subwoofer speaker system, using Bass Management, the response and overall accuracy of a monitoring system can be greatly improved. These benefits apply to any type of monitoring, whether two channels, 5.1 and beyond.