

Sub power

'Consumers love bass,' — and amped bass is all the more appealing in a smaller box, say speaker company executives

BY MICAH SHEVELOFF

The world of audiophile high-fidelity entertainment systems has evolved on a spectacular scale since the Edison phonograph, the vacuum-tube radio, and the console black-and-white TV. Today's theme is theater technology and home integration, and nowhere is that more evident than in the changes in loudspeaker design, in part because of the emergence of the subwoofer as a necessary component to the listening experience for music and video.

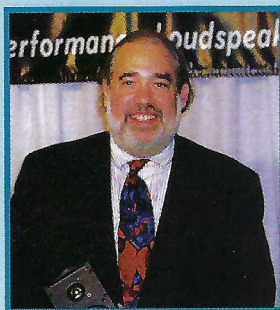
A brief explanation

Multi-channel audio formats such as Dolby Digital have begun to change the way carefully integrated home theater systems are designed and calibrated. Filmmakers have directed bass information into the main channels of movie soundtracks (right/left/center/rear), anticipating that a more uniform delivery of the entire bandwidth surrounding the viewer would provide the most realistic audio/video experience. In order to supplement the bass information coming from the main channel speakers, a low-frequency effect (LFE) channel was created as part of the original recording. The LFE channel (the point-one in Dolby Digital 5.1) is calibrated during soundtrack production to contribute up to 10dB more bass output than the front three channels, relieving the front speakers of excess strain and possible distortion, especially during dynamic peaks. For consumers building multichannel theater systems, the LFE channel insures that they will have the

impact and resolution at low frequencies without creating distortion in their front and center speakers. Dolby Digital 5.1-ready electronics have the LFE output and the necessary bass-management circuitry, which allow for individualized adjustments and acoustics matching. Although a subwoofer typically handles the signal from an LFE output, it is important to note that the subwoofer output found on many A/V components is not equivalent to an LFE output. A subwoofer output is designed to deliver bass information derived from an original source, such as a CD or DVD soundtrack, unlike the LFE output that is actually engineered into thousands of multichannel recordings that exist today, and routed through a dedicated LFE output channel.

Sandy Gross, president of loudspeaker manufacturer Definitive Technology, summed it up nicely: "Consumers love bass." As younger generations have elevated themselves into an earning bracket that allows them to purchase homes and all of the technological trimmings, their demands are reflective of the music and video experiences they have had. Even the impact of car audio systems and Omni theaters

have exposed a world of music listeners to more thunderous bass than ever before, and the hunger for low-frequency resolution in the living room is reflected in the ever-growing popularity of the subwoofer as a must-have component in a home entertainment system. Speaker manufacturers began to realize in the late 1980s that multi-channel audio was becoming more than a trend, and that consumers would be likely to use a greater number of smaller speakers to fulfill their surround-sound needs. Thus, they deduced, the bass output would have to come from an alternative source, such as a subwoofer. Definitive Technology manufactures several models of the classic subwoofer, featuring cone diameters ranging from 8" to 18". The enclosures also contain the necessary electronic crossovers and amplifiers internally to make each unit an individual low frequency solution. Gross also reported that he will introduce what he has named the SuperCube this summer, incorporating a 10" long-throw woofer, two 10" sub-bass radiators, and a 1,000-watt amplifier — all in a diminutive, one cubic-foot enclosure. "Powered woofers have enabled us to deliver super-high-quality bass with relatively compact



Sandy Gross
Definitive
Technology

"Having at least two subs in a room will provide a better integrated overall sound."



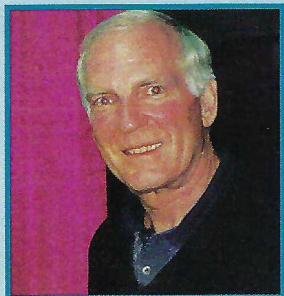
Paul Barton
PSB
Loudspeakers

"The demographics of a home theater listener are not the same as a traditional two-channel audio customer."

speakers," added Gross, who remembered when Dolby Labs used to borrow six of his subwoofers in order to demonstrate its 5.1 concept. "They would place a single woofer with each front, rear, and center speaker, to be certain that there was a full-range signal surrounding the listener." Another

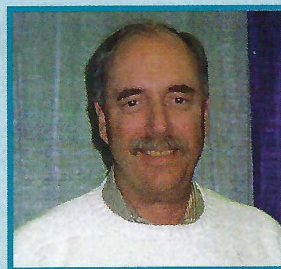
approach that Definitive Technology takes is to build powered woofer systems into its bookshelf and floor-standing loudspeaker models. "Having at least two subs in a room will provide a better integrated overall sound," explained Gross. There are several models of powered towers, PowerMonitors, and even rear-channel surround speakers with a built-in powered woofer system.

Paul Barton of PSB Loudspeakers has been designing subwoofers since 1978, and referred to a technique he learned from one of his teachers, Dr. Floyd Toole. Toole believed that two subwoofers did successfully combat room-cancellation problems much more effectively than one. Barton reported that even though Toole's technique demonstrated that the best sound was often achieved by using two woofers for a flat response, home theater listeners looking for the biggest bang found that one woofer located in the corner of the room suited their needs best. PSB offers four subwoofer models capable of satisfying either listening preference. Ranging in size from 8" to 15", they include class A/B amplifiers with hi-pass filters for use with small satellite speaker systems, and very sophisticated limiting circuits to prevent audible distortion caused by amplifier clipping or over-excursion of the woofer cone. The 8", 10", and 12" models are available with tuned ported enclosures. The flagship 15" version comes with a sealed enclosure, and a retail price of \$949. "The demographics of the home theater listener are not the same as the traditional two-channel audio customer," added



Barry Ogg
Audio
Products
International

"Today, subwoofers are more than 25 percent of our overall business."



Fred Yando
Velodyne

"We measure the output of our amps with all frequencies driven simultaneously, to present an accurate representation of their power."

Barton. "There are many more people in the world that watch TV, and they tend to want bang for the buck. PSB makes aesthetically pleasing woofer systems that are as acoustically transparent as possible, and our main goal is to deliver powerful bass with as little distortion as possible."

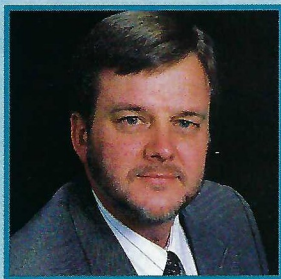
Another innovative manufacturer of woofer systems is Audio Products International (API), makers of the Mirage, Athena, and Energy brands. "I remember the end of the '80s, when our industry began to see beyond two-channel systems as home theater began to emerge," reminisced executive vice president Barry Ogg. "We launched our first subwoofers under the Mirage and Energy names at the 1992 Winter CES in Las Vegas. They had a retail price between \$500 and \$600 and they were virtually an overnight success. Today, subwoofers are more than 25% of our total business." One feature that was included on the very first subs from Mirage and Energy and remains there today is the audio/video switch, located on the amplifier. If the audio position is selected, the response from the system is flat — perfect for critical music-listeners. If the video position is chosen, there is an equalized increase between 40 and 50 cycles designed to enhance the effects of thunderous explosions and other big-bang effects found on video soundtracks. Both Mirage and Energy have won numerous awards for subwoofer/satellite systems, which include front and rear speaker pairs, a center-channel speaker and a subwoofer. "It is a category we have paid a lot of attention to," added Ogg, who

noted that API-branded products are designed and built in their own facility, including woofers, amplifiers, and even wooden subwoofer enclosures. "The Energy Take 5 system is an 8" powered sub, four satellite loudspeakers and a center-channel speaker with a retail of \$800, and it has generated the most awesome review response we have ever had," reported Ogg.

Velodyne is a subwoofer manufacturer that has established a reputation for bringing leading-edge technology to a diverse product lineup. Velodyne vice president Fred Yando agreed that the subwoofer category has come on dramatically since the Dolby Digital system became available for consumer use at home. Velodyne products feature many state-of-the-art developments such as Current Recovery digital amplifiers and servo assist technology. Digital amplification is extremely efficient, and operates with much less heat output than conventional switching amplifiers. "We measure the output of our amplifiers with all frequencies driven simultaneously (the frequency range of a subwoofer amplifier is approximately 20 to 100 cycles) in an effort to present an accurate representation of their power," reported Yando. Servo-assisted woofers use some form of mechanical monitoring device attached to the woofer's cone, such as an accelerometer. Data are gathered comparing the cone's movements to the original input signal, allowing a correction circuit to reduce distortion. Velodyne says it uses servo technology on some models, combined

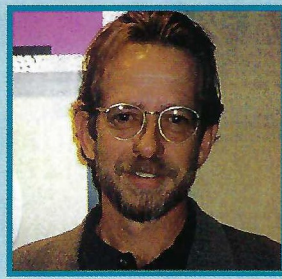
with its highly efficient amplifiers to insure that accurate bass is available from either music or movie soundtracks. Yando also spoke of newer Velodyne products, such as the SPL-1000: Selling for about \$999, the 12" cube houses a 10" woofer and a 750-watt RMS/1500-watt peak output digital amplifier. Velodyne is also offering "very high quality" satellites, a package of five small speakers (two front, two rear, and a center) selling for about \$499. A step-up version of the package should be available in the fall of 2001.

Paradigm is a company that also favors the use of a servo-assisted woofer in its Paradigm Reference subwoofer system. The Reference has a 15" woofer and extends to a subterranean 14Hz. Paradigm's closed-loop servo comparator analyzes the electrical signal created by the accelerometer and makes corrections at a rate over 3,000 times per second. The Reference retails for \$1,500. Like API, Paradigm builds its own woofers and constructs its own cabinets. Paradigm managing director Bill VanderMarel indicated that home theater has made subwoofers such a mainstream item that they have become part of "the new reality" in the loudspeaker business. "Our focus is on very high performance for both music and theater applications, due to the extended deep bass in modern recordings," said VanderMarel. "We concentrated on amplifier quality, providing high current to our woofers. As a result, they play loud, go deep, yield very low distortion, and are still affordable." Paradigm also offers a less costly line of woofer options, including two models that feature a bandpass enclosure design. Bandpass enclosures are vented, multi-chambered boxes that typically make more efficient use of amplifier power. Paradigm packages 10" and 12" versions of its "bass-shaping" bandpass



**Bill
VanderMarel
Paradigm**

"[Consumers] seem to have realized the benefits of having larger, full-range speakers in addition to a capable subwoofer."



**Chris Byrne
NHT**

"The challenge is to design a configuration that provides great bass, but is easy to stash someplace in the room."

enclosures with a 175-watt RMS amplifier. Paradigm's VanderMarel reports that they are both capable of very smooth responses and extreme-

The popularity of the subwoofer has diminished consumer interest in tower speakers — particularly among the more decor-conscious consumers

ly high output levels.

"Consumers were buying small speakers and supplementing them with subwoofers for a while," says VanderMarel. "However," he continues, "they seem to have realized the benefits of having larger, full-range speakers in addition to a capable subwoofer for truly the best performance. Paradigm is first and foremost a musical performance company. We have always believed that speakers that are good for music are the best for home theater as well."

"The challenge with subwoofers is

to design a configuration that provides great bass, but is easy to stash someplace in the room," added Chris Byrne, vice president and general manager of NHT, a company that introduced its first subwoofers in 1994. "Our mainstay products have always been bookshelf speakers. However, now, we are concentrating on multi-channel systems that include subwoofers. With the popularity of home theater systems, I don't see that trend reversing." Byrne also noted that the popularity of the subwoofer has diminished consumer interest in tower speakers. Decor-conscious consumers see the subwoofer, and immediately think, "Oh. OK. I can put that behind the couch." Clever installers often find ways to hide the satellite speakers behind panels or sections of grille cloth. NHT manufactures bookshelf speakers and subwoofer/satellite packages in a variety of sizes, in addition to three powered subwoofers. For 2001, NHT has upgraded its subwoofer technology to include Bob Carver/Sunfire-designed amplifiers in all but the entry-level offering. Retail prices range from \$500 to \$1,200.

The magic of home theater technology lies in the creative integration of powerful electronic entertainment components into a room setting, allowing the consumer to exist in an environment that can be instantly converted into a visceral audio/video experience. The subwoofer plays an important part in achieving big-screen realism and bringing to life the full range of the musical spectrum.