Are Cyber-Subwoofers the Wave of the Future?

Velodyne DD-10 Subwoofer

Many of *AVGuide Monthly*'s writers are rapidly coming to the conclusion that subwoofers are an essential part of a well-conceived music system. Of course, we're accustomed to subs in home-theater applications, but a properly designed and integrated sub can make as much or more difference on music. Sallie Reynolds and I have each covered this in recent reviews, and Sandy Gross of Definitive Technologies makes a similar argument in his "Sounding Board" guest editorial in *AVguide Monthly*, Issue 3.

The potential fly in the ointment is that subwoofing for accurate music reproduction is in many ways more demanding than subwoofing for home-theater. Sure, on film, high output at very low frequencies is required. In listening to seven different subwoofer designs over the last few months, ranging in price from $299 to $2499, I would observe that this is actually a fairly simple matter. At least in smallish rooms, all these subs do a reasonable job with door slams, tornados, gun shots, crashes and the like (for larger rooms, you need bigger subs or more of them).

Music, on the other hand, mercilessly reveals problems that these same subs have with box resonances, room placement, room dimensions, and integration with the main speakers. String bass, electric bass, bass drum, pipe organ, and synthesizer sounds vary tremendously from sub to sub. We can notice these problems on music and be bothered by them because we have a clear reference to check: the sound of musical instruments in real performance spaces. By comparison, it is harder to know what the real sound of a Xylon 5 Intergalactic Warship's Ion guns is on impact (in fact, in a vacuum, how do they make a sound?). Similarly, I don't *really* know what a tornado sounds like. And, while I can readily go to a club to hear a Fender Fretless bass, it is bit more difficult to find a tornado to listen to up close.

So, I draw two conclusions from this. First, if you use your system for both music and film, you need to use both soundtracks and music for evaluation, with an emphasis on music. Don't go to a showroom and draw conclusions with typical film demo fare only. Second, the challenges of musical subwoofing are substantial, and many designers have barely scratched the surface of what is needed. Shop carefully.

Velodyne's DD-10 shows some serious thinking about the problems of subwoofers, particularly for accurate musical reproduction in real rooms. The difference between the DD-10 and all of the other under-$2500 subs I've tried is apparent when you open the box. Inside you find a microphone, a mike stand, and a set of conveniently long cables. The DD-10 itself contains a signal generator, a 8-band equalizer (with controls at 20, 25, 32, 40, 50, 63, 80, and 100 Hz) and the circuitry to display test results on your TV. The idea is simple: With a built-in test rig, you can check the frequency

response of your main speakers and the subwoofer and use the results to adjust the typical controls—crossover frequency, phase, and volume. In addition, with the test equipment in place, you can see the results of moving the sub to different locations (the effect is big). Finally, because your room dimensions and speaker placement will inevitably create peaks and dips in frequency response, you use the equalizer to adjust the *combined* response of main speakers plus sub to be as flat as possible.

It works like a charm. I started by running a test sweep on my reference Revel Salon speakers (as always, these have been located in the room using RPG's Room Optimizer software). I set the microphone up at my listening position, turned on the signal generator with the supplied remote (a remote should be standard equipment for all subs over $500), and immediately was looking at a 15-200Hz frequency sweep on my TV. The frequency sweep is an absolute necessity with full range speakers like the Salons, because the bass response isn't obviously flawed. What I saw on the curve was bass that was flat (actually slightly elevated) to 40Hz, and then a slow, smooth drop by about 6db down to 20Hz (from other tests, this drop is a function of the room). I also noticed that the bass range below about 80Hz was slightly elevated in comparison with the 100-200Hz range.

"…you use the Velodyne's equalizer to adjust the combined response of main speakers plus sub to be as flat as possible. It works like a charm…"

It took about 10 minutes to set the crossover frequency and adjust the equalizer to flatten the response substantially below 40Hz, and smooth it a bit in the 40-100Hz range. It would have taken 5 minutes, except that I initially had the sub running out of phase with the Salons, and it took me a few minutes to realize this (the equalizer controls basically work backwards when the phase is wrong). This is much, much less time than such adjustments would take with the trial and error approach necessary without the test system supplied with the Velodyne.

The sonic difference was immediately obvious. In my setup, the Salons, despite their six woofers and massive size, can sound a bit light on really deep bass in my 3000 cubic foot room. The addition of the Velodyne addressed these issues nicely. Electric bass, kick drum and synthesizer immediately had a stronger and more complete foundation, and overtones were a bit more accurate. The upper bass of the Salons in my room is not completely open, however, and the addition of the Velodyne didn't change this fundamental quality (which is probably the result of room modes above 100Hz).

From looking at the frequency trace on the Salons alone, they aren't the ideal candidate for just adding a sub, because they are full range, relatively smooth, and, in my room, have slightly elevated mid-bass. The Velodyne, or any other sub, can add bass, but it can't subtract it. To see what the Velodyne would do with a speaker having obvious bass limitations, I tried it with a pair of ProAc Super Tablettes, whose 4.5" woofers have response down to about 80Hz, and then drop off rapidly.

I followed the same procedure as with the Salons. In the case of the Tablettes as main speakers, of course, once the crossover frequency was selected, it was primarily a matter of adjusting the equalizer to mate the Velodyne with my room. To give you an idea of the maximum degree of adjustment needed, the 80Hz "slider"

was set to -6dB and the 25Hz slider to +5dB. An 11dB adjustment range is substantial, and gives you some quantitative sense of the correction needed. Most of the other controls were set to within 3dB of flat.

Of course, none of this matters if it doesn't sound right. But it does. Deep bass, on drum and electric bass, for example, had the shuddering, air-moving quality that you hear at times in live performances. I recently heard Puccini's *Turandot* live, and can attest that some of the bass drum whacks could be heard as massive air shudders in a 2800 seat hall. The Velodyne can produce a similar effect, without losing control. Mid-bass on the DD-10 was solid and pleasantly free of resonance (the Achilles heel of many woofers). Mid-bass was also well-defined, especially on plucked acoustic instruments that some woofers render indistinguishable from their electric counterparts.

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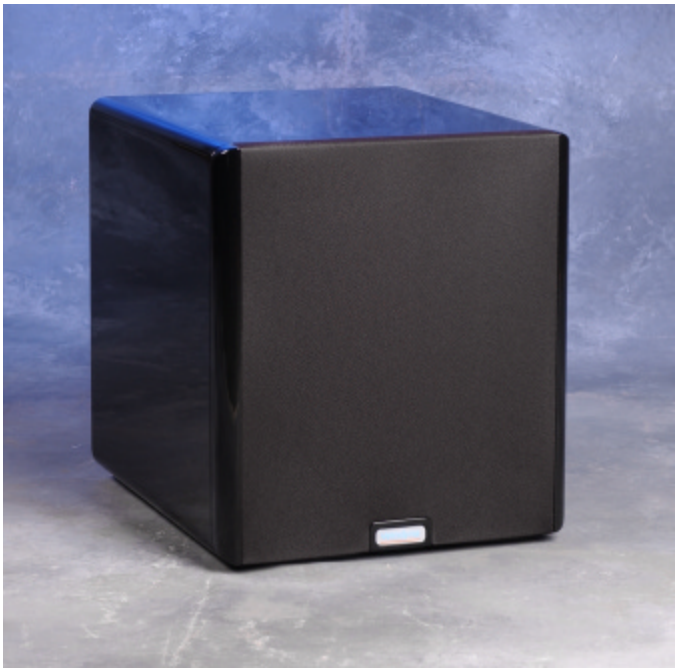
This setup with the ProAcs is in some sense an acid test. It gives a relatively pure view of what the DD-10 sounds like on its own over a rather wide frequency range. In that context, one measure of how the Velodyne technology adds up is that I'd slightly prefer the bass of DD-10 "alone" to the bass of the $20k Salons alone *in my room.* I add those italics not to say "your results may vary". Rather, I want to indicate that the primary difference between the Velodyne bass and the Revel bass is not based on the intrinsic quality of the Velodyne woofer versus the Revel (both are very good), but instead on the room integration facilities provided with the Velodyne (equalization and flexible placement).

For many, the key point of comparison is with other subwoofers. Of the seven subs I've listened to recently, the Velodyne is one of the top two. My other favorite is the REL Strata III (I have not used the Definitive SuperCube Reference in my system, but it, too, is a worthy contender). The REL tends to sound slightly more open than the Velodyne, in part because its bottom octave can't be tuned to be as strong, and it is significantly cheaper ($1200). Integration with the REL can be harder, due the lack of test and measurement facilities, and, of course, some adjustments simply can't be accomplished without equalization. But if you're willing to spend some time tweaking, this may not matter, as the REL can deliver excellent bass. There is also the small matter of all the other things you could do to improve your system with that $1200. On the other hand, if the price difference is manageable for you, I think the probability is that you'll realize better sound from the Velodyne. Comprehensive room integration really matters.



(See comments from Velodyne's Curt Chisholm on page 33 to learn about additional EQ options supported by the DD-10. -Ed.).

Specifications

Price: $2499
Frequency Response: 18-120Hz, +/- 3dB
Integral Amplifier Power: 1250 watt internal class D amplifier
Driver Complement: One 10" driver with 3" tandem voice coil, 19.3 lb. magnet
Controls & Inputs: Low pass crossover variable from 15Hz to 199Hz in 1dB increments,high pass crossover at 80Hz, line level balanced and unbalanced inputs, high level inputs, phase variable from 0-180 degrees in 15 degree increments
Dimensions: 11.75"w x 11.75"h x 13.5"d
Weight: Not Specified
Warranty: Two Years

Associated Equipment

McCormack MAP-1 multichannel preamp, Sunfire Signature power amp, Yamaha S2300 universal disc player, Toshiba DVD player, Revel Salon and ProAc Super Tablette loudspeakers, Nordost Blue Heaven interconnects, Audioquest Jaguar interconnects, Audioquest Type 4 speaker cable, Monster Power Conditioner

Manufacturer Information

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