In the Lab

I measured the direct-field frequency response of each subwoofer in the optimal corner of my 7,500-cubic-foot room with its level control turned fully up and its crossover set for maximum bandwidth. The results are given under the sound-pressure level (SPL) graphs at right. In a smaller room, you can expect better extension by 2 to 3 Hz and 2 to 3 dB higher SPL.

Next I measured the peak SPL each sub could produce without its distortion going past 10%, using a ramped 6.5-cycle tone burst at ⅓-octave frequencies over the sub's bandwidth. The main microphone was placed at an optimal listening seat 2 meters away, and a distortion-sensing microphone was placed close to the speaker. The SPL scores were then averaged over the range of 25 to 62 Hz, where most of the bass in movie soundtracks resides (the rightmost bar in the graphs).

I also recorded the maximum SPL attainable at the lowest frequency the subwoofer can produce with low distortion. Better subs go lower in frequency, play louder with low distortion, and have a smoother power bandwidth — that is, they output the same SPL at any frequency in their range. Otherwise, a sub could get an unfair statistical advantage by having its average output measurement increased by an unusually high output at 50 or 62 Hz, with rapidly falling response at lower frequencies. That's why we include a number for *bandwidth uniformity*, which tells how smooth the sub's output is in the 25- to 62-Hz range (higher numbers are better). It's calculated by dividing the average SPL over the range by the maximum SPL. (These figures, too, are given below the graphs.)

For example, a sub with 100 dB average SPL that produces 104 dB at all frequencies from 32 to 62 Hz has a bandwidth uniformity of 96%, while one with the same average that peaks at 116 dB SPL at 62 Hz and quickly falls off below that has an 86% bandwidth uniformity. The latter subwoofer will tend to overemphasize frequencies higher in its bandwidth, causing the bass range to seem uneven or boomy. This can make it more difficult to integrate into your system.

Remember, you want a subwoofer that can go low, can play loud enough to reproduce recorded music and movie soundtracks accurately, and has a smooth response over its operating range. Subwoofer sound-quality differences are directly related to these three factors, especially the latter two.

I also checked the actual crossover points and slopes at the marked settings of the crossover-frequency controls — or at full, half, and minimum dial rotations when there were no interim markings. All ten subwoofers had crossover slopes that met specification. Indeed, the interaction with the output level as the crossover frequency was lowered was less in each case than I've encountered in the past. Nevertheless, whenever you adjust a sub's crossover frequency or level, you should adjust *both* controls for best results.

With the Canton AS 20 SC, organ-pipe resonances at 400 and 800 Hz were clearly audible. Its output peaked sharply at 62 Hz and fell quickly at lower frequencies, putting its bandwidth uniformity to a just-below-average 91%. There was no crossover/level interaction in the upper two-thirds of the crossover range and only a –4-dB reduction at the bottom end. The Canton had limited upper- and lower-frequency bandwidth.

While the markings on the crossover dial of the Atlantic Technology T70 PBM extended from 40 to 140 Hz, I measured the sub's true acoustic bandwidth to be 60 to 115 Hz. I found no interaction between the crossover and level controls except for 4.5 dB at the very bottom of the crossover control.

There was no crossover/level interaction for the PSB SubSonic 5i, even at the bottom end, but its upper bandwidth was only 113 Hz despite the 150-Hz crossover-dial marking. Moderate port noise was noticeable when the PSB was driven into overload.

The level control of the M&K V76 is unconventionally labeled as –6 to +9 dB, but it worked as advertised. What's more, there was no level/crossover interaction, and the acoustic crossover frequencies closely matched the marked values at the lower end of the dial and were 10 Hz lower than indicated at the 100- and 125-Hz marks. The biggest drawback in my book is the lack of an on/off switch, which means you'll probably want to unplug the subwoofer whenever you're going to be away for a while.

Velodyne's CHT-15 was capable of prodigious output over the full 25- to 62-Hz bandwidth — 108 dB SPL or more from 32 Hz upward — and it had above-average uniformity to boot. SPL testing caused glassware to ring in my adjacent kitchen. There was moderate level/crossover interaction (less than 2 dB), and the actual crossover frequency was often 30 Hz lower than indicated.

Although there was only 2 dB level/crossover interaction over the full range of JBL's S120PII when the crossover was set to 150 Hz, the true turnover frequency was only 100 Hz. The lower part of its range was close to the marked frequency.

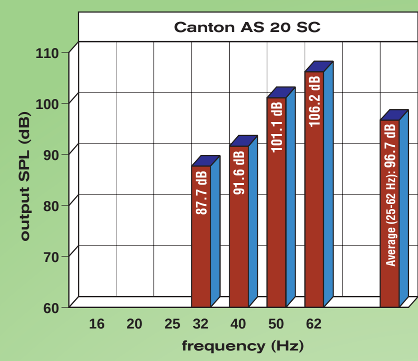
The operation of the equalizer for the Cambridge SoundWorks Newton Series P500 differed depending on the frequency setting. At 60 Hz, for example, there was +6- and –3-dB action centered at 50 Hz over a 30- to 75-Hz range. At the 40-Hz position, output increased below 40 Hz by +6 dB at the +6-dB marking, but moving the control below the 0 detent to –6 dB produced no change. At the 20-Hz setting, response below 30 Hz was increased or decreased by +4 to –2 dB over the ±6-dB range. The equalizer can be useful, but you'll need to experiment for the best results. Measurement instruments — specifically a sound-level meter — would be most helpful. The true acoustic bandwidth of the Cambridge sub varied only from 50 to 100 Hz over the full range of the low-pass filter, but there was only 2 dB of level/crossover interaction. Dynamic output fell rapidly at lower frequencies.

The crossover control of the Pinnacle Baby Boomer is marked from 50 to 150 Hz, but I measured the true acoustic bandwidth as 113 to 169 Hz. Its expanded upper bandwidth is particularly noteworthy. There was no level/crossover interaction.

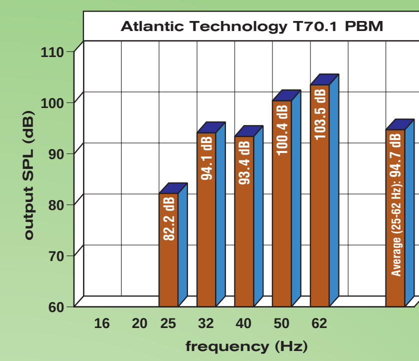
The B&W Model 675 had little cross-over/level interaction except at the lowest crossover settings (–6 dB at 45 Hz). At the upper end of the crossover dial, the actual turnover frequencies were often 30 Hz lower than marked, while the high-pass filter worked as advertised.

The prodigious 62-Hz output of the Bag End Infrasub-12 fell by 24 dB per octave at lower frequencies. Measurements acoustically verified the low- and high-pass 95-Hz crossover frequencies. There are no operating controls other than a level dial and phase switch.

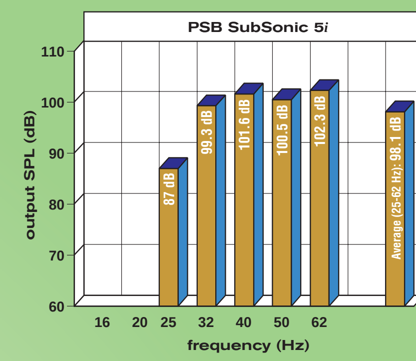
None of the subwoofers in this test showed any signs of damage during SPL testing, even when driven well into audible overload. I suspect that all of them will prove to be reliable in normal use. — *T.N.*



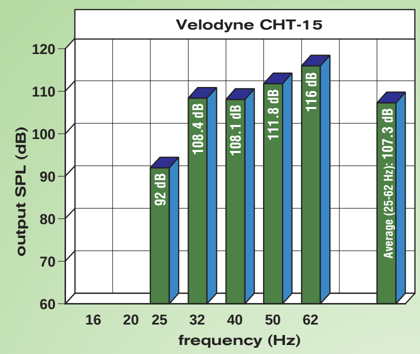
Frequency response . . . . . .60 to 106 Hz ±2.4 dB
Bandwidth uniformity 91%



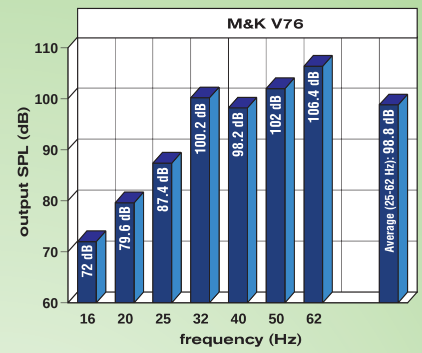
Frequency response . . . . . .42 to 115 Hz ±2.6 dB
Bandwidth uniformity 92%



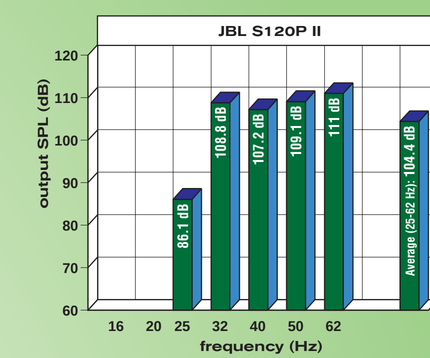
Frequency response . . . . . .dB 30 to 113 Hz ±3.5
Bandwidth uniformity 96%



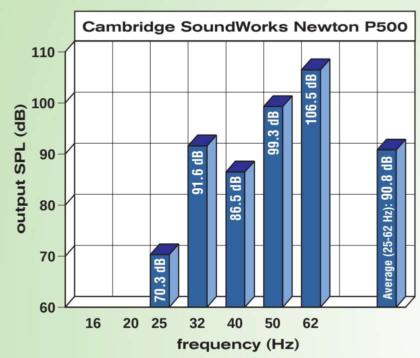
Frequency response . . . . . .30 to 101 Hz ±2.3 dB
Bandwidth uniformity 93%



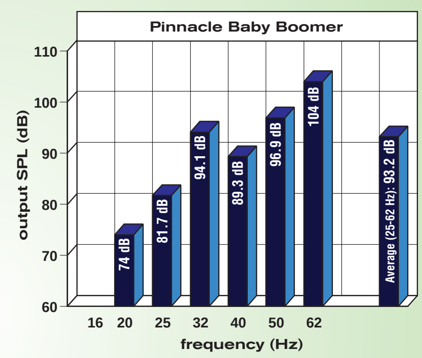
Frequency response . . . . .25 to 114 Hz ±3 dB
Bandwidth uniformity 93%



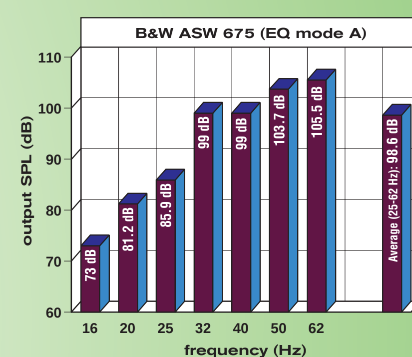
Frequency response . . . . . .41 to 100 Hz ±2.5 dB
Bandwidth uniformity 94%



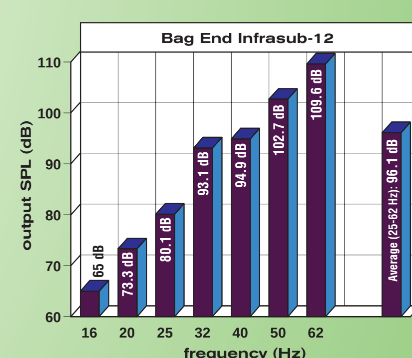
Frequency response . . . . . .24 to 101 Hz ±3.1 dB
Bandwidth uniformity 86%



Frequency response . . . . .27 to 169 Hz ±3 dB
Bandwidth uniformity 90%



Frequency response . . . . . .24 to 114 Hz ±3.3 dB
Bandwidth uniformity 94%



Frequency response . . . . .19 to 83 Hz ±3 dB
Bandwidth uniformity 88%