TEST BUY

OVER THE FIRST HALF OF the '90s, home theater—which can be defined as a big-screen TV buoyed by a dedicated surround-sound audio system—has washed over our shores like a tidal wave, leaving a string of satisfied couch jockeys in its wake. And though better speakers, bigger amplifiers, and, in some cases, surround-sound processors are being built into TV sets, even the finest onboard TV-audio package doesn't come close to equaling the performance of a modest surround-sound system. Surround-sound quality is key, of course, since trying to enjoy a movie without a well reproduced soundtrack is like sitting through a Broadway extravaganza with earmuffs strapped to your head: You'll get an eyeful, but you'll be missing half of the action.

Each piece in the surround-sound chain is important, of course, but the most popular—and, perhaps, most misunderstood—component is the subwoofer. A subwoofer is dedicated to reproducing only the lowest part of the audible spectrum; as such, it's a complement to the front left, center, right, and rear left and right speakers that make up a basic surround-sound system. The "misunderstood" part is that many people—including salespeople in big electronics-chain outlets—simply crank them up as loud as they can go, without any thought for musical accuracy or a natural sonic presentation.

A typical mid-'90s-vintage sub, particularly one destined for a home-theater system, should be used to reproduce frequencies down to about 25 Hz. Its upper limit—usually something between the THX-certified "cutoff" of 80 Hz and about 125 Hz—should be defined by the capabilities of the speakers with which it's matched. Use a subwoofer to produce frequencies above 125 Hz or so and it'll start to function as a woofer, calling attention to itself acoustically and destroying the realism of the experience. Overall output should be set so that this low bass adds authority to the rest of the audible spectrum—but doesn't drown it out.

Though it spans only a few octaves, a sub's intended frequency range is hugely important for home theater, because that's where you find most of a film's gut-wrenching low-level effects. We're talking explosions, train wrecks, thunder cracks, and *big* T-Rex foot-stomps—you know, the fun stuff. Simply put, a subwoofer adds the "oomph" to your home-theater system. In addition, it adds a much-needed foundation to music scores that include low frequencies—think *Phantom of the Opera* organ notes, bass drums, Charles Mingus' bass, and a host of other musical bottom-dwellers.

A subwoofer generally resembles a largish cube, though many models are taller than they are wide. Construction is generally of particleboard and wood veneer, though vinyl may be used on inexpensive models and true wood may be used on relatively expensive models.

Contrary to popular opinion, however, adding a subwoofer to your system can actually save space. Simple physics tells us that the size of the front left and right speakers used in a home theater (AKA the "main" speakers) is largely dictated by how much appreciable low bass their manufacturers want them to reproduce. Use a good subwoofer, and you can get by with significantly smaller main speakers—without sacrificing sound quality. In fact, taking this route should improve the overall frequency response of your system, since it's tough for mains to deliver appreciable amounts of truly low bass no matter how big they are. Freeing them of this responsibility enables the speaker designer to craft a speaker that can do an excellent job of reproducing frequencies that are well within its capabilities.

Some audiophiles and videophiles believe that using two well designed subwoofers represents the ideal solution in a full-blown home theater; others believe that an ideal system based on cutting-edge Dolby Surround AC-3 processing may employ four or more subwoofers ["Surrounded," October 1995]. On the other hand, my research shows that a single sub run in mono is *always* preferable, since multiple subs can introduce acoustic anomalies.

Because a lot of power is required to reproduce low frequencies, most subs are equipped with their own built-in power amplifiers. Built-in amplification enables you to add a powered sub to virtually any system without overtaxing your A/V receiver or preamp/processor/amplifier combo, which really has enough to do as it is.

In most cases, the best way to wire a powered sub into a system is to use a standard RCA cable to link the line-level RCA output jack marked SUBWOOFER, MONO, or PRE-OUT on the back of an A/V receiver or preamp/processor with the sub's back-panel RCA input. If the A/V component lacks these outputs but the sub offers speaker terminals, the sub can still be connected via the A/V component's main left/right speaker terminals: Common speaker wire runs from these terminals to the sub's input speaker terminals, and additional wire runs from the sub's output speaker terminals to the system's main left/right speakers.

Once a sub has been connected to a system, it needs to placed in the room and adjusted so that its output blends in naturally with the rest of the system. I've taken literally hundreds of in-room measurements and performed a series of controlled listening tests of a few dozen subwoofers, and my data reveals that the best way to use virtually any sub in virtually any room is to place it in a corner. The result usually is the smoothest possible response at lower frequencies. Since the low frequencies that are a sub's domain are basically omnidirectional, you can place a sub in any corner—even in one that's behind you—without upsetting the sonic image produced by your main and surround speakers.

My research also shows that the sub's "low-pass filter" should be set at some point below 100 Hz for best performance. The low-pass filter "tells" the sub at which frequency to begin repro-

ducing sound. If you set a sub's crossover to 80 Hz, for example, it will reproduce only those frequencies that fall below 81 Hz. Most subs provide a knob for "continuous" adjustment of the low-pass filter point.

The low-pass "cutoff" point you select should be inextricably linked with the low-bass capabilities of your system's main speakers. Generally, you want the sub to begin producing low bass at the point where your mains stop producing it. Every speaker has a natural low-bass "rolloff" point, but many subs let you bypass the drill of discovering that point for your mains by offering a "high-pass" filter; you may get one or two high-pass cutoff choices, or the sub may offer a fixed cutoff.

If the sub has an 80-Hz high-pass filter (and you use it), for example, you should set the low-pass filter to 80 Hz; in this setup, the mains produce everything above that point and the sub produces everything below it. Using identical cutoffs for both filters is generally advisable, since muddy or bloated sound can result when the mains and sub "double up" on the task of reproducing bass. And since, as mentioned, a lot of power (relatively) is required to reproduce low bass, using a high-pass filter introduces a bonus: Because you'll be asking the mains to produce less low bass, all of the power that your system devotes to them will be used to help them do a better job of reproducing higher-frequency sounds.

Most subs also offer a phase control in the form of either a knob that offers continuous adjustment from 0 to 180 degrees or a two-position switch with 0- and 180-degree settings. Explaining the subject of phase would require an entire article, so suffice it to say that the best course is to simply use the switch or knob setting that produces the most bass while *all* of the speakers in the system are playing (interactions between a sub and the other speakers are what cause phase problems).

The last key adjustment to make is the sub's level. As mentioned, you don't want the sub to drown out all of the other sounds. You want it to growl and rumble and boom appropriately with scenes that include raucous special effects, but it should contribute subtly to scenes that are calmer. Since most people don't have real-world points of reference for the explosions and car wrecks that make up so many movie special effects, it's easiest to set a sub's level using a well-recorded music CD with which you're familiar. Just adjust the knob until the bass sounds full, deep, and rich—again, without overpowering everything else.

Comparing subwoofers prior to making a purchase can be tricky, since the tight frequency range in which they work means that the only differences that *may* be audible between comparable models are ultimate "low-end extension" (how low the sub plays, denoted in hertz, or Hz) and peak output level (how loud the sub plays, denoted in decibels, or dB, of sound-pressure level, or SPL). The lower in frequency a subwoofer can go, and the louder it can play at the lowest frequencies (without unacceptable distortion), the more potential the sub has to deliver every last bit of bass in your favorite movies (and music CDs).

Note, however, that movie soundtracks, like most CDs, have virtually no sonic content below 25 Hz. This makes a sub's ability to play below that point somewhat irrelevant in the real world—unless you harbor fanatical audiophile intentions. This means that smooth response down to 25 Hz is all you really need. In terms of output, 105 dB SPL is plenty in an average-size living room.

TO GET A FEEL FOR THE CREAM OF THE current powered-subwoofer crop, we put 11 models through their paces. Manufacturers who accepted our invitation to participate in this comparison were allowed to submit any model they chose, with one stipulation: The sub's suggested retail price had to be between $750 and $1,000. We picked this range because we know from experience that it provides an excellent balance of performance and value.

Most of the subs in this price range are capable of meeting the basic requirements of a home-theater system, which, as mentioned, is 25-Hz extension and 105-dB output. The contestants include (in alphabetical order): Allison's NL-5400P ($880), Altec Lansing's PSW10 ($850), Cerwin–Vega's HT-12PWR ($900), Hsu Research's HRSW12V ($850), KEF's Model 30B AV ($750), Klipsch's SW12 Series II ($1,000), M&K's MX-125 ($995), Phase Technology's Octave 1.0 ($950), PSB's Subsonic III ($899), Triad's InRoom Silver ($1,000), and Velodyne's VA-1215X ($999).

Each model is an extremely sophisticated piece of engineering, employing a dedicated amplifier, filtering, and equalization to deliver loud, high-quality bass with plenty of setup flexibility—all from a relatively compact package. Most of the subs use one 10- or 12-inch driver mounted in a sealed or ported cabinet that consumes approximately 2.5 square feet of floor space. They play loudly enough—well over 100 dB SPL from 30 to 50 Hz—to realistically reproduce one of my benchmark laserdiscs (the "gate-crash" sequence from *Terminator 2*), and they're musical enough to make audiophiles reach for the Kleenex. Their features and setup flexibility make it a snap to mate them with virtually all existing home-theater gear.

Our contestants come in two basic varieties: First, we have the bigger, tougher, kick-out-the-jams variety exemplified by models from Allison, Cerwin–Vega, Hsu, Klipsch, M&K, Phase Tech, and Velodyne. These models feature 100- to 250-watt amplifiers and one or more 12- or 15-inch woofers. The other category, which includes Altec Lansing, KEF, PSB, and Triad, feature smaller cabinets with more modest output. The unifying factor: All of these subs boast high-tech engineering features.

TEST PROCEDURES

I measured all of the subwoofers in the "best corner" of my 22 x 12-foot listening room, with "best" equating to optimal subwoofer performance as depicted by a response map of the entire room. Measurements were taken with a MLSSA analyzer, and included frequency response (with a sub's variable crossover set for both maximum and minimum bandwidth) and maximum output at the primary listening position (from 10 to 80 Hz with a limit of 10 percent THD). For the max-output measurements, I used Audio Control's 3050a real-time analyzer and a B&K SPL meter, set the MLSSA to its SCOPE mode, and played a CD-R containing a special tone-burst signal developed by audio mainstay Don Keele.

The performance chart on page 47 lists two measurements each for frequency response and SPL: For frequency response, you'll see "F3," the frequency where each sub's output falls 3 dB below its average output level (AKA

the "half-power" point) from its lower extreme to 80 Hz, and "F10-percent," which indicates the lowest frequency at which each sub was able to produce audible output with a limit of 10 percent total harmonic distortion. For SPL, I've noted maximum and average SPL from each sub's low-frequency extreme to 50 Hz, both with no more than 10 percent distortion. In ranking the subs, I also factored in each model's ability to play smoothly right up to the point where distortion became unacceptable.

After running the numbers, I listened to each sub, mating it with a pair of high-quality two-way monitors configured as a stereo pair; in all cases (except for the Hsu, which had a 91-Hz cutoff), the low-pass filter was dialed to 80 Hz. While listening, I found that there were no significant differences in sound quality with ordinary rock or popular music—though there was with acoustic jazz and classical music. The subs that "went lower" consistently delivered more satisfying deep bass, and those that got the loudest belted out more involving and more breathtaking special effects when I spun some movies in my laserdisc player. The ones that went lowest *and* got loudest were my favorites overall. Commentary on individual models, which are listed in ascending order of preference based on sheer performance, follows.

KEF MODEL 30B AV

The stylish 30B AV ($750) is the slimmest and trimmest sub in the group. Its smallish sealed cabinet houses a 12-inch driver. Along with the Hsu HRSW12V and Velodyne VA-1215X, it's the only model with a shielded cabinet. The click-stop volume and crossover controls make the 30B AV very easy to use; they have good sensitivity in the right places and are easy to return precisely to a previous setting.

The small cabinet limits bass performance, however. It extends down to 31.5 Hz with 10 percent distortion; the half-power point was a good 29 Hz. Maximum output was only 95.8 dB SPL, and average output measured 93.5 dB SPL over its 31.5 to 50-Hz range.

ALTEC LANSING PSW10

The 10-inch woofer in the PSW10 ($850) is housed in a sealed cabinet, which has a nice sense of style. There are some sophisticated electronics onboard, including an automatic loudness circuit that maintains realistic bass levels at low volume settings. All of its controls are on the front panel, simplifying their adjustment. And though no high-pass filtering is provided, the PSW10, along with the Velodyne VA-1215X, is the only sub that offers a choice of slopes for its low-pass crossover.

This sub had a fine half-power point of 25 Hz, but it only delivered bass down to 31.5 Hz before our 10-percent-distortion ceiling was breached. Output was limited for this group, averaging only 95.5 dB from 25 to 50 Hz with a peak output of 95.8 dB.

ALLISON NL-5400P

Finished in black lacquer, the largish NL-5400P ($880) resembles a safe without a door. The thick, tough rubber feet provide stability and simplify the process of moving the sub. The NL-5400P's single 12-inch woofer fires down from the bottom of the sealed cabinet; high-pass filtering is fixed. The bottom of the cabinet also includes a pair of dual banana jacks for daisy-chaining a second NL-5400P.

Performance was excellent in the bass-extension department, showing a half-power point of 25 Hz with low distortion. Maximum output was still on the low side at 99.4 dB, and average output was only 96.4 dB over the critical 25 to 50-Hz band—not enough to turn heads in this company. Frankly, I expected more output given the cabinet's size and the rating of the integral amplifier, which, at 300 watts, was the highest in this group.

TRIAD INROOM SILVER

Triad's handsome InRoom Silver ($1,000) uses a pair of 8-inch woofers and a sealed cabinet; two 8-inchers have roughly the same piston area as a single 12-inch woofer. The Triad doesn't offer a high-pass filter.

The Silver delivered 25 Hz with less than 10 percent distortion; the measured half-power point was 27 Hz. Output was relatively low for this group, averaging 100.2 dB over the 25 to 50-Hz range. Maximum SPL was a reasonably robust 102.2 dB, however—thanks, perhaps, to the inclusion of a 250-watt-rated amp.

Triad clearly intends to seduce subwoofer shoppers who want good all-around performance, but also demand killer looks. The InRoom Silver really is stylish, with a small footprint, a neat wraparound-type grille, and a sweet marble top.

KLIPSCH SW12 SERIES II

The SW12 Series II ($1,000) pairs a down-firing 12-inch passive radiator and a front-firing 12-inch woofer in a ported cabinet. Input and output connectors are located, as usual, on the lower edge of the rear panel, but the volume, phase, and crossover controls are conveniently situated behind the grille on the front panel. Along with PSB's Subsonic III, the SW12 Series II is the only sub in the group without an auto-on function. The slope of the low-pass filter starts at 12 dB per octave, but sharpens to 24 dB per octave above 120 Hz; a nice touch is that two high-pass cutoffs are provided.

Measurements revealed a half-power point of 24 Hz, but the sub only hit 31.5 Hz with our 10-percent-distortion reference point. And though the passive radiator produced some distortion at the sub's output peak, output was very good—104.6 dB from 32 to 50 Hz, with a max of 106.5 dB.

PSB SUBSONIC III

The Subsonic III ($899) has a smart look, with a black-lacquer top. It also has a smart design, basically matching the smallest subs in this group for size but giving the biggest ones a run for their money in terms of performance. It uses a 12-inch woofer and a ported cabinet. The lack of an auto-on function, and the presence of line-level outputs only for the fixed high-pass filter, are feature-related concessions; you do get full low-pass options, however.

The half-power point measured 27 Hz, and the Subsonic III produced 25 Hz without breaking our 10-percent-distortion ceiling. Output was relatively mild, however—100.1 dB average from 25 to 50 Hz, and 104.3 dB max. Smart looks and deep extension make this sub a natural for those who don't need—or can't enjoy—big-bore output.

CERWIN-VEGA HT-12PWR

The HT-12PWR ($900) is an unassuming package, loading a 12-inch woofer into a plain, ported black box. There's no high-pass filtering, but the C–V does come with a handy remote control that lets you change the sub's level from the couch; this is especially convenient when you're watching TV, since low-bass content varies a great deal from show to show and channel to channel. The integral 150-watt amplifier features a protective filter, and the sub's level control is situated in the top-left corner of its front panel.

Like most C–V speakers, the HT-12PWR kicks out a big sound. The low end extended down to 25 Hz with less than 10 percent distortion, and output peaked at a rib-rocking 108.4 dB. The average output—105.9 dB SPL over the 25 to 50-Hz range—was also very good. Bottom line: Only two subs went lower, and only one got louder.

M&K MX-125

As is true with Velodyne, the folks at M&K are old hands at subwoofer design. And the MX-125's performance proves that experience counts. This largish sub employs a pair of 12-inch woofers and a sealed enclosure; equalization is generously used to tailor the output to suit M&K's idea of accurate subwoofer performance. One sub fires forward, the other into the cabinet from its bottom-mount position. This orientation requires the use of supplied steel spikes to keep some distance between the second sub and the floor; the spikes can be capped with the supplied rubber cups in uncarpeted rooms. There's no power switch, so once you've plugged in the MX-125 ($995), it stays powered continuously.

Only Hsu's HRSW12V got lower than the MX-125, and the M&K did very well in terms of max output. These results reflect the company's traditional design goals—quality over quantity. Bass extended down to 24 Hz. Average output with 10 percent distortion was a modest 101.8 dB, but output peaked at 105.3 dB; a response bump centered at 100 Hz largely disappeared when I used M&K's recommended low-pass cutoff of 75 Hz. Because the MX-125 has low-distortion output to 25 Hz and the shape of its response curve tilts to the lower end of the spectrum, it sounds even better than it measures. An all-around stellar job.

PHASE TECHNOLOGY OCTAVE 1.0

The Octave 1.0 ($950) is *beautiful*; the mahogany top adds a real touch of class. It's the only sub in this group to employ a 15-inch woofer, and the largish cabinet is sealed. Like the Altec Lansing and Hsu, the Octave 1.0 provides limited low-pass filter choices; as with the Klipsch and the Velodyne, however, you get multiple high-pass filter choices.

The Octave 1.0 was an all-out excellent performer. Its integral 240-watt amplifier helped the Octave 1.0 crunch out 25 Hz at our 10-percent-distortion limit. Maximum output was a big-time 106 dB, and the sub averaged 103.3 SPL from 25 to 50 Hz. Don't think its excellent styling hides a mouse: This is a very serious subwoofer.

VELODYNE VA-1215X

As mentioned, Velodyne has been in the subwoofer business for a long time, and this sub's topnotch performance proves that the company has this act down. The VA-1215X ($999) features a 12-inch woofer, a 15-inch passive radiator, and a shielded ported cabinet. Two high-pass filter choices are offered, there's a full range of low-pass cutoffs with an adjustable slope, and you get a detachable power cord. The back panel features a two-position switch marked VIDEO/MUSIC.

The VA-1215X was a flat-out excellent performer. Bass extended down to a solid 25 Hz with less than 10 percent distortion, and its half-power point was 26 Hz. Maximum output measured a truly bold 108.5 dB, and output averaged a very respectable 102.6 dB from 25 to 50 Hz.

The sub's response curve didn't change when I switched the VIDEO/MUSIC control back and forth, though setting it to VIDEO does increase output level by about 3 dB. While this is a convenient way to add punch to movies, you can accomplish the same thing by turning up the gain control. In any case, the VA-1215X is a monster performer.

HSU HRSW12V

The HRSW12V ($850) is available only through mail-order, and comes with a 30-day money-back guarantee. It isn't a looker, though, and it should stay in the locker room until the swimsuit competition is over. The tubular, shielded ported cabinet houses a 12-inch woofer; uniquely for this group (though not for the product category), the amplifier is housed in a separate enclosure, which measures 7.4 x 9.75 x 6.5 inches (h/w/d) and attaches to the sub via a speaker cable (not supplied). The amplifier offers level and phase controls as well as screw-type speaker terminals. The Hsu is also unique in that its filters are set by plug-in modules. Our test sample came with two 91-Hz modules with slopes of 24 dB per octave; other modules are available from the manufacturer for $15 apiece.

The HRSW12V was unrivaled in this group in terms of performance. Bass extended down to 19 Hz at its half-power point. At 10 percent distortion, it extended down to 25 Hz and crunched out a league-leading 110.1 dB SPL; average SPL was 106.5 dB over the 25 to 50-Hz range. Plain and simple, the HR-SW12V has the look of a barrel and can be tough to position in a real-world living room, and its wired amplifier can be tough to live with, too. But it goes the lowest and plays the loudest here, and it earns top honors in terms of sheer performance.

WHETHER YOUR PREFERENCE IS PERFORMance, style, or some combination of the two, there's a sub here to meet your needs. Note that the top five subs were incredibly close in terms of overall performance, meeting our requirements for a modern powered subwoofer that's destined to serve honorably in a high-quality home-theater system: 25-Hz extension with about 105 dB of maximum output.

If deep bass and plenty of output are your only priorities, the **Hsu** HR-SW12V, **Velodyne** VA-1215X, **Phase Technology** Octave 1.0, and **M&K** MX-125 are the clear winners in this company. If the absence of a high-pass filter doesn't present system-integration problems, the **Cerwin–Vega** HT-12PWR fits nicely into the mix; it's actually the number-two performer when measurements are the only factor.

If your sub has to look as good as it sounds, know that the **Triad** InRoom Silver, **PSB** Subsonic III, and Phase Tech are the supermodels in this group. While each has similar (and very fine) low-end extension, recall that the Phase Tech kicks out about 2 dB more output than the PSB and about 4 dB more than the Triad. If you don't have a lot of space for a powered subwoofer, but still demand good all-around performance, the relatively small PSB and Triad score again.

As is true with any purchase, the best way to find the sub that's right for you is to audition every model that catches your attention. The place to do this is at a specialty A/V dealership—specialty dealers are the only ones who'll be able to give you demos that are fair and thorough. Keep in mind that it's very tough to hear the difference between, say, 27 and 25 Hz, though 3-dB differences in output are appreciable. And don't forget to factor in the ease or difficulty with which any particular model will integrate with *your* system—if you can't use it properly, it really doesn't matter how good it sounds. ■

POWERED SUBWOOFERS

Measurements by Tom Nousaine

Make, Model Phone	Price[1]	Size[2]; Weight	Finish	Driver[3]	Type	Shielded	Amp Power[4]	Auto-On	Crossovers[5]	Phase Control	Connections	SPL[6]	Extension[7]
Hsu Research HRSW12V 800.554.0150	$850	23 x 22;[8] 69 lbs.	Black knit or oak wrap with zolatone top	12"	Ported	●	150	●[11]	91 (24);[12] 91 (24)	SW	Sub: L, S HP: L	110 dB; 106.5 dB	19 Hz; 25 Hz
Velodyne VA-1215X 408.436.7270	$999	19 x 18 x 20; 67 lbs.	Black vinyl with marble feet	12"	Ported[9]	●	250	●	40–120 (6–24); 80,100 (6)	K	Sub: L, S HP: L, S	108.5 dB; 102.6 dB	26 Hz; 25 Hz
Phase Technology Octave 1.0 904.777.0700	$950	20.8 x 18 x 18; 79 lbs.	Black laminate with mahogany top	15"	Sealed	O	240	●	60, 80, 100 (24); 60, 80, 100 (24)	SW	Sub: L, S HP: L	106 dB; 103.3 dB	25 Hz; 25 Hz
M&K MX-125 310.204.2854	$995	25 x 15.3 x 17.6; 70 lbs.	Black or oak veneer	(2) 12"	Sealed	O	125	●[11]	50–125 (36); 100 (6)	SW	Sub: L, S HP: L, S	105.3 dB; 101.8 dB	24 Hz; 25 Hz
Cerwin-Vega HT-12PWR 805.584.9332	$900	23.5 x 15 x 18.8; 72 lbs.	Black-ash vinyl	12"	Ported	O	150	●	45–150 (12); —	SW	Sub: L, S —	108.4 dB; 105.9 dB	25 Hz; 25 Hz
PSB Subsonic III 905.831.6333	$899	17.5 x 16 x 16; 56 lbs.	Black vinyl with lacquer top	12"	Ported	O	180	O	50–150 (24); 80 (18)	SW	Sub: L, S HP: L	104.3 dB; 100.1 dB	27 Hz; 25 Hz
Klipsch SW12 Series II 800.554.7724	$1,000	23.5 x 15.6 x 16.5; 60 lbs.	Oak, cherry, or walnut veneer	12"	Ported[10]	O	150	O	40–120 (24); 80, 120 (6)	K	Sub: L, S HP: L,S	106.5 dB; 104.6 dB	24 Hz; 31.5 Hz
Triad InRoom Silver 503.256.2600	$1,000	15.3 x 13.5 x 13; 65 lbs.	Black vinyl with marble top	(2) 8"	Sealed	O	250	●	50–180 (6); —	K	Sub: L, S —	102.2 dB; 100.2 dB	27 Hz 25 Hz
Allison NL-5400P 606.236.8298	$880	21 x 19 x 19; 70 lbs.	Black lacquer	12"	Sealed	O	300	●	40–180 (12); 60 (12)	SW	Sub: L, S HP: S	99.4 dB; 96.4 dB	25 Hz 25 Hz
Altec Lansing PSW10 717.296.4434	$850	17.4 x 17.4 x 17.4; 27 lbs.	Walnut or black veneer	10"	Sealed	O	100	●	50, 80, 100, 150 (18, 24); —	SW	Sub: L, S —	95.8 dB; 95.5 dB	25 Hz; 31.5 Hz
KEF Model 30B AV 508.429.3600	$750	15.2 x 14.6 x 16.8; 30 lbs.	Gray veneer	12"	Sealed	●	100	●	80–150 (12); 150 (12)	SW	Sub: L, S HP: L, S	95.8 dB; 93.5 dB	29 Hz; 31.5 Hz

KEY: ● Yes O No HP = High-pass K = Knob L = Line-level S = Speaker level SW = Switch

NOTES: 1. Suggested retail. 2. Height x width x depth, in inches. 3. Cone diameter, in inches; (2) denotes presence of two drivers. 4. As rated by the manufacturer. 5. Manufacturer's rating of low-pass range or options, in Hz (slope, in dB per octave); manufacturer's rating of high-pass cutoff or options, in Hz (slope, in dB per octave). A dash indicates that high-pass filtering is not offered. 6. Measured maximum sound-pressure level before the onset of audible distortion; measured average sound-pressure level before the onset of audible distortion. 7. Measured maximum low-frequency extension at half power; measured maximum low-frequency extension with less than 10 percent distortion. 8. Diameter x height. 9. Port sealed by a 15-inch-diameter passive radiator. 10. Port sealed by a 12-inch-diameter passive radiator. 11. As long as it's plugged in, the subwoofer is always powered. 12. Optional crossover modules are available.

HSU RESEARCH HRSW12V

SUBWOOFER

Robert Deutsch

Hsu Research may not be as well known as Velodyne or M&K, but this small California company (originally called Definitive Research, a name deemed too similar to Definitive Technology) has established an enviable reputation among subwoofer cognoscenti looking for a bargain.

How do they keep the prices down? First, Hsu Research subwoofers are sold factory-direct, thus saving retailer/distributor markups. Then, there's some clever, cost-saving engineering in the design of the enclosure, a cylinder made of recycled paper. It may not be high-tech, but it's cheap, light, good for the environment, and the cylindrical shape provides for excellent rigidity while the non-parallel walls prevent standing waves within the enclosure. The cylinder is covered with black cloth on the sides; the review unit had the standard speckled gray "Zolatone" top, which gave a no-nonsense, utilitarian impression. (Oak or walnut is available for an extra $75.)

The HRSW12V uses a single long-throw 12" driver in a down-firing (slot-loaded) vented configuration, the vent flared to smooth the air flow. Three spiked feet elevate the HRSW12V 2" from the floor. (With a slot-loaded design, the speaker must be elevated, or else the poor woofer will be banging against the floor.)

SEPARATE POWER AMP

The Hsu Research HRSW12V is a powered subwoofer, but unlike the Velodyne and M&K units reviewed in this group, the power amplifier and associated crossover are in a separate box rather than built-in. Although this has the advantage of removing the electronics from a vibration-laden environment, you'll need an additional length of speaker cable to connect the sub to the amplifier. The binding posts are at the bottom of the subwoofer, which makes connecting thick speaker cables difficult—the AudioQuest Midnight I was using kept coming loose whenever I moved the speaker. Another advantage of having the amplifier separate is that if it requires repair, you don't have to return the entire speaker. My first sample of the amplifier/crossover had an unacceptably high noise level. The second sample was dead quiet.