

OEM Systems ICBM Subwoofer System Reviewed

by Brent Butterworth

“ I was shocked and thrilled to hear how the ICBM system energized the whole room... The bass and the room seemed to be one. ”

– Brent Butterworth - HomeTheatreReview.com

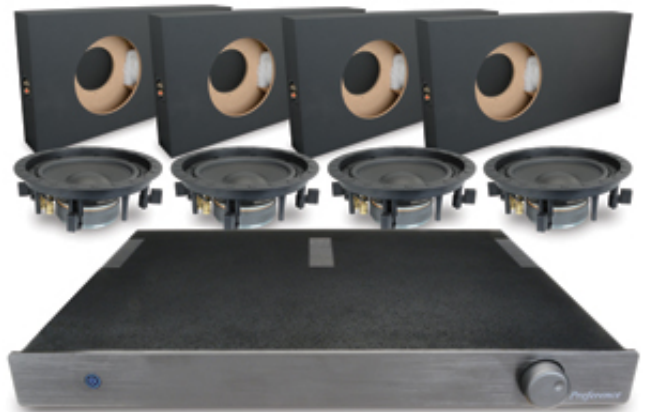
The OEM Systems ICBM (Integrated Custom Bass Management) System might be the first subwoofer system to make it easy for average listening rooms to get great bass in every seat. Although it's a new system, first demoed at CES 2016, the ICBM's genesis dates back to the 2002 Audio Engineering Society convention.

The 2002 AES saw a true revolution in sound--or, at least, what should have been a revolution in sound. Previously, audio experts had been setting up subwoofers using a variety of methods and configurations, with adopters of various practices all proclaiming the correctness of their methods. In a paper authored and presented by Harman International researcher Todd Welti, titled "Subwoofers: Optimal Number and Locations," we finally learned how to do subwoofers right. Welti's paper proved that using four subwoofers, either with one in the center of each wall or one in each corner, delivered the flattest bass response across a large listening area.

This technique nearly eliminated the big problem with using a single subwoofer: if you optimize the bass for one seat, the bass won't be as smooth in the other seats. Some seats might see near-complete dropouts at certain bass frequencies. That's not a problem if you're the only one listening; however, if you're listening with family and/or friends, using a single subwoofer can't deliver a good experience for everyone.

The downside is that the method outlined in Welti's paper requires four subwoofers, which take up a lot of space and can be complicated to hook up and calibrate. Thus, manufacturers haven't done much to capitalize on Harman's findings. Harman released an automatic four-surround processor called the BassQ, but soon discontinued it. That's why I was enthusiastic when I heard a demo of the ICBM at CES. It's an attempt by an audio company to make using four subwoofers practical.

The \$2,700 ICBM system combines four SE-80SWf eight-inch in-ceiling/in-wall subwoofers, four ENC-816LP in-wall enclosures, and one P-500XB subwoofer amplifier. You can also get a package with the same amp and just two subs for \$1,600, and you can buy the package without the enclosures (\$1,700 for four subs, \$1,100 for two), which might get you



ICBM Subwoofer System

somewhat deeper bass response (depending on your wall/ceiling configuration) at the expense of more drywall vibration and more leakage of bass into adjacent rooms.

This system makes the four-subwoofer configuration more practical primarily because of the slimness of the subs. Each one is just four inches thick with the driver and grille installed, making it practical not only to mount them in-wall, but also to simply slide them under or behind couches and other furniture. A dealer who stopped by my house to hear the system told me that the design's stealth is especially important. "We have very few jobs where we could install four subwoofers out on the floor," he said.

The system has two unusual and important features. First is the SE-80SWf itself, which uses a slimmed-down eight-inch, four-ohm driver that OEM Systems engineer Oliver Lieder told me is custom-designed for this sub. "The only stock component in it is the spider," he told me. (The spider is the part--usually a pleated yellow fabric--that connects the voice coil to the frame.)

Second is the P-500Xb, a Class D amplifier designed specifically to drive multiple subwoofers. It's a stereo amp rated at 90 watts per channel into eight ohms, and up to 500 watts RMS (700 watts peak) when bridged for mono into four ohms. It includes several subwoofer-friendly features, including a defeatable crossover that can be set for any frequency between 40 and 160 Hz; a subsonic filter adjustable from 10 to 50 Hz; a boost filter centered at 30 Hz and adjustable from flat to +9 dB; and a power range control for the internal limiter that adjusts the limiter's attenuation from 0 to -9 dB. It also offers the usual phase and level controls.

What the system doesn't offer is the ability to adjust the volume and EQ of each sub separately, which is recommended in the Harman paper. It occurred to me that you could connect two subs in series to each amp channel so that you could at least adjust volume and EQ in pairs, but this would require adding a couple of subwoofer EQ/control boxes and wouldn't give you the maximum output from the amplifier. At any rate, making all the subs independently adjustable would have greatly increased the cost of the system.

The Hookup

Lieder stopped by to show me the features of the P-500Xb and help with the setup. Not wanting to cut holes in my walls, I simply laid each sub on the floor in a different corner of the room, which yielded performance similar to what I'd have gotten by mounting the subs in the walls. We ran long in-wall speaker cables from the subs to the P-500Xb. To get the most out of the amp, Lieder put it in bridged mono mode, connected the two pairs of subs in series, then connected the pairs in parallel, giving a combined impedance of four ohms and allowing the amp to deliver all of its maximum rated 500 watts.

For Lieder's visit, we set up a 2.1-channel system using a Classé Audio CP-800 preamp and CA-2300 amplifier driving Revel Performa3 F206 tower speakers, using Wireworld Eclipse 7 interconnects and Mini Eclipse 7 speaker cables. Later, I switched to a 5.1 system using a Denon AVR-2809Ci AV receiver, an AudioControl Savoy seven-channel amp, and Sunfire CRM satellite speakers. With the Revels, I set the crossover point in the CP-800 to 80 Hz. With the tiny Sunfires, I set the AVR-2809Ci's crossover to 100 Hz.

Lieder showed me how the controls on the P-500Xb work and set them himself, but I almost immediately had to reset everything so that I could run measurements on the system. When I set it back up, I settled on a +3dB boost at 30 Hz, a subsonic filter setting at 20 Hz (because I intended to play ultra-low-frequency test material very loud and didn't want to damage the drivers), and a power range of zero to bypass the limiter. (Considering the CEA-2010 output figures I measured from the system, I thought it unlikely that the drivers really need a limiter--not for my short-term testing, anyway.)

Performance

When hearing Lieder's setup and the setup I did myself after the measurements, I was thrilled to hear how effortlessly the ICBM system blended with the Revels (and later with the Sunfires) with next to no effort from either of us. I think this occurred for a few reasons. First, I've found that subs with smaller eight- or 10-inch drivers seem to blend more readily with the main speakers when an 80-Hz or 100-Hz crossover point is used. (That's assuming we're talking about a fairly conventional, low-

mass driver, not the high-mass, ultra-beefed-up small drivers found in typical mini-sub.) Second, the more even frequency and phase response of the four subs reduces that sense of boominess that makes the sub sound different than the main speakers and helps your ear tell there are subwoofers in the system. Third, with a subwoofer in each corner, the bass becomes impossible to localize, even if you're using a relatively high crossover frequency.

I expected the ICBM system would be more of a home-theater-oriented product, but its benefits for music reproduction are, to me, more impressive and important. I loved the evenness with which it reproduced the upright bass on my favorite jazz recordings. Singer Cécile McLorin Salvant's irresistible version of "Wives and Lovers" is packed with precisely played rhythmic accents from bassist Paul Sikivie. While a typical single-subwoofer setup would likely have made some notes in his bassline boom, the ICBM's four subs kept all the notes smooth and precise, which is especially important in a performance like this where timing is everything. In my listening chair, which I placed in a position where the bass tends to sound smoother in my room, the response sounded close to perfect. It wasn't as good in my room's "sour spot"--a place about six feet behind and four feet to the left of my listening chair where visitors often like to sit but where the bass usually sounds grossly uneven. Still, even in that compromised position, the response was about as flat as I'd get from a carefully set-up single subwoofer in my listening chair.

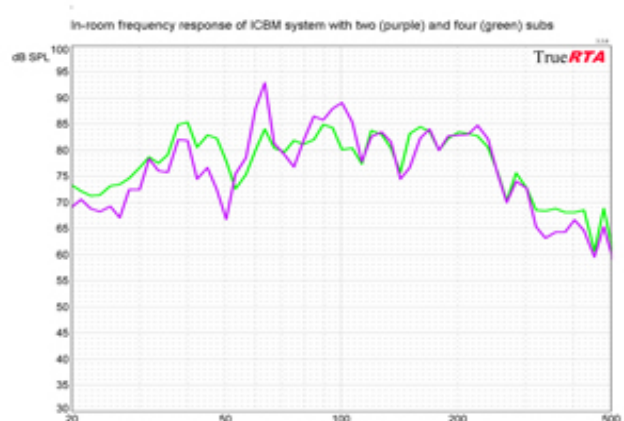
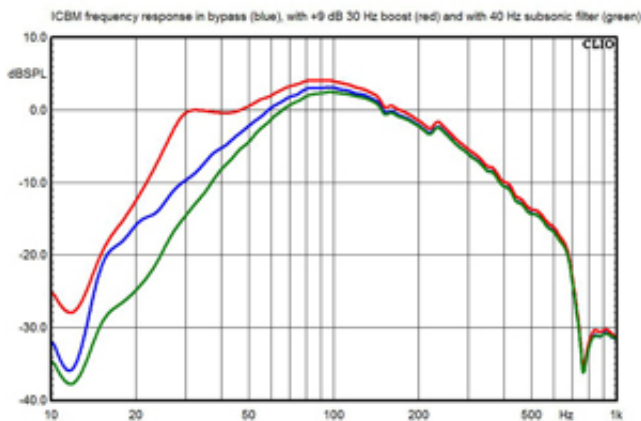
I loved the way the ICBM system allowed the lowest frequencies of the upright bass on Holly Cole's version of "Goodtime Charlie's Got the Blues" to blend perfectly with the upper notes, so the result sounded like a miked acoustic bass rather than a bass with a piezoelectric pickup. All the bottom-octave power of the bass was there, but not hyped--just the way a real bass sounds when you're a few feet from it.

When I put on Deadmau5's "A City in Florida," which like most EDM relies largely on a single, throbbing deep bass note, I was shocked and thrilled to hear how the ICBM system energized the whole room, making it feel like I was in a club with speakers surrounding a dance floor. The bass and the room seemed to be one, and I didn't get any sense that I was hearing a subwoofer. The system showed no sign of strain on this tune, even though my system was playing loud enough that it would have drowned out the noise of a pretty large dance party.

The system also did a great job with most movies. Despite the eight-inch subs' small drivers, they had no problem keeping up with the action in Spectre, the latest Bond film. As in most Bond films, Spectre includes plenty of crashes and explosions, and the ICBM system portrayed them at my usual high listening level with no audible distortion. As with the Deadmau5 tune, the system seemed to couple perfectly with my room when the movie's music swelled, particularly during some intense 40-Hz pulses in some of the action scenes.

Measurements

Here are the measurements for the OEM Systems ICBM System. *(Click on each chart to view it in a larger window.)*



Frequency response:
±3.0 dB from 46 to 216 Hz

Crossover low-pass roll-off:

-15 dB/octave

Maximum output (two subs):

	CEA-2010A (1M peak)	Traditional (2M RMS)
40-63 Hz avg	113.0 dB	104.0 dB
63 Hz	116.8 dB L	107.8 dB L
50 Hz	113.2 dB L	104.2 dB L
40 Hz	105.7 dB	96.7 dB
20-31.5 Hz avg	96.5 dB	87.5 dB
31.5 Hz	100.6 dB	91.6 dB
25 Hz	94.8 dB	85.8 dB
20 Hz	91.9 dB	82.9 dB

Maximum output (four subs):

	CEA-2010A (1M peak)	Traditional (2M RMS)
40-63 Hz avg	117.9 dB	108.9 dB
63 Hz	121.2 dBL	112.2 dBL
50 Hz	118.4 dBL	109.4 dBL
40 Hz	111.3 dB	102.3 dB
20-31.5 Hz avg	101.8 dB	92.8 dB
31.5 Hz	105.6 dB	96.6 dB
25 Hz	100.4 dB	91.4 dB
20 Hz	97.5 dB	88.5 dB

The first chart shows the frequency response of one ICBM sub with the system set for flat, unprocessed response (blue trace), with the 30-Hz boost set for maximum (red trace), and with the subsonic filter set to 40 Hz (green trace). The flat response is what I'd expect for an eight-inch sealed-box subwoofer with no bass boost in the chain. The controls work largely as advertised, although there's one small wrinkle in the crossover control: its markings indicate the -3dB point of the amplifier, not the combination of the amp and speaker. So, at the 80-Hz crossover setting, the actual -3dB point of the combined amplifier/speaker system is 110 Hz. OEM Systems responded that the P-500Xb is a multi-purpose amplifier used with a variety of speakers and thus can't be calibrated to the total system response because they don't know what speaker will be used with it--and that the company provides charts on its website that help you set the crossover frequency correctly. I should add that, if you use the ICBM system with an AV receiver or preamp/processor, you'll almost certainly use that unit's crossover instead of the one built into the P-500Xb, so in most installations this won't matter.

The second chart shows the response in my room with the microphone placed next to my listening chair, with four subs (green trace) and two subs (purple trace). It's obvious that the four subs produce a much smoother response.

The CEA-2010 output measurements for this system are also pretty much what I expected. I measured a single sub (not

shown), and its output results were in line with other well-designed, eight-inch sealed subs I've measured. For the multiple-sub measurements, I stacked the subs side by side with gaps between, almost like a line of dominos. Increasing the number of subs gave me results pretty close to the theoretical output increases I expected--i.e., going from one sub to two kicks the output up about six dB, and going from two to four kicks it up roughly another six dB.

Note, though, that this will not be the case if you mount one sub in each corner because some of the additional subs' output goes to fill in the holes in the response of the other subs. To see what the effect of the additional subs would be on total output, I measured the maximum output of the system using CEA-2010 technique but indoors, with no attempt to compensate for room acoustics. At some frequencies and in some seating positions, I did get something close to that theoretical six-dB boost, and in a couple of cases slightly more. But at some frequencies and positions, adding more subs actually reduced the output. Of course, you can opt for more output by pairing up the subs--i.e., placing pairs of them in adjacent wall cavities. You'll get something closer to that theoretical six-dB boost, but you'll probably lose some of the frequency-response smoothing in the process. The upshot here is that adding more subs is at least as much about improving sound quality as it is about increasing output.

Here's how I did the measurements. I measured frequency response using an Audiomatica Clio FW 10 audio analyzer with the MIC-01 measurement microphone. I close-miked one of the woofers and smoothed the result to 1/12th octave. Except as noted, crossover frequency was set to maximum. I measured in-room response using True Audio TrueRTA software, an M-Audio Mobile Pre USB audio interface, and an Earthworks M30 measurement microphone.

I did CEA-2010A measurements using the same Earthworks M30 and M-Audio Mobile Pre, with the CEA-2010 measurement software running on the Wavemetric Igor Pro scientific software package. I took these measurements at two meters peak output. The two sets of measurements I have presented here--CEA-2010A and traditional method--are functionally identical, but the traditional measurement employed by most audio websites and many manufacturers reports results at two-meter RMS equivalent, which is -9 dB lower than CEA-2010A. An L next to the result indicates that the output was dictated by the maximum gain of the amplifier and not by exceeding the CEA-2010A distortion thresholds. Averages are calculated in pascals. (See this article for more information about CEA-2010.)

The Downside

Unless they're beefed-up, bass-boosted and driven with 1,000-plus watts of power, eight-inch drivers in sealed boxes can't match the floor-shaking power of larger subwoofers. Not even if you have four of the eight-inch subs. The ICBM delivered plenty of excitement when I played over-the-top action scenes, such as the Hoover Dam collapse in San Andreas, but it only shook my listening chair a little and didn't shake my floor at all.

I've mentioned before that the subs in this system cannot be adjusted or processed separately. While the geek in me would love to see an upgraded system with four channels of amplification, each one with separately adjustable, DSP-based EQ, the businessman in me (yes, there is one!) knows few installers or consumers would have the equipment or know-how to adjust them. (Even though the equipment can cost less than \$100, it takes considerable time and effort to learn and use.)

Of course, with any in-wall system, installation is typically fairly costly and complicated. Walls must be cut, wires must be run, etc. But that's between you and your installer. While I'm on that subject, this system is sold primarily through installing dealers, but the company does have a couple of distributors that will sell direct.

Comparison and Competition

Just to get it out of the way: Yes, you can achieve higher performance with four good \$500 standalone subwoofers than you can with the ICBM, but you'll have four subwoofers sitting out in your room.

Thus, the ICBM isn't really comparable with conventional subs, except in one way: I'd say it's actually competitive with some audiophile subs from Sumiko and REL, in that it blends easily with most speakers and its small, relatively low-mass drivers produce the definition and punch that audiophiles want. The ICBM will also deliver flatter response in-room than any non-

EQ'ed single subwoofer can, and in my room at least, it never revealed any of those traits that audiophiles hate about subwoofers--i.e., boominess, chestiness of male voices, poor bass timing caused by phase errors, and audible localization of the subwoofer. Of course, an in-wall subwoofer system may conflict with the preconceptions of audiophiles (which some seem to cherish more than they actually cherish sound quality), but I doubt anyone who actually hears an ICBM system would argue with the contention that it competes sonically with audiophile-oriented subs.

Of course, there are plenty of other in-wall subs available, and you can always buy four of them plus some amplifier to drive them. But my web search uncovered little that's really competitive with the ICBM. You can get cheap, no-name in-wall subs from a place like Amazon, but you're gambling because it's unlikely any competent technician or reviewer has evaluated them; all you have to go by is the customer reviews. You can get in-wall subs from well-known speaker companies, but typically those are at least \$500 each without enclosures, and you still have to find an amp.

Conclusion

The OEM Systems ICBM four-subwoofer system produced some of the flattest, most musical bass I've heard in my listening room, and I've tested well over 100 subwoofers in this room. The subs themselves allow placement either in-wall or behind or under furniture, and the amp provides some nice additional tuning flexibility compared with most subwoofer amps. If you're looking for audiophile-grade bass and don't want anything taking up your precious floor space, the ICBM is a great option.