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NHT Xd Loudspeaker System

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NHT Xd Loudspeaker System

Manufacturer: NHT, 6400 Goodyear Road, Benicia, CA 94510; 800/648-9993; www.nhtxd.com

Price: 6-piece satellite/subwoofer system including active electronics in a separate enclosure and dedicated stands, \$6,000; extra XdW for stereo subwoofer applications, \$1,200; extra XdS, \$900.

Source: Manufacturer Loan

Reviewer: David Arthur Rich

Features and Notes:

XdS satellite speaker: 1" aluminum dome tweeter with heat sink. Driver is directly connected to the banana jacks at the back of the speaker. 5.25" magnesium cone midrange unit with direct connections to the banana jacks at the back of the speaker. Molded composite acoustic-suspension enclosure. Dimensions: H 10.5" (not including stand), W 6.5", H 8.5". Weight: 13 lbs

XdW powered subwoofer: Two 10" aluminum cone side-mounted drivers. Input jack: XLR (balanced) directly connected to an internal power amp, which in turn is directly connected to speakers with no internal equalization of crossover. Level control is on the back of this unit. It has cheeky markings, less, just right, and more. Do not be tempted to move the control to the more position. Power amp, 500 watts RMS. Automatic power down: A music signal activates the subwoofer but a sort delay occurs before the woofer activates. Acoustic suspension enclosure with very low closed box Q. Requires equalization to be flat and can only be used as part of the Xd system. Dimensions: H 22", W 11", D 13". Weight: 57 lbs

XdA integrated digital amplifier: Developed with DEQX Pty Limited. The XDA has 4 sub-functional groups: (1) Stereo pair of analog to digital converters, which are driven from balanced or unbalanced input jacks. A microphone preamp and phone plug jack are provided to connect signals from a microphone to the ADCs for room calibration. The function is not yet implemented. (2) DSP processor unit. The DSP processor performs crossover functions and driver equalization. Room equalization capability is possible but not yet implemented. The DSP processor is fully software-configurable using the USB connector on the unit.

Software changes are delivered via e-mail to any host computer with a USB connector. Software is supplied by NHT to be loaded on the host computer. This software is used to transfer the file in the email to the XdA USB port. Updates are produced approximately once a year. Soft keys on front panel implement four possible boundary compensation modes for XdS woofer. These can be adjusted independently for each channel. As-configured crossover frequencies are at 110 Hz and 2.1 kHz. As-configured subwoofer output is mono for single subwoofer. Unit has added electronics to support stereo powered subwoofers. (3) 6 digital to analog converters (three for each channel). Two of the DAC channels are assigned to drive a pair of subwoofers through balanced and single-ended outputs on the back of the XdA. Summation of subwoofer signals for single subwoofer operation is set by a switch on the rear panel. (4) Four power amps to drive the stereo pair of XdS speakers (woofer and tweeter). The remaining four digital to analog converters connect to the internal power amps. Maximum

output power per channel is 150 watts RMS. Analog Class D switching power amps and switching power supply are used to reduce size and weight of the XdA to a manageable level. The XdA takes about 7 seconds to become fully operational after turn-on. During this time, low-level signals may

emerge from the speakers. Wait for the system to be fully operational before adjusting volume. Dimensions: W 17" by H 3" by D 16". Weight: 12 lbs.

XdS custom stands: Height of stand is 24.5" Base of stands is a 12-inch square. On the stand the tweeter height is at 32 inches. A special metal post attaches the base of stand to the speaker running completely through the stand. The speaker has a built-in special locking system to accept the post and another pin built into the top of the stand. You should attach the stand as soon as you unpack it and the XdS because the curved nature of the bottom and the extremely smooth finish of the composite material makes the unit hard to handle and unstable. Do not even think of using another stand lest you find the XdS on the floor.

Accessories: Two pairs of 20-ft dedicated speaker cables with color-coded quad banana plugs at each end that match with color-coded banana jacks on the XdS and XdA. The plugs are not key-locked and can be reversed if one rushes the setup

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and ignores the color coding. In this condition, the tweeter receives the woofer signal and the speaker plays at a very low level. If you experience this condition, do not increase the volume level lest the tweeter become damaged. Check the connections! Also included is a 20-foot cable with an XLR connector at each end for connection between the XdA and XdW

On to the good stuff!

Long-time readers of *Stereophile* may recall that Sam Tellig first called his column “Audio Cheapskate,” but after testing enough affordable equipment, he changed the name to “Sam’s Space” so he could review higher-priced stuff. So here I am reviewing a \$6,000 loudspeaker system. How can this be a sensible expenditure? Have I contracted a case of Tellig disease?

Well, look at the feature list above. All this stuff fills eight – count them! – eight boxes. Hint: To save you time unpacking this thing (and you will want one by the time we get to the end of the review), remember that the 20 feet of special hookup wire is hidden in the bottom of each XdS box.

In addition to the physical items that come in

the boxes, you are paying for five years of software and hardware engineering that went into the development of what is relatively low-volume product from two companies, NHT and DEQX. Let me recap the extraordinary amount of R&D time and expense that went into this speaker. At the 2001 CES, the company now known as DEQX was demonstrating a prototype DSP-based crossover and equalizer system. By chance, they used the NHT Super Ones to demonstrate the technology. They switched between the prototype system of what is now the XdA and the internal crossover of the NHT. Many who heard the demo memo left amazed. NHT representatives must have been one of the folks that left impressed, because a year later at CES 2002 they announced a partnership with DEQX.

It would be another four years before the unit would ship in volume. It is important to understand that the multi-year development work on the system was not only on the DEQX side but also from NHT. A handful of very expensive speakers have been demonstrated at CES 2005 and 2006 with DEQX technology separate from the NHT speaker system. DEQX sells a component distinct from the XdA (see

www.deqx.com) for use by other manufacturers. The software used in the DEQX stand-alone box differs from that custom developed by the NHT/DEQX team.

Although the other speakers with DEQX are excellent, the Xd system is the only speaker with DEQX technology that has magic powers. This should come as little surprise, because NHT has a team of engineers that have deep experience designing cost-effective speakers, with some résumés extending back to the days when Acoustic Research was a cutting-edge company.

When one first looks at this thing, one asks, “Why didn’t they just design a pair of thin towers instead of the satellite and subwoofer?” This approach would have made system setup a lot easier, since the woofers would be an established distance from the midrange and we would be dealing with placing two boxes in the room instead of adding a third, which interacts with the other two.

The first answer to this question lies in the imaging abilities of the speaker. I have not heard a full-range speaker that comes close to imaging the way the Xd system does even if it speaker has a robot head (e.g., B&W and Waveform).

The second answer is practical. Big boxes do not sell in enough volume to justify the large R&D expense required to bring this very complex and path-breaking project to production. The audiophile market is shrinking fast and the number of micromanufacturers is growing (you have a business if you can sell two pairs of a speaker with a \$200,000 list price made from OEM drivers and particle board). Furthermore, those who frequent high-end store are not at all receptive to active speakers.

To make this project a reality, given the huge R&D expense, a much larger market needed to be tapped – the market targeted was custom-installed AV systems. The much smaller profile of the XdS and its great looks makes acceptance of this speaker into a high-end home theater an order of magnitude higher than a floor standing box. I am not going to elaborate on the look of the speaker; the pictures speak for themselves.

I will comment, though, on the material used for the cabinets. It is not wood, but a special composite material that is much more robust. The composite material allows the complex curves of the front panel to be implemented without compromise. In this way, diffraction effects are significantly attenuated. Given all the attention to diffraction, I view the small grill assembly as a something to protect the speaker when not in use.

The composite material also makes the enclosure sound almost completely dead when you place your ear on top of it and do the old knuckle-knock test. I also tested the ability of the composite material to absorb significant energy without damage. This test resulted from my fumbled fingers loosing grip on the curved surfaces at the bottom of one of the XdS when I was placing it on a high stand to do my ETF measurements (the higher the speaker is from the floor, the longer it takes for the first reflection to arrive at the test microphone, resulting in a more accurate measurement). It fell 3 feet and showed not a scratch or a dent. You will not be dropping the XdS if you follow the instructions to attach them to the speaker stands as you unpack them (see the features and notes section above).

Not visible from an external look at the XdS is the heat sink on the tweeter that attaches to the back of the tweeter and terminates at the back of the cabinet. The woofer is a top-of-the-line SEAS magnesium cone speaker with an exposed pole piece. This speaker is well known for its low energy storage (low resonant behavior) as well as low THD and IM distortion. The high-order lowpass crossover connected to the midrange ensures that any out-of-band energy storage or intermodulation products cannot occur. The tweeter is also sourced from Norway, but has no other identification. Both speakers are equalized for extremely flat response by the XdA. It is also possible that NHT has asked the driver manufacturers to customize the speaker for less flat frequency response (the DSP flattens things) in exchange for reduced distortion or energy storage.

Note that the woofer is only 5.25 inches in diameter. It could not be enlarged without introducing significant narrowing of the XdS horizontal radiation pattern above 1kHz. That is why well designed 3-way systems sound much better than mini monitors with 6.5 inch woofers (see my article in issue 106 for more details on this). Things get even worse with respect to radiation patterns clashing if you try to cross over a 7-inch woofer with an open back to a 1-inch closed-back dome tweeter.

How can the XdS produce high SPLs with such a small woofer? The first part of the answer is the high-order crossovers, which keep the bass energy out of the woofer and instead send almost all of it to the subwoofer. The second part of the answer is NHT uses a relatively high crossover point of 110 Hz, which presents issues we will address below.

OK, we have shown that the speaker is worth \$6,000, but is it sensible to spend that much money

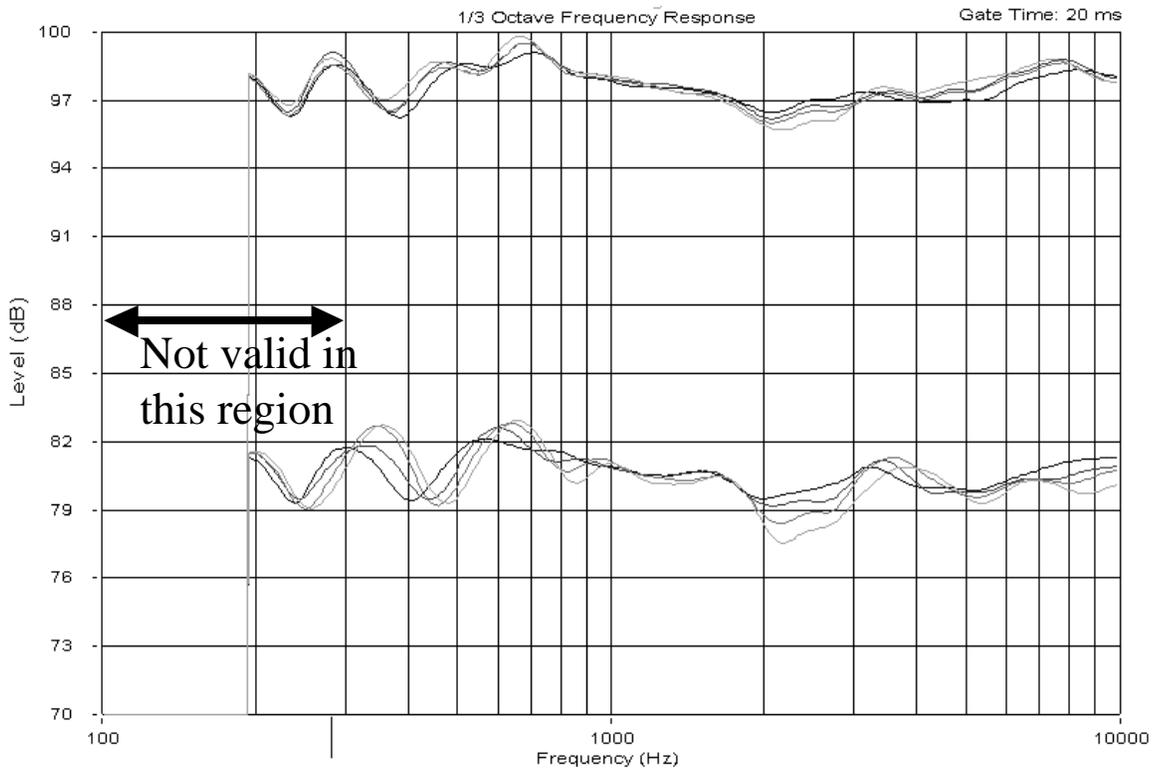


Figure 1. Vertical radiation pattern.

Upper curve: +5 degrees (darkest tone) to +20 degrees (lightest tone) in 5-degree steps.
 Lower curve: on-axis (darkest tone) to -15 degrees (lightest tone) in 5-degree steps.

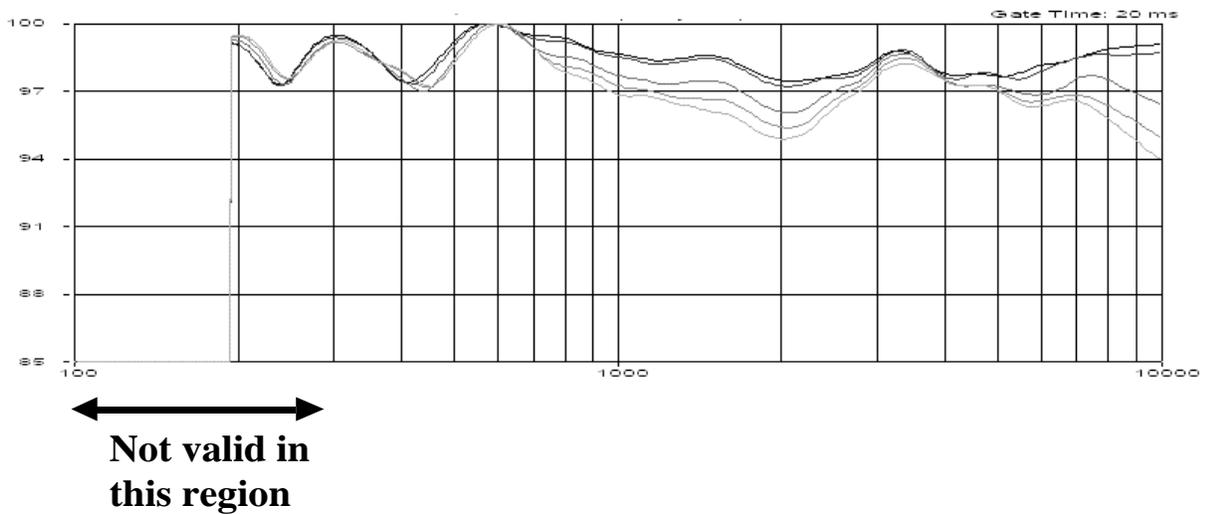
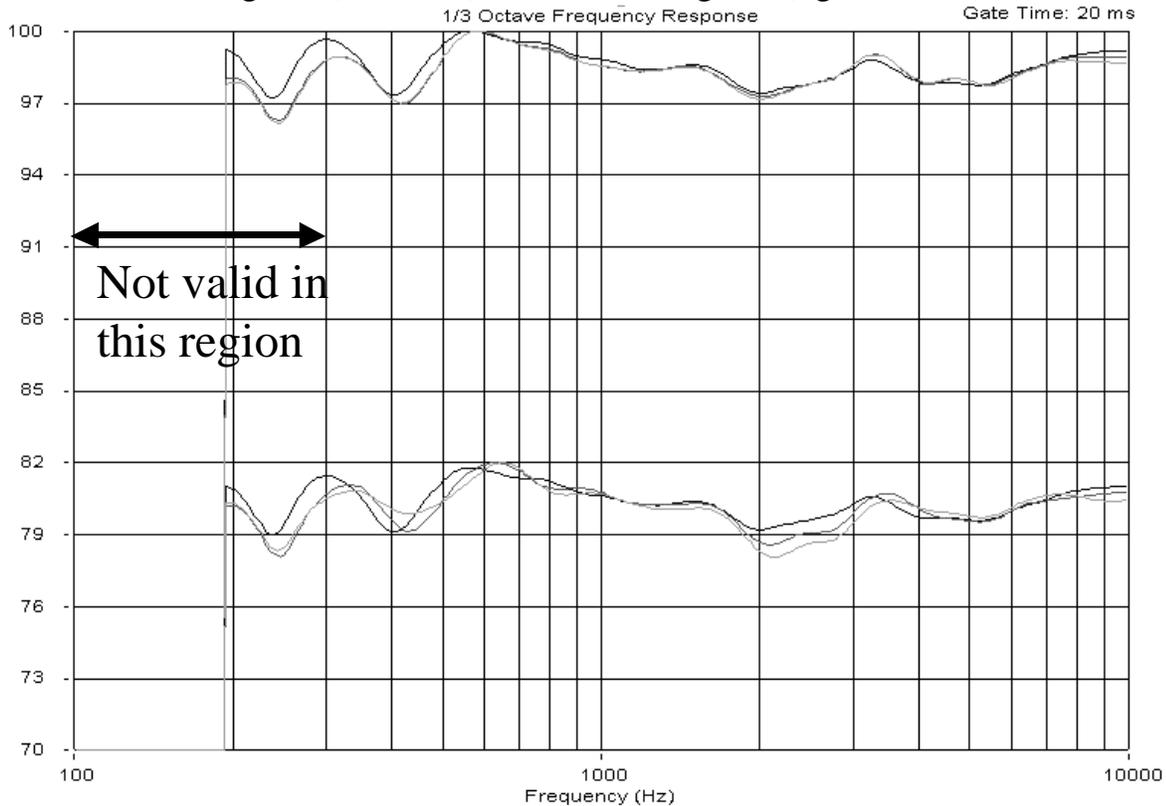


Figure 2. Horizontal radiation pattern.

On-axis (darkest tone) to 60 degrees (lightest tone) in 15-degree steps.

Upper curves: Direct response (darkest tone), averaged horizontal response from 0 to 45 degrees (mid tone) and 0 to 60 degrees (lightest tone).



Lower curves: Direct response (darkest tone), averaged vertical response from -10 to +10 degrees (mid tone) and -15 to +20 degrees (lightest tone).

Figure 3. Horizontal and vertical response.

on any speaker? That is the issue I will address in the rest of this review. In past issues of T&S, I have presented extensive discussion of this speaker without actually having a review sample in hand (Sneak preview: NHT Xd DSP-corrected Loudspeaker Issue: 101 Page: 30) and the advantages that DSP technology brings to a speakers performance (Speaker Testing Issue: 106 Page 9) I will not repeat what I wrote in those articles here, but for the first time I actually have the speaker to test. As it turns out, NHT has staggered the reviews for the Xd system by sending review samples in a daisy chain. Since this review is at the back of the chain you did not have to wait for my review to see the extraordinary performance that this speaker is capable of with extensive measurements having already been presented in *Stereophile* (November 2005 and January 2006), *Home Theater Magazine* (November 2005) as well as the Australian magazine *Hi-Fi* (September/October 2005).

The title of the Australian review is "World's Most Accurate Loudspeakers." The title is absolutely correct. Compare the measurements of the Xd system in *Stereophile* to other speakers they have measured (they have a huge database on their website). You can do a similar exercise on with the *Home Theater* magazine database on their website. Although *Home Theater*, unfortunately, takes a more limited set of measurements than *Stereophile*, many of the speakers *Home Theater* has tested are different from the ones measured in *Stereophile*.

My measurements of the speaker confirm what has already been reported, so what we have here is mostly a subjective review. Before we move onto to my subjective evaluation, however, let's take a look at the measurements.

Figure 1 shows the vertical response for the angles of -15 degrees to +20 degrees. As you can see, they stick together like glue. I did not make a measurement for -20 degrees because the XdS is lower in height than normal (tweeter height is 32

inches) and only your dog could be listening at -20 degrees vertical. The +25 and +30 curves are missing because the speaker fell off the test stand before I could make them and the speakers never left the low custom XdS stand after that. Figure 1 thus represents a total span of 35 degrees, which is what I have used for typical speaker measurements, but I have expanded this to 45 degrees when testing a speaker that exhibited good vertical dispersion characteristics. Be careful comparing my radiation pattern curves that have a 35-degree span to those with the larger span. If you want to see how the Xd system performs with a wider span, the *Stereophile* measurements of the speaker used a massive 90-degree span. Note that *Stereophile* only uses a 30-degree window when measuring floorstanding speakers, so again be careful as you compare graphs.

Figure 2 shows the horizontal radiation pattern. Except for an effect where the 5" woofer of the XdS is becoming more directional at higher frequencies because of its piston diameter becoming longer than the radiated wavelength. We do note slightly more directionality in the tweeter than some other speakers we have measured, but this is a design choice. I have pointed out in the past that the correct radiation pattern for a tweeter continues to be a subject of research. I have never found speakers with extraordinarily flat horizontal radiation patterns beyond 60 degrees to sound good since they excite too many room reflections. I also note such speakers often have very poor vertical radiation patterns. The horn loudspeaker is a perfect example of the issue. David Moran and Howard Ferstler disagree, but they might change their minds once exposed to the magic of this speaker.

The most amazing curves are the average of the data in Figures 1 and 2. This is presented in **Figure 3**. In the top set of curves we have the measurement of the direct frequency response overlaid with an average of the horizontal radiation pattern curves from 0 to 45 degrees and another curve with the average of the horizontal radiation pattern curves for 0 to 60 degrees. Note the curves are again glued together. On the bottom of Figure 3 we repeat the exercise with the direct frequency response overlaid with the average of the individual vertical radiation pattern curves. The first curve is the best 5 curves averaged together (20-degree span) and the second is the more difficult average of curves from -15 degrees to +20 degrees (a 35-degree span, which is 5 degrees greater than the span I normally use to generate this curve). Again, the curves almost look the same.

What we are looking at is a speaker that has

identical response characteristics for both the direct sound and the sound radiated off both the vertical and horizontal axis. This is unprecedented!

I also measured performance of the speaker including the effects of the room. The room measurement in a 16' x 13' x 8' room with minor room treatment consisting of eight Echo Buster (www.echobusters.com) 2-inch-thick wall panel absorbers (8 sq feet per panel) placed at locations to damp first reflections. 1-inch-thick panels are only effective at high frequencies and the panels dampen what would otherwise be a very live room given the laminate wood flooring (My allergist banned all carpets from my house).

Making a 9-point average (200-msec gate window) over a 1-foot cube around the listener's head at the normal listening position in the room yields a curve for each speaker (not shown) that looked very similar to the quasi-anechoic data in figure 3. Both the left and right speakers created very similar in-room curves. It is all absolutely unprecedented and truly revolutionary.

Near-field measurements of the XdS showed the tweeter is down 20 dB at 1800Hz and the woofer is down 20 dB at 2850Hz. The -20dB point is where the speakers will interfere with each other to a worst-case maximum of 1dB. The crossover point measured 2250Hz. Thus, the frequency span where interference can occur is slightly less than half an octave (2850-1800)/2250. A 4th-order crossover frequency span of interference is 1.25 octaves and a 2nd-order is 2.5 octaves.

The subwoofer (XdW) crosses over to the satellite at 110 Hz. That is a frequency where we are getting close the point of localization of the sound source. NHT has an option to use two subwoofers to solve the localization problem. This adds \$1,200 to the price of the system. For the two-subwoofer system to work properly, each woofer must be close to a satellite, distracting from the distinctive look of the system. I stayed with the single subwoofer, which is how most of these systems will be deployed. NHT recommends for best results that the subwoofer be placed centered between the XdS and close to a wall. The front of the XdS optimally should be 2 feet from the front of the XdA according to NHT

I have strongly recommended that *T\$S* readers avoid subwoofers. A significant reason for this is that the crossover slopes between the satellite and subwoofer that are generated by an AV receiver are not sharp enough, typically ranging from 2nd to 4th order. On top of this, the bottom end of the satellite and top end of the woofer are not equalized to

ensure that the phases of the drivers are not deviating from the mid-band values. Phase changes start to occur about a decade before the speaker starts its amplitude rolloff. Crossover networks built into AV receivers do nothing to compensate for these phase errors and the result is a very lumpy frequency response in the area that the two drivers are operating together, which can extend for an 1.25 octaves or more when a 4th-order crossovers are used. It's worse with the THX crossover system.

The NHT crossover system is 8th-order, which reduces the interference effects of the summation of the 3-piece system from 90 Hz to 150 Hz (these are the -20dB points of the crossover). The range of interference is just half an octave. Furthermore, the XdS is an acoustic suspension system with a low system Q and a 2nd-order rolloff characteristic. NHT has no need to extend the XdS bass response with a port or peak up the bass so it moves quickly out the door on the sales floor, since it is never sold alone. The XdS bass tuning makes phase compensation much easier and the phase of the XdS is compensated by the XdA. The XdW is also amplitude- and phase-compensated by the XdA.

Still, the ultimate NHT system still leaves use with the problem of placing the speakers so that the 90-150 Hz band does not develop a notch (no peaking here, since the XdS and XdW are in phase in the crossover region and any phase angle change as a result of a path delay change will result in a reduction of the summed amplitude as explained in more detail in issue 106. A roll your own subwoofer system can peak 6 dB or more.).

Given what I have just explained NHT had to throw in to get the satellite to blend with the sub, I hope it is clear why I have told you to stay clear of subwoofers. You are working with an order of magnitude less sophisticated equipment than what

the Xd system uses and you are trying to use different pieces from different manufacturers. You just cannot make it happen on your own.

Now the presence of any notching around 110 Hz is predominantly the result of changes in the path delay between the subwoofer and satellite. At the present time, the XdA does not provide a room calibration option to compensate for different distances from the XdW and XdS to the listener, thus symmetrical response for both channels is achieved only if the path delays between both satellites and

the subwoofer are identical. (Center the XdW or put it far away from both of the satellites).

An additional constraint for flat response is the path delay should be a constant. Hence the recommended two-foot offset between the front of the XdS and XdA. The good news is that if you do get some energy loss in the crossover region, it will be narrow and far, far, far less audible than any other satellite/subwoofer setup. I also repeat the well-known audio bit of wisdom that a dip in frequency response is less audible than a peak, although many audiophiles prefer the bass to be shelved up.

Below the crossover region, the XdW acts like any subwoofer. Room modes and interaction between the speaker and room will cause all sorts of undesirable dips and peaks. This is where parametric EQ available in units such as the Pioneer VSX-72TXV AV receiver come in. In a few competitive high-end subwoofers, (e.g., the 110-lb \$3000 Revel Performa B15a) a 3-band parametric equalizer may be included. They are implemented in the analog domain and adjustments can be made through controls on the back of the unit. Unfortunately, NHT has yet to implement such a feature in this system, although it appears to have the capability to do so without any hardware change. I found the Pioneer did a good job of



addressing room modes above 64 Hz (the limit of its equalizer), especially if I adjusted the equalizer manually using my averaged in-room measurements to guide me to the correct settings. When using the automatic setup system, the Pioneer concludes – correctly – that the effective distance of the speaker is about 8 feet further away than a tape measure tells you. . The extra distance is the delay that the XdA introduces when it does the DSP processing. The Pioneer went about its business of adjusting the level and distance parameters of a multichannel system and was not disturbed by the XdA in the front channel loop. You do need that extra distance correction it calculates if you are running a multichannel system with a mix of an XdS system up front and passive speakers for the other channels.

Unfortunately, it not possible to use the Pioneer or any other equalizer to apply response correction just to the subwoofer or the satellites in the range of 90 Hz to 150 Hz, because the crossover between the XdS and XdW occurs digitally in the XdA. I found the most important peaks in the response curve to reduce were those which were excited by the subwoofer from about 80Hz to 120Hz. This is the frequency range where we can still localize a signal, thus any added energy from the subwoofer made it possible to localize the XdW. Once I applied correction with the Pioneer, the localization problem was in many cases resolved.

As it turns out, in my 15 x 13 x 8 room, both XdS units produced the flattest response placed at a point in the room where a significant node at about 110 Hz existed at the listening position. Other placement would reduce or move the notch, but at the cost of smoothness in frequencies above the notch. Placing the XdW in its optimum position against the wall 2 feet back from the XdS resulted in a similar notch. Again the notch was a problem associated with the room, not the speaker. With the notch from the room at almost the same place as the crossover point, the XdS and XdW never got a chance to talk to each other. I did have an audible loss of energy in the band in the region around 110Hz but I could not blame the Xd system. The XdW boundary compensation (it's fixed, unlike the boundary compensation for the XdS) appeared to work well enough below 90Hz so that I did not use any parametric EQ. Eliminating the EQ also allows my assessment of the speaker to more closely approximate the experience you will have with an Xd system if you had no access to room-correction systems

In my place, the next largest room available was

19 x 18 family room with a complex vaulted ceiling that goes to 16 feet high at the center. This room is one of those open-floor-plan things with a half wall to the kitchen area and another opening to a large hallway. At the edge of the family room the second floor is finally closed off. This edge produces a slap echo that can be clearly heard on gated noise impulses. I found the XdW was not happy in this space, with significantly reduced output below 40Hz, apparently because the space was too big to provide significant room gain below 40Hz. At the same time, I had some room modes near the critical crossover point as the half walls started to make their presence known. This is not the fault of the XdW. Any subwoofer without EQ would have the same problem.

I had much better luck in bass response in this room with the full range Energy Reference Connoisseur 70 tower speaker reviewed in the last issue. Above 150 Hz, when the XdS was running solo it was clearly a superior speaker to the Energy, but the XdS lacked the magic it achieved in the smaller rectangular room. I do not think this has anything to do with the XdS but instead the limitations of the room, especially the slap echo. I am sure things could have been improved had I brought in a professional home theater installer who was also an official NHT dealer. Many of these folks (one place to check their credentials is the Custom Electronic Design and Installation Association website at www.CEDIA.com) know how to work with these complex rooms. I decided not to go through that exercise, because the Xd system worked excellently in the smaller rectangular room and the rest of the household was very happy to see the equipment move from the open family space to the isolated room. They were very tired of hearing many repetitions of two-minute clips of recordings I was using to do matched level comparisons between two sets of speakers as well as all the strange test and calibration tones.

Concluding this segment, I can report that the Xd speaker system is easier to set up than other 3-piece systems, owing to the dramatically more sophisticated crossover technology, but it is more complex to deal with than a pair of full-range speakers Above 150Hz it is not more room-sensitive than other speakers, but because it produces sound more accurately than any other speaker, the room effects that were not audible with less-flat equipment now become the dominant barrier to achieving the sound quality of which the Xd is capable. One last thing before we take leave of my monster family room. The Xd systems had no

trouble producing dynamics that rivaled the Energy or any other speaker I have tested in the giant room. Things were loud enough for the rest of the household to yell, "Turn the darn thing down!!"

I am not going to recap the details of why the technology of the Xd system allows it to produce the measured results presented above, but instead refer you to my previous articles. Advances in the science of electroacoustics and accompanying measurements to confirm analytical and computer simulations alone only get you best-paper prizes at professional conferences. What you want to know is how this thing *sounds*; that is what the rest of the review is about. I will note that I expect the results in my room to be equaled or bettered in larger rectangular rooms, provided the speakers and listening chairs can be optimally placed. You are more likely to get the primo pair of spots in a room with the fantastic looking XdS on its stand than with some big pair of boxes.

Tonality is the most important aspect of a loudspeaker's performance. If a speaker cannot capture the correct sound of an instrument, its imaging and dynamic range characteristics are meaningless. While one's aural memory of the sound of live acoustic instruments is important, human memory is not very good at maintaining a detailed memory of the sound heard a given live event. To compensate for this, we must also reference a loudspeaker under test to other loudspeakers in the same room. The problem with doing this with the NHT is that its accuracy of tonality is so much better than what has gone before that comparisons to other loudspeakers yield little information as to how good the Xd system is.

The only thing left to do is use headphones as a reference. Audiophiles have long known the best headphones are a whole other world in performance compared to loudspeakers with respect to tonality and dynamic range. It makes sense since the room is out of the picture, the drivers run full-range, the directional properties of the driver have no influence on the headphones performance, and the cone movement of the driver is a small fraction of what a speaker must achieve. OK, we know the imaging of headphones is not acceptable, but for everything else they are the ideal reference. I used the Sennheiser HD 600 headphones as my reference.

It is amazing but true that the Xd system gave the Sennheisers a run for their money. The anechoic and in-room measurements discussed above tell us how this can be so. Here is a speaker which is flat as a headphone and has the SPL capability to match a headphone's distortion performance when listening

at reasonable levels.

That the tonality of the speaker matches what one hears on good headphones makes describing tonality of the speaker easy. Put on your own set of good headphones and listen to your collections of CDs. You hear more details in the sound of the individual instruments. The difference between the timbre of different instruments is much clearer, because the frequency response is flatter. When listening to larger ensembles, you can hear a section of strings, not just one blob of string sound. You can hear diction more clearly with large choirs, especially when the orchestra gets going underneath. This is no new news. You have known this since the first time you put on a good set of headphones.

One phenomenon I do want you to key into is that what you consider bad sounding CDs on loudspeakers may not sound so bad on headphones. Yes, the best recordings sound fantastic, but the weaker ones are better played flat than when colored and distorted by a speaker.

Be careful. On headphones, what you thought was a poor recording of a violin may be revealed as a poor performer who has trouble making sweet notes up high. Remember that string quartet you heard live last month that you said you would never go to hear again? Well, they are not going to sound much better on a recording if it is clean and not filled with so much artificial reverb to cover everything up. Not every bad sounding recording is the engineer's fault.

I did notice the Sennheiser HD 600 rendered diction on large choruses a little more cleanly on some recordings than the Xd system. On woodwinds, the Xd system might be slightly warmer and closer to the real thing. I could not declare an overall winner. Double basses did not come through with as much power on the Xd system compared to the Sennheisers, but this is mostly do to the notch problems of my room at 110 Hz, although I had similar problems in my much larger suboptimal room, which did not have the suckout at 110 Hz. On the other hand, the Xd system was much more accurate below 40 Hz than the headphones until it started to roll off at 25Hz.

Finally, I note that when I ran the Xd system as a multi-channel system (no center and the excellent Phase Technology 3.3 II in the rear – we will have a lot more to say about this system in the next issue) the double bass section of the orchestra and other instruments in that range became full and clear with fantastic articulation of the individual instruments. The rear speakers did not have the 110 Hz suckout

where I had them placed, and they filled in notch in the front channels.

A comment on the dynamics of this speaker system is in order. Before the Xd system came along, speakers mumbled, so audiophiles pushed up the level to try to hear some detail. But the Xd delivers the detail, so you can keep the level down to the level you would hear at row J in a concert hall. Now, when the conductor encourages the brass when the score is marked *fff* you feel the dramatic contrast as in a live performance. That does not happen when you have set an artificially high level to get detail out of a normal speaker, because the dynamics of your hearing will be compressed.

So if you like the sound you are hearing on your headphones but hate the blob-in-the-head imaging, we have great news for you, provided you have \$6,000 of spare change. The Xd can create a soundstage.

First off, let's note that the satellites are really small, so the wave launch is very different from a big tower and radically different from an omnidirectional design. Also note that the tweeter height is lower than most tower speakers.

To evaluate imaging, we must use our memory of the live event – but we have a problem. Different halls present very different images depending on where you sit and the reverberation characteristics of the hall. If the engineer has captured the sound of the musicians and the hall, we will key on imaging characteristics from the recording. With another hall and a different microphone placement, the sound space may be very different.

But before we try to compare our memory of live with what is playing in our room, we need to deal with the effects our eyes have on the perceived image both in the concert hall and in the home. For me, that requires critical listening to the Xd system with my eyes closed. I did the same thing at live acoustic events. While it is impossible for a pair of speakers in an average-sized room to produce the soundstage of a piano trio in a 400-seat hall, the Xd system came surprisingly close. With my eyes closed I could not localize the speakers. Finding the position of the instruments in the sound field with my eyes closed was possible, but not with pinpoint clarity. That's just like the real hall. Center images are really strong because the frequency response of both channels is so accurate. Different instruments have differently sized images. That is to be expected, since the sound board of cello is different from a violin. A French horn has a very different type of image given the direction the sound is launched and the manipulation of the instrument's bell with the

hand.

All the detail and tonal accuracy of headphones are present in the sound field that runs across and perhaps beyond the speakers. Combine the tonal accuracy with the excellent rendering of space and you can sometimes think you can reach out and almost touch a musician when you are listening to a really good recording. For small groups, nothing sounds bloated and magnified like on big dipole or bipolar speakers.

On big orchestral sources, you can hear the size and depth of the string section if the recording is good enough to allow this to happen. Adding in rear channels for some reverb can sometimes enhance the effect, but on other recordings the rich detail of the timbre of the instruments get lost and the overall sound is less real.

The key here is you can turn the rears on and off depending on what sounds best. If you have a big dipole source, you are stuck with the way it bounces sound off the rear wall to create that sense of air and space. It may work on some recordings but not the vast majority. With the Xd system you can deploy rear channels if you like the effect of surround but only deploy the rears when they help the recording. I found 30% of the time yes and about 70% of the time no.

At this point I am left to wonder what six channels of XdS speakers would sound like. At around \$16,000 (approximate price with one woofer for all channels) I think I will have to continue to wonder, but it is clear that the sound of the Xd system up front moves the bar up significantly over any other multi-channel system even when I was deploying lower-cost but still excellent 3 way passive speakers for the rear. Under no condition would I place a passive center channel between the XdS satellites (except perhaps in a video application to centralize dialog).

You will note I am not telling you what the "excellent recordings" I used were. This is a pointless exercise. The speaker has to blow you away with your best recordings. I can tell you I listened to many, many CDs from all the major labels and most of the minor labels that have any significant presence on the Tower Records classical site and most of the time I was pleased as punch. Even now, after a couple of months with the Xd system optimally set up, many well recorded CDs from my collection surprise me with the quality of sound that has been captured and the Xd system is reproducing.

To reaffirm what I said above about less-than-great recordings, they often sound better on

headphones. That statement holds for the Xd system also. 1960s CBS recordings with Ormandy and Walter went from OK on the average speaker to really good on the Xd system. The Xd has the tonal accuracy of headphones plus the ability to develop a seamless soundstage, which often improves these recordings even further. Turning on the rear channels (using Dolby Pro Logic II Music or DTS Neo 6 Music) when playing one of these recordings often made things even better. Mid-60s RCA Dynagroove specials remastered on CDs also sounded much more pleasant on the Xd systems and these recordings did not require the rear channels as often. Think of all the times you were about to cringe with a 1960s recording when the first violins were going to come in fortissimo and you remember the scratchy sound that was about to occur. With the Xd system, you may find it was not all the recording's fault, but some peaks in the upper midrange of your current speakers. Unfortunately, nothing I tried could make the NY Philharmonic under Bernstein recorded in Manhattan Center sound good, but many of the older recordings on John Puccio's list will sound excellent.

For those who worry about the quality of the electronics affecting the sound of these speakers, I will tell you that I used an entry-level Onkyo Universal DVD player and a Yamaha integrated amplifier (you need something with line-level outputs, which most low cost stereo receivers sold today do not have) for most of the auditioning of the speaker. Only for auditioning in multi-channel or to insert equalization did I move up to the Pioneer VSX-72TXV driven by the Onkyo.

What more can I say? This speaker is fantastic. As I said in my preview article in issue 101, its technology represents the next great advance in audio reproduction, comparable to what AR did with the 3a and almost as big as when the CD arrived. Only Phase Technology has a competitive speaker designed for in-room use in a consumer's home and it is available only as a multi-channel system at a much higher price point as I write this. The Phase Tech does, however, include room correction, a feature not yet implemented in the Xd system.

I warn you if you hear the Xd system properly set up and listen with your eyes closed so the size of the system does not affect your perception of the quality, you are going to want this system. You can spend a lot more for a pair of speakers, but at this point in time you will get less. The measurements tell you that; more importantly, your ears will too.

One final note. A good group in a good concert

hall still sounds better than the Xd system. A live concert is an event that a recording can only attempt to capture. Subscribe to the concert series of your choice. Keep those halls filled, or you will not have a place to go to hear the live sound.

-DAR

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