

Audio *perfectionist* **Journal**

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The material presented in this excerpt builds on concepts that were presented in previous issues. It's not absolutely necessary to have read the first five issues in order to benefit from the information offered here, but it's a good idea.

Vandersteen

In the late 1950s, the original Quad ESL electrostatic loudspeaker was available for purchase only in the UK. It took nearly a decade for Quads to appear at retail locations in the United States. Stores selling Quads were few and far between and the speakers were available only in limited quantities. Serious audiophiles managed to find them. I bought a pair from Jonas Miller Sound in Beverly Hills, California, in the early 1970s. Many speaker designers of the day were listening to Quads, too. They were trying to figure out how to make a practical loudspeaker that could sound as open and natural as the Quad ESL.

The Quad ESL (sometimes called the Quad '57) was a 2-way, three element electrostatic design with temporally aligned panels. (The electrostatic tweeter panel was centered between two electrostatic woofer panels and set back from the plane of the woofers.) It was the first time- and phase-correct multiway speaker, so far as I know. The Quad could pass a pretty good semblance of a square wave and offered midrange fidelity that was simply unrivaled in this era.

The Quads were far from perfect, however. They focused an image in a spot just big enough for a single head. They could play just loud enough to produce chamber music at realistic sound pressure levels for a listener seated no more than six or seven feet away. Quads had limited bandwidth with very little output capability in the low bass or high treble regions. They were fragile—I sold mine when my stock of tweeter panels was depleted—and they presented a difficult load for the amplifiers of the day. The reward, for the few enthusiasts who could tolerate these impracticalities, was glorious sound and an immensely satisfying musical experience. After parting with my Quads, I struggled for many years before I was able to fully duplicate this level of musical satisfaction.

High Standards

The Quad ESL speakers set a high standard for the audiophile speaker designers of the day. Many labored to create practical loudspeakers with the open, natural sound of Quads. Two talented designers, Jon Dahlquist and Richard Vandersteen, suspected that the open sound of the Quads might be attributable to the fact that they had no reflective baffle surrounding the drive elements. They were partially correct.

Dahlquist was the first major speaker manufacturer to produce dynamic loudspeakers with small baffles (one eighth wavelength I believe) around all drivers except the woofer. The original DQ-10 was introduced in the mid-1970s and it was a revolutionary design.

With the grilles in place, the Dahlquist DQ-10 looked almost exactly like a Quad ESL. Under the Quad-styled grilles, the DQ-10 had a 10-inch Advent woofer in a rather conventional sealed enclosure that made up the lower two-thirds of the speaker. The other three drivers in this four-way system were each surrounded by small baffle boards, made from Masonite, which were attached by brackets to the top of the woofer enclosure. Upper range drivers included a 5-inch Philips midrange, a 1-inch dome tweeter and a Motorola piezo super tweeter. These drivers were staggered so that the voice coil terminations were lined up, in an early attempt at time—oops, I mean temporal—alignment. The drivers were not arranged in a vertical array. Due to its steep-slope crossover filters and primitive attempts at driver alignment—there were no FFT analyzers then—the DQ-10 was not a time- and phase-accurate speaker system. But it was a major advance in dynamic speaker design.

Vandersteen went a step farther to eliminate what he refers to as “baffle distortion.” The original Vandersteen Model 2 speakers had virtually no baffle at all. The first Model 2 had an 8-inch woofer mounted in a trapezoidal (as viewed from the top) enclosure with no baffle extending beyond the sides of the bass driver.

A 10-inch rearward facing passive radiator shared this same enclosure. The dome midrange and dome tweeter drivers were mounted in free air, supported by a backbone structure attached to the woofer enclosure. This was the first “baffleless” Aligned Dynamic loudspeaker and Vandersteen has been building speakers based on the same basic principle ever since. Although current Vandersteen baffleless speakers are also time- and phase-correct, the original Model 2 was not completely phase coherent.

Minimizing baffle reflections proved to be only a partial solution. While both Dahlquist and Vandersteen had successfully managed to reduce the negative audible effects produced by reflective baffles surrounding the drive elements, their early speakers were not time- and phase-correct. The Dahlquist DQ-10s and the original Vandersteen Model 2 speakers sounded more open and natural than conventional box loudspeakers but neither could match the transient speed and transparency of the time- and phase-accurate Quad ESL. Vandersteen made a giant leap toward closing the gap with the introduction of the Model 2A—the first time- and phase-correct Vandersteen speaker—at the end of 1977.

Today, Vandersteen Audio makes fifteen time- and phase-accurate loudspeaker and sub-woofer models including many designed primarily for home theater use. In this article we’ll concentrate on the four floor-standing, full range models numbered 1, 2, 3 and 5. (There used to be a Model 4 but, alas, it is no more. There will be a Reference Monitor, priced between the 3 and 5, but it’s not available yet.)

Because his speakers cost less than other high-end brands, Vandersteen sells lots more of them. The lower price tags are achieved by minimizing the costs of expensive, furniture-grade enclosures on all but the flagship Model 5.

While a big percentage of the price of competing speaker systems is invested in the enclosures, most of the price of Vandersteen speakers is devoted to the components inside. Those components are among the finest available regardless of price.

Vandersteen likes to refer to the \$3,500 a pair Model 3 Signature as “a \$6,000 speaker system in a plain wrapper.” I’d go farther and say that the Model 3 Signatures can be favorably compared to any speaker system selling for \$8,000 a pair or more. There are negative aspects to this “bargain” pricing (for the manufacturer not the consumer).

Because Vandersteen speakers are so inexpensive, they have failed to get much attention from the influential magazines or from audio-philosophers who believe that high cost is synonymous with high quality. I’m going to provide slightly more detail when describing Vandersteen products in an attempt to dispel this false notion. These relatively inexpensive speakers are built to quality standards that equal or exceed any in the industry, and Vandersteen speakers contain many innovative design features which can’t be obtained anywhere else at any price.

Shane Buettner and I visited the Vandersteen factory in early July in preparation for this article and a review that I had planned for Widescreen Review Magazine. (It appears at the time of this writing that Shane, rather than I, will be doing that review.)

Vandersteen Audio employs twenty-two people in the small central California town of Hanford. The factory is located on the outskirts of the central business district in a 50,000 square foot, free-standing building built and owned by Richard Vandersteen. The facility is as low-key as the owner. There is no sign on the building other than the address. There are no plush listening or meeting rooms where visitors can be entertained and there are no fancy offices for the sales and management staff. In fact there is no sales and management staff. This is a family business run by the patriarch and manned by a hand-picked crew which includes two sons and a daughter.

Richard Vandersteen likes to describe himself as “just a truck driver from Hanford, California,” but beneath his modest facade is one of the sharpest minds that I’ve ever encountered. He and I have been good friends for nearly twenty-five years and I was one of the very first

Vandersteen dealers, so I am admittedly biased. The man's engineering talent is quite extraordinary and his ingenuity has led to some breakthrough technology.

He studied advanced Fast Fourier Transform measurement techniques with the late Richard Heyser at Cal Tech, but Vandersteen had already pioneered the use of FFT analysis in speaker design some years before. Vandersteen Audio was the first speaker company to employ FFT analysis, using an early Gen Rad 2512 instrument for research and development. Today, Vandersteen also employs the TEF and MLSSA instruments along with his keen ears. I've shared listening sessions with many key figures in the audio industry (including the three designers profiled in this issue of the Journal) and Richard Vandersteen is among the most aurally perceptive. (I'm prejudiced here too, because he and I share similar tastes in music and equipment.)

Vandersteen has developed many unique technologies which are offered in various speaker models. The patented, reflection-free midrange driver used in the Model 3 and Model 5 speaker systems, the true push-pull subwoofer driver used in the Model 5, the baffleless enclosure designs used throughout the line, and the multilayer constrained-layer construction of the Model 5 head module are examples. Vandersteen Audio, in the early 1980s, was the first company to build subwoofers that operate primarily below system resonance. These subwoofers are essentially aperiodic in the pass band. Vandersteen Class B subwoofer amplifiers have a number of circuit innovations. Battery-biased crossover networks are still unique in the industry. Forerunners of the current Vandersteen "open frame" midrange and push-pull subwoofer drivers date back to the early 1980s. Aligned Dynamic baffleless designs date back to the late 1970s.

The Basics

Vandersteen speakers are Aligned Dynamic "baffleless" designs. That means that there are virtually no baffles extending to the sides of the drive elements. Each driver is mounted in an individual subenclosure with a front face that is just large enough to contain the mounting flange of that driver. The faces of these subenclosures are staggered to temporally align the drive units. Adjacent structures are rounded and covered with felt to eliminate any reflective surfaces or diffractive edges around the drivers. Woofer enclosures are trapezoidal in shape (as viewed from above) so that no reflective surfaces extend to the sides of the low frequency drivers. Grille cloths are wrapped around dowels placed well away from the enclosure assembly for complete sonic transparency. The driver outputs are blended with first-order acoustic slope, impedance compensated crossover networks.

Vandersteen uses a variety of diaphragm materials depending on the application. Various metal alloys are utilized for subbass drivers and tweeters. Upper bass, and midrange frequencies are reproduced by mica-filled polymer cones with proprietary profiles. The upper bass/lower midrange driver in the Model 5 has a Kevlar-reinforced cone with a mica-filled polymer skin on one side.

Bass loading varies from model to model. The Model 1 has a bass transmission line. The Models 2 and 3 have dual active drive units (8-inch and 10-inch) that share a common sealed enclosure but operate over different frequency ranges. This unique bass loading system performs like a theoretically perfect QB₃ vented system over much of its range. The Model 5 has a built-in powered subwoofer with a remarkable driver that features a true, symmetrical push-pull motor system. The bass enclosure of the Model 5 is sealed. Midrange and tweeter drivers are transmission line loaded in all Vandersteen models.

Each Vandersteen model is a full range speaker system. Stepping up in the model range buys higher resolution, primarily, along with smoother response and some bass extension. Adding Vandersteen subwoofers improves the midrange definition of all models except the Model 5 which has an integral powered subwoofer.

Vandersteen Full Range Speakers

The Vandersteen Model 1C is a 2-way, floor-standing, truly full range (38Hz-22.5kHz±3dB), baffleless, time- and phase-accurate speaker system with an 8-inch cast frame, curvilinear polycone woofer and a 1-inch alloy dome tweeter. Model 1Cs sell for \$785 per pair! That is not a misprint. Vandersteen 1Cs cost seven hundred eighty-five dollars a pair.

The Model 2Ce Signature is a baffleless, time- and phase-accurate 4-way (Vandersteen calls it a 3-way) speaker system with a 10-inch active bass coupler (low-woofer), an 8-inch cast frame polymer cone woofer, a 4.5-inch linear surround midrange (same cone assembly as the Model 3 but mounted in a conventional die cast frame with ceramic magnet), and a 1-inch alloy dome tweeter. Each Model 2Ce Signature is hand-tweaked in an anechoic chamber to produce response from 32Hz-21kHz within ±1.5dB. Pairs are matched to .1dB (one tenth dB) and sell for \$1,549.

The Model 3A Signature is a baffleless, time- and phase-accurate 4-way (Vandersteen calls it a 3-way) speaker system with a 10-inch cast frame aluminum cone active bass coupler with dual spider suspension, an 8-inch cast frame polymer cone woofer, a 4.5-inch patented “open-frame” midrange and a 1-inch dual-chamber alloy dome tweeter (using Model 5 technology). Each Model 3A Signature is hand-tweaked in an anechoic chamber to produce response from 30Hz-22kHz within ±1.5dB (-3dB@26Hz). Pairs are matched to .1dB and sell for \$3,495 including Sound Anchor rear braces.

The Model 5 is the Vandersteen flagship. It has a built-in powered subwoofer based on a unique 12-inch dual aluminum cone driver with an enormous symmetrical push-pull motor system. This subwoofer is blended with the upper frequency drivers utilizing a passive high-pass filter system which is placed in front of the main amplifier which drives the speaker above about 100Hz. This subwoofer interface is similar to the method used with the Vandersteen 2WQ subwoofer (see Issue 2 of the Audio Perfectionist Journal). The Model 5 subwoofer system utilizes a 400-watt internal amplifier (in each speaker) and offers multiband parametric equalization and adjustable “Q.”

Midbass in the Model 5 is handled by a transmission-line-loaded 7-inch driver featuring a kevlar-reinforced cone with a mica-filled polymer skin. The 4.5-inch transmission-line-loaded midrange driver is the patented Vandersteen open frame unit that has no reflective magnet structure behind the cone. High frequencies are reproduced by a 1-inch ceramic coated alloy dome, dual chamber tweeter. There is a rear facing .75-inch alloy dome auxiliary tweeter and a switch to turn it off. Vandersteen Model 5s cost \$10,900 a pair.

Drivers

The drivers used in the Vandersteen speaker systems range from near-catalog units, sourced from Vifa/Scanspeak and SEAS, to unique Vandersteen designs protected by patents. All drivers have Vandersteen part numbers and are made to proprietary specifications. All drivers are assembled overseas from parts obtained from sources around the world. Vandersteen owns the tooling for all proprietary components, some of which are manufactured in Hanford.

Vandersteen tweeters are modified in the Hanford factory and the level of modification varies with speaker model. The tweeters used in the Models 3 and 5 are quite different from those used in the Models 1 and 2 although they all look similar from the front. All drive elements have die

cast alloy frames (except the active bass coupler in the Model 2) and large ceramic magnets are utilized in all drivers except for the open frame midrange unit which has an Alnico magnet that is made in England.

Vandersteen woofers have linear magnetic systems with extended and shaped pole pieces and copper rings. The 10-inch active bass coupler used in the Model 3 has a filled aluminum cone and a dual spider suspension for extremely long linear travel. The chassis for the symmetrical push-pull subwoofer driver used in the Model 5 is die cast in Hanford.

The “open frame” midrange driver used in the Models 3 and 5 (patent number 5073948) has a curvilinear mica-filled polymer cone and a flat, linear surround. The die cast chassis for this driver is manufactured in Hanford, the magnet assembly comes from England, the cone is made in Germany and the driver is assembled in Scandinavia. This very special midrange is partly responsible for the extremely open, spacious sound of the Vandersteen Model 3 and Model 5 speakers. Here’s why.

Conventional midrange drivers have large magnet assemblies directly behind the radiating diaphragm (cone or dome). Sound coming from the back of the diaphragm is reflected off the magnet and frame of the driver and is reradiated through the diaphragm with a slight delay. Planar speakers don’t suffer from this problem and that’s one reason that planar speakers tend to sound more open than conventional box speakers.

The Vandersteen open frame midrange driver eliminates these reflections as a source of time smear. Removing this reflective time smear improves transient response and makes the speakers sound more open and less “boxy.” The aerodynamic frame and small diameter Alnico magnet used in this driver provide an open path from the rear surface of the diaphragm to the transmission line of the enclosure where the rear wave is terminated without harmful reflections.

Vandersteen uses metal alloys for subbass driver diaphragms which, in his designs, do not

radiate directly toward the listener. He prefers metal alloys for tweeters, too. The metal domes in Vandersteen tweeters are mechanically damped to minimize the inevitable resonant peak that occurs at ultrasonic frequencies.

Vandersteen has chosen a mica-filled polymer material for the diaphragms of his midrange drivers. For this critical range of frequencies, he believes that this material provides the best compromise between softer compounds like paper and stiffer alternatives like metal alloy. We have already discussed, at length, the arguments about diaphragm materials in the articles profiling Dunlavy and Thiel. Vandersteen offers another balance of compromise for you to evaluate by listening.

Dunlavy uses soft diaphragm materials exclusively. Thiel uses primarily aluminum alloys. Vandersteen uses aluminum for subbass, metal alloys for high frequencies and high-tech polymers for midrange diaphragms.

Enclosures

Vandersteen uses individual subenclosures to create smaller baffles around each driver than those found in other speakers. These structures are complex and commensurately difficult to make. Computer controlled woodworking machinery is required to manufacture the elaborate shapes of the various parts used to create the Vandersteen enclosures. Vandersteen has designed and made specialized machinery to automate the manufacturing process but much work must still be completed by hand. For example, there are 32 pieces of MDF material, in different sizes and shapes, used to make each Model 2 speaker. These parts are created by computer controlled saws and multi-axis routers and assembled using custom-built pneumatic jigs and fixtures.

Models 1, 2, and 3 have enclosures made from heavily braced MDF material. Panels in the Model 3 are 1-inch to 1.5-inches thick. The trapezoidal shape of the bass enclosures adds stiffness to the structure and helps to break up internal standing waves. Cabinet resonances were specifi-

cally engineered to be dispersive rather than additive by shaping and arranging the many small parts used to form the enclosures. The mechanical design of the Vandersteen cabinets was accomplished with the aid of FFT analysis.

An accelerometer was placed on all cabinet surfaces and the output analyzed with a computerized instrument during the design process.

The subwoofer enclosure for the Model 5 is shaped like a truncated pyramid and made from constrained-layer damped, 2-inch thick, laminated MDF sitting on a base made from 1-inch thick, machined epoxy laminate material. This bass enclosure has a series of unique braces throughout its interior (see picture on the Vandersteen web site). The head module for the Model 5 is made from 22 laminated layers of .75-inch MDF. The front plate of the head module, on which the drivers are mounted, is made from a 1-inch thick machined epoxy laminate material.

The Models 1, 2, & 3 have hardwood-veneered end caps, available in a variety of finishes, at the top and bottom of cloth-wrapped enclosures. The Model 5 has a furniture-grade wood finish on the lower portion of the cabinet with a cloth-covered bonnet crowning the upper portion. Model 5s are available in a variety of standard and custom wood finishes.

Crossover Networks

The crossover networks in all Vandersteen speakers are engineered to provide frequency and phase compensation for the drive elements and to provide first-order acoustic transitions between drivers. All components are of exceptionally high quality, including the unique barrier strip input connectors which facilitate biwiring.

All glass-epoxy circuit boards are double-sided and through-plated. Premium resistors, premium film capacitors and air-core inductors wound with 6n copper wire are used throughout. Critical components are encapsulated in potting resin to make them immune to vibration. The crossover networks in the Model 5 use battery-biased film capacitors as do the external high-pass filters used with the Model 5 speaker system.

Models 1, 2, & 3 have unique thermal protection circuits which prevent damage to the midrange and tweeter drivers in the event of a severe overload. This makes these models ideal for home theater use.

Quality Control

All speaker components are individually performance tested. Drivers are selected, matched and coded for response characteristics. Driver response characteristics are recorded to aid in speaker matching and to facilitate future replacement. Crossover components are tested and selected before assembly. Completed crossover networks are individually tested and matched to .1dB tolerances.

All speakers are high-power sweep tested and performance verified by computer instruments. All "Signature" models, and the Model 5, are individually tested in an anechoic chamber where crossover components are hand tweaked to achieve the advertised performance specifications. Speaker pairs are matched to .1dB (one tenth dB).

Model 5 cabinets are hand finished and inspected at all stages of assembly.

Strong Points

Vandersteens offer a unique combination of smooth, musical sound and high resolution. When driven by the best electronic components, Vandersteen speakers produce a more focused and three-dimensional image than most other speakers, regardless of type or cost. You hear more of the signal and less of the speaker, in my opinion.

They cost far less than speakers with fancier cabinets and comparable component quality. Each model in the Vandersteen line provides performance that can be favorably compared to speakers costing twice as much or more.

Models 2 and above can be biwired or passively biamped. Vandersteen subwoofers blend seamlessly with all models except the 5 which has a built-in powered subwoofer.

Even the lower-priced models in the line provide full range response with bass extension that is unrivaled by competitors costing far more.

Negative Considerations

Vandersteen speakers do not present a difficult load to the amplifier but they do have low nominal impedance and they are relatively low in sensitivity. They will require more amplifier power than higher sensitivity designs and they will not play as loud as speakers with higher sensitivity or steep-slope crossover filters.

While inexpensive amplifiers will drive Vandersteens, the shortcomings of less than state-of-the-art electronic components will be mercilessly presented to the listener by these high resolution speakers.

The unique bass loading system of the Vandersteen Models 2 and 3 allows these products to produce lots of bass energy down to very low frequencies. Some listeners may prefer a tighter, leaner low end with more definition. Vandersteen subwoofers provide the solution here.

Vandersteen speakers, with the exception of the Model 5, may seem to be dynamically compressed to some listeners. I believe that this is due to a reduction in distortion, particularly baffle distortion, to which many listeners have become accustomed. Subwoofers can increase the perceived and actual dynamic range potential of most Vandersteen models.

The low price tags on Vandersteen speakers may be confusing to the novice buyer. These are high resolution loudspeakers that should be used with associated equipment of the highest quality. They are seldom demonstrated or reviewed that way. Consumers and reviewers who have been told that they should spend two-thirds of their audio budget on speakers will need to be reeducated.

Measurements

Vandersteen speakers deliver impeccable measured performance. They are demonstrably accurate in both frequency and time domains. The alloy dome tweeters produce some minor ringing on the impulse and step response graphs. This is due to energy storage at ultrasonic frequencies. Is this a reasonable trade-off for higher resolution?

We'll discuss this question in the next issue of the Audio Perfectionist Journal.

The Vandersteen measurements show a wider range of frequencies, 100Hz to 40kHz, and have 5dB increments per division. These graphs are not accurate below 300Hz. Ignore the lower portion of the range between 100 and 300Hz. Note that the tweeter resonance is well above the audible range and that high frequency bandwidth extends far above the range of soft dome tweeters to -6dB at 30kHz.■

Journey to Enlightenment

From Bipolar Speakers to Time- and Phase-Accuracy: A Personal Journey into High-End Audio by *Shane Buettner*

As a complement to Dick Hardesty's work on time- and phase-accurate speakers, Dick thought it would be interesting for you to read a testimonial regarding my own experiences in the last year. This time period started with me using Definitive Technology bipolar loudspeakers and, after experiencing several high-end speaker systems, culminated with me buying a reference system of Vandersteen loudspeakers (just as Dick predicted I would after gaining more experience).

For me, this journey is very much about being exposed to a higher standard and set of perspectives on audio than the current home theater gurus promulgate. The attitude that products out there are "good enough for home theater" is keeping people from being exposed to truly high-end audio products in many cases. This is pervasive in the industry, from what you'll read in the magazines that support the industry, to what you'll likely be shown on a showroom floor by dealers of home theater products. But trust me, there is a higher fidelity, truer experience to be had if you're willing. I wrote a song about it, and now I'm gonna' play it for ya'....

My Roots

I'm 31 years old. As long as I can remember I've been emotionally involved with books, music and movies, and not necessarily in that order at any given time. I was an avid vinyl collector in my later years of high school, and throughout college. A college roommate and I collected records and shared a system to play them on. (At one point we even had a huge pair of Acoustat electrostatic speakers that we used to cram into the tiny apartments we lived in!) When we went our separate ways the turntable went with him and, with the CD boom in full force,

I started collecting CDs from that point on. It was the most convenient thing to do.

CD collecting was coincident with an increased involvement with film and movies on home video. I bought a laserdisc player to experience films in their original aspect ratios and remained very focused on movie watching. I still listened to a lot of music but I wasn't nearly as involved with it emotionally. At the time I thought this was simply because I was watching more movies and reading more books. But, as I found out, it was something more.

Six or seven years back, I swapped out the Harman Kardon integrated amp that I had used through college for a Pro Logic surround sound A/V receiver. I had a big screen TV and a laserdisc player, and I enjoyed watching movies on this system very much. But I found I was listening to music more often in my car than at home. Then one day I upgraded my laserdisc player from a lower end Pioneer player to a Pioneer Elite CLD-79. This not only improved the video end of the movie experience, I accidentally re-discovered music as an emotional experience through the CLD-79, which was a decent CD player.

All of a sudden instead of a congealed tangle of sounds creating each song, I could hear the instruments that made up the band when the music played. Digital didn't sound as bad all of a sudden, and I began to focus much more on music and became emotionally involved with it once again. From that point on music playback began to enter into my purchasing decisions again, but getting access to reliable information on which products fit that particular bill became another obstacle. As much as I'd like to debunk some of the myths regarding front-end electronics and their suitability for music as well as home theater, I need to stick to speakers, so, now that you have some background on me, let me re-focus.

The Home Theater Years

Over the last several years I've used two brands of loudspeakers for the most part: NHT and Definitive Technology. I bought an NHT system several years ago based on their home theater model VT-2. NHT builds a good and honest loudspeaker that's well-engineered, and provides a hell of a lot of performance for the money compared to many conventional loudspeaker manufacturers. I used the VT-2 system for two to three years before swapping it out for another NHT system, this one based on the 2.5i model, which I found to be more satisfying musically.

Over a year ago I swapped out the NHT 2.5i-based speaker system for a Definitive Technology system based on a pair of their "powered tower" bipolar loudspeakers with built-in powered subwoofers, which I had reviewed for Widescreen Review. The Definitives are also a relatively good buy for the money, particularly for home theater. They're very dynamic, to say the least, with the home theater slam and impact that many people enjoy. The resolution overall is pretty good, about as good as the NHTs, but more laid back compared to the rather forward and matter-of-fact sound of the NHTs.

Of course, the signature of the Definitives is the bipolar radiation pattern created by having driver arrays mirrored on the front and back of the speakers, firing in phase with one another. The seductive thing about them is that, in a room like mine, which is a very typical tract home living room doubling as a home theater/listening room, they add a sense of spaciousness without the other colorations and dynamic limitations that electrostatic (or hybrid electrostatic) designs offer. The soundstage of the Definitives sounds relatively focused compared to other conventional designs, but is artificially expanded by the reflected radiation coming off the front wall. What I didn't notice until living with the Definitives for several months, followed by living with a superior monopole speaker system by Aerial Acoustics (that I also reviewed for Widescreen Review), is that this artificial spaciousness is entirely detrimental to image focus and was not allowing me to truly

hear what was happening in the soundstage of music and to the spatial characteristics of multi-channel music and movies.

When the Aerial Acoustics speaker system came in, the improvements were immediate and dramatic. The midrange, in particular, came to life, imparting a dramatic sense of increased resolution. Spatially, sonic images became very sharply focused; it was like going to the eye doctor and getting a new prescription. With some of the multi-channel music material that I had previously appreciated, the increased focus revealed spatial and spectral clues that I simply hadn't heard before. On the DTS CD of Lyle Lovett's *Joshua Judges Ruth* I was able to hear that the mixes on several of the songs put Lovett's voice into all five channels creating a vocal image right inside my head. This effect had actually been mitigated by the poor image focus of the bipoles I had been listening to. But hearing this effect as it actually is on the disc was maddening. Instead of Lovett being a palpable vocal presence in the front of the room, which is a reasonable impression of Lovett being in the room on the regular CD, the multi-channel mix on the DTS disc created a big, fat, lifeless image emanating from everywhere but nowhere in particular. And that's to say nothing of the rest of the mix. You can argue about whether you want to hear how ludicrous some of these mixes are, which accurate speakers will certainly show you.

Up at the front of the soundstage, with two-channel material, the differences between the Definitive and Aerial systems were just as obvious. Instead of an artificially large soundstage up front, the Aerials offered a sharp perspective with space and air around vocals and instruments, and sound that was not at all confined to the physical boundaries of the speakers. But the Aerial's spaciousness did not come at the expense of detail and resolution, which was inevitably the case with the bipoles whose soundstage was undoubtedly blurred as a result of all the reflected energy bouncing off the front wall from the rear-firing driver arrays.

The Aerials also did a better job of sounding less like big speakers with big cabinets. The Aerials are built to a higher standard, with superior damping and extensive cross-bracing. This results in the Aerials doing a much better job of keeping the cabinet from singing along with the music. The midrange and tweeter of the Aerials are isolated in separate subenclosures, with the midrange surrounded by asphalt and wool to prevent coloration in that critical frequency range. This construction quality allowed the Aerials to "disappear" in the room to an extent that the Definitives really couldn't approach.

The experience I've gained in the year since I wrote that review has been invaluable, and the things I look for in a loudspeaker don't allow for the colorations I hear now in bipolar loudspeakers. I like and respect the people I know at Definitive and I hope this isn't taken to sound as critical as it might. I do believe that Definitive offers products superior to many things out there at the same price and even higher. But today my standard is elevated, and let me tell you why.

Exposure to Time- and Phase-Accurate Speakers

During the months that I had the Aerial Acoustics speaker system in my home, I also spent a lot of time listening to music and movies on Dick's Vandersteen system. There were several things I noticed immediately about the Vandersteen system that I would not hear from anything else I listened to. The first thing that struck me was how open and transparent the sound of the Vandersteens was in general, and the midrange in particular. Relaxed, liquid, musical detail and low level resolution that just poured out of... well, nothing. The "baffleless" design of the Vandersteens means that there is no baffle around the midrange and tweeter module at all. I think the main thing that people are seduced by with electrostats is that you don't hear a box around them; they just seem to disappear in the room. The Vandersteen baffleless design imparts much of that same sense of openness and lack of cabinet

coloration. Smooth, grain-free sound with lots of air and extension is what I heard from the Vandersteens.

This sensation of the Vandersteen's open sound, uncolored by large cabinet structures, is interesting to contrast with Dunlavy's speakers, another time/phase-accurate, well-engineered design. While there were many things I admired listening to Dunlavy speakers, I was always aware of those speakers being just what they are: very big speakers with enormous cabinets. At the CES show in January 2001 Dunlavy's room was set up with several of his speaker pairs lined up next to one another. It was always easy to discern exactly which speaker pairs were playing at any given time. The Dunlavy's are certainly more efficient and will play louder, and perhaps more dynamically than the Vandersteens, which will be a strong recommendation for many people. But I just didn't get the same sense of open transparency that the Vandersteens offer in spades, and in the end I found I couldn't live without that.

The other thing that knocked me out with the Vandersteens was the precise and defined soundstage and unparalleled imaging. At Dick's place, when he played a reference quality LP like *Mel Torme and Friends Live at Marty's*, it was spooky in its "you are there" feeling that particular recording imparts. The sound of the crowd, the musicians on stage, the dual vocalists coming from different sides of the stage—it was all there so clearly that I could practically see it. That's imaging! And I could certainly feel it; the connection to the music was physical, just like being there. Needless to say, this experience also renewed my interest in vinyl, but that's a different story for a different day!

Moving on, Dick also played some cuts off of the Q-Sound recording of Roger Waters' *Amused to Death*, and some multichannel music such as Columbia's DVD of the *Best of Sessions at West 54th volume 1*. With the Roger Waters disc, which uses a bunch of phase-related shenanigans to create some very interesting spatial effects, the Vandersteens placed sounds so far out

to the sidewalls that, if I closed my eyes, it sounded like I was in a much larger room, an absolutely enormous space. Sounds also imaged directly above my head at the listening position, an amazing sensation I'd not experienced with any other loudspeaker. Although we were listening in stereo, to the uninitiated I think it might have seemed that the Vandersteen VSM surround speakers on the walls were active (they weren't), so expansive was the imaging.

The *Sessions* DVD features a Dolby Digital 5.1-channel track of a mix that's not nearly as offensive as many of its multichannel brethren. It's an interesting sonic perspective that moves with the camera around the musicians, but it's subtly and tastefully done. The performances are tremendous. This disc illustrates how precise the Vandersteens are spatially, especially on the Rickie Lee Jones cut which has sound moving along the sidewalls and in between the front and surround speakers in a fairly aggressive but still natural fashion. Suzanne Vega's *Caramel* and Annie DiFranco's *32 Flavors* are other examples, with everything from backing vocals and drums to accordions wrapping gently around the soundstage and into the surrounds as the camera pans. Neat stuff, and the Vandersteens make it feel natural, real and emotionally involving.

Emotional involvement is a key issue here. As you'll read in the Journal, Dick's belief is that time- and phase-accuracy are of such paramount importance that experienced high-end enthusiasts should only consider loudspeakers that are accurate in that respect—which means Thiel, Dunlavy, and Vandersteen would be your only choices out there in the wide world of speakers. After listening to the Aerial Acoustics speakers for a long time—which are some of the best (if not the best) conventional speakers I've heard—I must agree with Dick that the time- and phase-accurate designs are in another performance category altogether. Thiel, Dunlavy and Vandersteen all offer superb loudspeakers but, for the reasons outlined above, I connected emotionally to what I heard from the Vandersteens. You may feel differently

and connect emotionally to one of the other two brands, which are indeed outstanding loudspeakers. Reviewers can help point you in the right direction by accurately describing the performance attributes of a component, and hopefully, in some cases, ferreting out the genuine products from the snake oil. Some people want us to do all the work, as we're constantly bombarded with people who say "I've read all the reviews you've done, but is product X better than product Y?" Do yourself a favor, use the reviews as a guide, and go out and listen. Find out which of these recommended products you respond to emotionally and I think you'll be happiest with your purchases.

At Home with the Vandersteens

The Vandersteens had a few more tricks up their proverbial sleeves that I discovered upon having them in my own home. I knew from listening at Dick's that I was getting tremendous two-channel performance with the Vandersteen system I purchased. But I wasn't prepared for just how stellar they'd be with movie soundtracks.

My system is identical to Dick's with 3A Signatures in the front, a VCC-5 center speaker, wall-mount VSM surrounds, and four 2WQ subwoofers for the right and left front and right and left surround speakers, respectively. While this system isn't going to produce action movie explosions louder than they'd be in real life, the Vandersteens, with the 2WQ woofers at the four primary channel positions, have enough transient snap and oomph that I've not missed any of the previous speakers I've had in my room when I watch movies. The imaging in between all speaker positions that made the *Sessions* DVD so involving is also revelatory with movie material. This system presents the most precise 360 degree imaging I've heard yet in my room. And what's more, the time- and phase-accurate VSM surrounds do a better job of providing diffuse ambience (when called for) than any type of diffuse-radiating speaker I've heard. This improvement is an order of magnitude above the performance you'd get from dipole surround speakers or DSP-

based de-correlation from a digital controller. Further, this speaker system is evidence of the absurdity of the extended surround sound "features," such as Surround EX and DTS-ES, now being peddled by the manufacturers of digital controllers and A/V receivers.

The spatial precision of the Vandersteen system is such that I get dead-center phantom images between the surround channels that are much more natural and "real" sounding than any hard center channel could be in the back of my room. And I know of what I speak. During the time that I had the Definitive Technology speakers in my room, I had enough of them that I tried several configurations of extended surround: two speakers at the side of the listening position with one or two speakers along the back wall, as well as two speakers on the back wall and a single center speaker in between. With the Definitives this brute-force approach yielded some increased performance with movie soundtracks encoded in extended surround (which should have been a clue regarding the imaging capability of the Definitive bipolars). But in my room, which measures about 13 feet across and about 18 feet long, the Aerials first, and then the Vandersteens especially, sounded much better with any and all soundtracks in a straight-up 5.1-channel configuration due to the fact that these speakers image in a much more accurate fashion. In all but the largest rooms I don't believe that any more than 5.1-channels of accurate, time- and phase-correct speakers are necessary for realistic, high resolution surround sound.

Of course, all of this is contrary to what some people in the industry are saying. There are some people saying that the alleged success of Surround EX and DTS-ES proves that people want more channels. Some even cite decades-old studies that "prove" that the more channels you have the better and more "realistic" the sound is. Tomlinson Holman himself trumps up a demo of a 10.2-channel system at every trade show, touting that system as the height of realism. All I can say in response is that I seriously wonder if any of

these people have ever heard a properly set-up system of time- and phase-accurate speakers. If they had, I doubt they'd be pushing systems of inferior products that require so many channels to create sound that is still grossly inferior to that attained by my Vandersteen 5.1-channel system. Of course, I think all of this is a moot point anyway.

Surround EX and DTS-ES may have helped some manufacturers sell some A/V receivers, but on the content side DVD producers haven't even bothered to indicate on DVD packaging when a soundtrack is presented in one of these formats. And my guess is that they haven't been flooded by complaints from consumers who care. This is to say nothing of the fact that most people have a hard time cramming 5.1-channels of speakers into their living rooms, let alone 6.1, 7.1, or, God forbid, 10.2 channels!

And Did I Mention the Price?

On top of the fact that I found the Vandersteens I purchased to offer superior performance to anything else I listened to, they cost little more than the Definitives and far less than other high-end competitors' products. The cost of my entire Vandersteen system is \$11,619. This is certainly not chump change, but look at everything that's in this system: a pair of 3A Signatures (\$3,495/pr, stands included), a VCC-5 center speaker (\$1,995), a pair of VSM surrounds (\$949/pr), and four 2WQ subwoofers (\$1,295 each.) That's a hell of a deal for nine loudspeakers, four of which have on-board power amplifiers, and all of which contain proprietary components and technology. The Aerial Acoustics speakers I reviewed, for example, had a system cost of \$25,800 with just two of their subwoofers, and \$15,000 with no subwoofers.

The cost of a pair of Vandersteen 3A Signatures and two woofers is \$6,085. This combination offers time- and phase-accurate performance that is accurate in the frequency domain to tolerances of ± 3 db from 18Hz to 22kHz. Name another speaker, time- and phase-accurate or

otherwise, that offers the kind of performance and accuracy that the Vandersteen package does at anywhere near this price. These are some of the most advanced and best performing speakers available, and yet they're also among the most reasonably priced. What else is there to say?■

That's All Folks

For more information about the speaker manufacturers profiled in this issue visit their web sites.

Dunlavy Audio Labs:
<http://www.dunlavyaudio.com>

Thiel Audio:
<http://www.thielaudio.com>

Vandersteen Audio:
<http://www.vandersteen.com>

This issue included only brief comments about the sound quality of the products described. We'll discuss the sound of Dunlavy, Thiel and Vandersteen speakers in greater detail in the next issue. We'll talk more about time- and phase-accuracy and its importance in stereo systems and how it affects the performance of home theater systems, too.

I'll tell you the truth about center channel speakers and describe why most of them perform so poorly and we'll talk about the surround channels in a multichannel system, and I'll describe some special requirements for accurate reproduction from speakers positioned at the sides or back of the room.■