

# The Audio Beat

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## Crystal Cable • Arabesque Minissimo Diamond Loudspeakers

*"... you simply hear less: less cabinet, less crossover and less driver."*

by [Dennis Davis](#) | April 4, 2016

Regular readers of *The Audio Beat* are forgiven for wondering why we're reviewing Crystal Cable's Arabesque Minissimo for a second time. [Roy Gregory reviewed the company's Minissimo loudspeakers](#), which came in a memorably vibrant shade of orange, back in August 2014. At first glance, the review you are reading right now may appear to feature the same speaker, just in a different color -- except for one small, almost invisible detail: These are Minissimo Diamonds, and on closer comparison, the difference in tweeters is evident but not obvious. However, to quote W. H. Auden, there's always another story, and in this case there's a lot more here than meets the eye.



Price: \$25,000 per pair with stands.  
Warranty: Five years parts and labor.

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One look at the cabinet confirms that much has been carried over from the "vanilla" Minissimo, which remains very much in the product range. The advanced FEA-designed, futuristic-looking cabinet, CNC machined from a single block of resin-based metal matrix to create a curved, thin-wall enclosure, remains essentially the same. The stand, consisting of three internally damped chrome-finished tubes fixed at one end to the cabinet and at the other to a perfectly weighted base, finished in a glossy metallic paint, remains the same. The 155mm (6 1/8") framed, laminated paper-cone bass driver remains the same, although Crystal Cable selects and pair-matches the drivers more rigorously (within 0.3dB) for the Diamond edition. Thus, much of what Roy wrote in 2014 also applies equally to this new version of the speaker.

The changes start with the substitution of a 26mm (1") diamond-dome tweeter for the beryllium-dome original. In addition, Crystal Cable has upgraded the internal cabling to the same monocrystal silver wire used in the Absolute Dream interconnects, speaker cables and power cords, in place of the silver/gold-alloy wiring employed in the standard model. The Diamond also incorporates a further evolution of the company's light-touch, Natural Science crossover, the introduction of the diamond driver allowing the creation of a completely phase-coherent system. The first-order filter incorporates bespoke silver-in-oil capacitors, an ultra-low-distortion air inductor and graphite resistors. The cabinet damping is largely the same, although subtle changes have been made to match voicing to the differences wrought by the driver and wiring modifications. Finally, the Diamond incorporates two pairs of WBT NextGen silver loudspeaker terminals to allow easier integration of the Subissimo subwoofer. An Absolute Dream jumper set is provided for those not using the biwire option, and the downward-firing port of the speakers can be closed for those who add the subwoofer.

The Minissimo Diamond is priced at \$25,000/pair, an increase of \$10,000 over the original model. On paper that seems like an enormous increase for what looks essentially like the same speaker. How much can a diamond tweeter cost? Quite a bit, actually. There are plenty of speaker manufacturers, including Avalon, Estelon, Lumen White, Märten, Kharma and Bowers &

Wilkins, that use diamond-dome tweeters. With few exceptions, however, the models with diamond tweeters have all been very large and extravagantly priced designs, where the extra cost of an exotic tweeter does not represent a significant percentage increase in the parts and build cost of the speaker. The exception of course is B&W, which perfectly demonstrates the economies of scale available in manufacturing. After all, they probably produce more Nautilus 802Ds than the total number of diamond-tweeter-equipped speakers turned out by the rest of the industry put together -- and that's just one model! They actually produce another five models that all use diamond-dome tweeters and all cost less than the 802D. That's how you end up with diamond drive units in speakers that cost less than \$5000 a pair.

Now, compare that to the costs faced by the other manufacturers listed above. In most cases, these manufacturers use a diamond tweeter sold by Accuton, which costs \$2900 off the shelf. Buying in numbers will reduce that, but any savings will be undermined by the need for (and cost of) any modifications to the standard design. The driver used by Crystal Cable is the result of a co-development project with SEAS, whose stock diamond driver costs \$6500. As well as modifications to the mechanical structure and electrical characteristics of the unit to match the system requirements, the voice coil is wound with monocrystal silver wire. SEAS includes a face plate to protect the fragile diamond diaphragm, which Crystal Cable modifies by adding a complex laser cut pattern of its own design that it

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claims is acoustically transparent.

So, given that the standard Minissimo is already an outstanding and highly regarded speaker, why significantly increase the price of a pair by adding a diamond tweeter? Diamond tweeters are created using industrial diamond ground to an ultra-fine dust and then deposited via chemical vapor onto a curved silicon substrate. The diamond dome is separated from the substrate (by dissolving the silicon in acid) and cut to shape by laser. The diamond membrane is then assembled with a surround and voice-coil former. Diamond domes are extremely fragile, hence the need for a shield built over the dome.

The reason for designing a tweeter from diamond is that it is extremely stiff and has relatively low density. This combination of physical attributes corresponds to the Holy Grail of high-frequency driver design, its low inertia allowing the driver to follow the input signal more accurately than traditional dome materials, due to its low mass, while pushing the first break-up mode out to 100kHz or so, well outside audibility if not audible influence. Interestingly, diamond's direct competitor in the high-tech-tweeter wars is beryllium, which is even lighter but not as inherently stiff. Focal, which uses the metal foil, mitigate this with their inverted-dome/inset-voice-coil design, yet another example of the old audio adage that it's not what you use but how you use it that matters, an aphorism that also helps explain why Crystal Cable chose to take the SEAS route. Simply using a diamond tweeter isn't enough. It has to be the *right* diamond tweeter.

Although Crystal Cable suggests that the Minissimo Diamond can be used on a shelf by blocking the port, helping to tailor the bottom end for near-wall placement, the speakers sound best positioned well out from front and side walls, with a relatively nearfield listening position. This combination also minimizes room reflections, which means they have a good chance of sounding great in a wide range of rooms. At High End 2015 and CES 2016, they essentially stood in the middle of very large rooms, the front wall consisting of a fabric barrier. I ended up with the speakers' drivers 7 1/2' apart, with the listening position slightly closer than a classic equilateral triangle. The cabinets are mirror imaged, with a comma-shaped footprint when viewed from above. I found the imaging best in my room with the narrow "tails" pointed in. Because of the speakers' compact size and integrated stands, the setup process was pretty much painless and repeatable. The feet (spikes for carpeting or discs for wood floors) were easy to adjust by hand on the fly, making leveling a snap. The Diamonds are not a plug-and-play set of speakers; they won't sound their best unless you expend the requisite care on placing them well, but they make finding the ideal places uncomplicated.

Crystal Cable rates the speakers as having 83.5dB efficiency with a nominal impedance of 8 ohms. The claimed frequency response is 46Hz to 50kHz. I've twice heard the Diamonds driven by a prototype of Crystal Cable's 200Wpc Cube, and once with my own amp, the 150Wpc Audio Research Reference 150 SE. The Diamonds sounded outstanding with both and did not seem to discriminate when it comes to choosing between transistors and tubes. Crystal Cable claims the Diamonds can be driven by 30 tube or 50 transistor watts, although like most small speakers with limited efficiency, they really thrive on power.

**T**he first thing I noticed while listening to familiar music with the Diamonds is just how rock solid the imaging is. Let me rephrase that: I didn't just *notice* it; the solidity of the images grabbed my attention. This was not merely a matter of resolution, which the Diamond displays in spades. The solidity of the speaker's imaging was surely a result of the low-refraction, reduced cabinet, a function of the unique shape and construction of the enclosure, combined with the lower noise and increased speed of the tweeter and the totally phase-coherent crossover. As good as the standard Minissimo is, the Diamond takes things to an entirely new level.

What do I mean by "rock solid . . . imaging"? All musical signals include overtones that should be reproduced, but less rigorously designed speaker enclosures add reverberation, resulting in a thicker, warmer, sweeter or more tubelike sound. In the best case, these additive elements are consistent and pleasing. All too often they instead appear as muddy bands, adding intrusive discontinuities that distract and impose. Yet the fundamental frequency and harmonic overtones of a musical instrument do not need any additional sweetening. The only things you want moving, and

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making sound, are the drivers, not the enclosure or baffle.

Speaker designers attempt to tackle this problem using an array of materials for the enclosure, generally wood-based or aluminum. Crystal Cable's single-piece, resin-based metal-matrix cabinet may be small, but it is also perfectly formed. The monocoque structure eliminates joints and is far more predictable in its behavior, while the CNC manufacturing allows both the material and its thickness/shape to be optimized for minimum resonance. Crystal Cable uses advanced COMSOL modeling

software in the design process, a package that allows the company to examine not just the mechanical behavior of the cabinet itself, but the gas dynamics inside it. The end result is one of the most advanced and certainly one of the least-audible cabinets out there, a shell far less likely to add its own sound to the drivers and the music than a pile of aluminum plates and bars or slabs of wood product. With the Minissimo Diamond, you simply hear less: less cabinet, less crossover and less driver. The result is more music and more of it in exactly the right place.

Listening to David Munrow's *Two Renaissance Dance Bands* LP [EMI HQS 1249] drove this point home. I picked up this "two Christopher" recording -- Christopher Bishop and Christopher Parker -- in 1971, and I've listened to it on every pair of speakers I've owned and auditioned since. It's one of those recordings, like *Kind of Blue*, where I almost don't need a recording anymore, because the music is fixed in my mind. Yet listening to the Munrow LP on the Diamonds, I heard this recording as never before. Renaissance instruments like sackbuts, crumhorns and period strings can sound flabby and irritating if not well recorded and reproduced, in part because of that buzzy, vibrating quality that was wrung out of most instruments as they evolved from the eighteenth century on. Some of that irritating sound comes from mistakes in re-creation of period instruments, some from the challenges facing the musicians, but much of it comes from the difficulty of reproducing these instruments with a home sound system. With the Diamonds, the sound of the sackbuts and cornetts lost that flabbiness. Combine this with the ease and extension of the diamond tweeter, and for the first time I felt as though I was sitting in my listening room with these musicians lined up around me in tight focus, playing early music instruments as they may have sounded during the Renaissance.

Audiophiles used to speakers without the Diamond's virtues may not be prepared for this adjustment with their favorite recordings. When diamond tweeters first appeared, many listeners complained that they sounded dull. Without the intrusive glare produced by break-up modes just outside the audible band, that's *exactly* how they sounded -- until we got used to their uncluttered clarity and started to appreciate their harmonic accuracy. Now, apply that learning curve to the speaker as a whole and you get a sense of just how far the Minissimo Diamonds move the goalposts. If you're used to your speakers making all tenor sax players sound like Ben Webster, the Diamond's ability to deliver the correct dose of overtones may require some reorientation. Once you've made that adjustment, the other parts of the picture fall into place, because the Diamonds combine that solidity of image with accuracy up the frequency range unmatched by other small speakers -- or most other speakers of any size.

Although many doubt the human ear's capacity to perceive the higher frequencies produced by a diamond tweeter, there's little doubt that orchestral instruments produce energy pushing the 100kHz limit. James Boyk, of the California Institute of Technology, has written that at least one instrument in each instrument family produces energy up to 40kHz and that the spectra of some instruments contain energy well above that point. He points out that 40% of the spectral energy of a cymbal falls above 20kHz and that a trumpet with a Harmon mute produces a spectrum of sound reaching between 70 and 80kHz. At least one study has concluded that frequencies above the hearing threshold still affect perception of sound quality. The Diamonds offer serious support to that proposition.



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Whether it's the Diamond's solidity of image, its frequency extension and accuracy or some other attribute, or (most likely) a combination of these factors, there's no missing the sheer quantity of low-level information that this speaker reveals. More than that, the detail is musically useful, organized in a way that sounds right both temporally and structurally.

The Diamond is like a sonic microscope, revealing the minute cues that let your brain know and appreciate the shape, pitch and intensity of sound. While these speakers sound nothing like the typical studio monitors, they do reveal and organize threads of detail on par with studio monitors. I've listened to Horace Parlan's *Us Three* LP [Music Matters MMBST-84037] many times, in both its original pressing as well as the excellent 45 and 33 1/3 RPM versions released by Music Matters. Rather than potting the front line instruments into the two speakers and dropping the balance of the musicians dead center, *Us Three*, especially the Music Matters reissue, provides an integrated stereo image that sounds like a real studio environment -- but a studio environment in the best sense of the phrase, one single space integrated so well that it could pass for a club date, yet one without the compromised sound of most clubs. However, until I listened through the Diamonds, I never truly appreciated how much of the Van Gelder studio sound was revealed in the recording. Sometimes a studio recording will sound just like that -- with the limitations of the production and studio intruding on the music. The best recordings can trick you into forgetting the studio, fooling you into believing that the band is in your own room, or that you are in the performance space. With great recordings like *Us Three*, the detail provided by the Diamonds is a blessing. On heavily processed or compressed recordings, the blessings may seem mixed.

To take the analogy another step, the Diamonds are also like really good headphones, allowing you to hear into the crevices of the music. But headphones are not very good at integrating those details into a holistic image, incapable as they are of representing any realistic, organized soundstage. The Diamonds are, on the other hand, outstanding in this regard, organizing the extra detail they reveal into a large and convincing soundstage.

It has become fashionable to claim that soundstaging is a superfluous artifact overrated by audiophiles who are unable to appreciate music in its unadulterated form. The most fundamentalist version of this belief implies that mono recordings remain the Holy Grail, in part because they allegedly dispense with dimensional cues. There may be a grain of truth embedded in these ideas, but what is lost is the fact that even the most basic mono recording, if executed properly, should exhibit spatial information, especially height and depth. Granted, the stereo recording process introduces a far greater margin of error, and the history of stereo recording has produced some grotesque examples of soundstaging that are genuinely unmusical. However, a speaker that fails to accurately reproduce information that preserves dimensional cues does not become more musical in the process, nor is the musical information contained within a recorded performance immune from these spatial markers. Musical flat-earthers notwithstanding, every expression of music has dimension, and if either your mind or your sound system cannot reproduce it properly, no amount of toe tapping will repair the damage.

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All of which helps explain just what an outstanding job the Diamonds do when it comes to imaging and soundstaging, but also just how musically engaging and important that is. It's not just a matter of wide, deep and tall, all of which are accomplished in spades. It's not just that the stage extends well beyond the boundaries imposed by most speakers, a single, palpable acoustic space, but that the Diamond has a special capacity for placing everything within that expanse, in precisely the right place. This is an expression of timing and rhythmic accuracy, the fourth dimension of the soundstage. This fourth dimension was already well served by the original Minissimo, but the revisions that created the Diamond display it in even greater relief.

Pete Townshend and Ronnie Lane's *Street in the City* [UK Polydor 2058 944], a 45 RPM single from *Rough Mix*, presents an expansive soundstage. This spectacular recording by Glyn Johns can make any system sound better than

it normally would, with depth and width to spare. With the Diamonds, the size of the stage was somewhat less expansive than expected, simply because its boundaries are better defined. The precision of events is so well structured that it makes the sound on most other systems seem a bit overblown. The organization of the musical material was far more transparent than usual, with the studio layering of, among other things, a string section being clearer than I've ever heard before.

On Speakers Corner's LP of Herbie Hancock's *Flood* [Speakers Corner SOPZ 98-99], the Diamonds reproduced the live recording made in Japan with an image that extended not only far behind the speakers' rear plane, but also one that extended as far in front of the speakers as I can recall hearing. Given the nearfield listening setup, the effect was startlingly immediate -- as my notes reflect, my reaction a simple "Wow!"

The Diamond's excellent staging ability was also apparent with mono recordings. Take Brownie McGhee and Sonny Terry's *Blues in My Soul* [Prestige Bluesville BV 1033]. Backed only by Roy Haynes on drums, the two musicians on this fine mono recording (also by Rudy Van Gelder) should not sound like a glob stuck between two speakers. The Diamonds spread the three musicians out, each occupying his own instrumental space with perfectly sculpted sound filling the space between the speakers, effectively rendering stereo superfluous. And what these speakers did with human voice was simply magical -- I can't imagine an intimate recording like this sounding better or more natural, more convincing or engaging on any speaker, no matter the cost or size.

As kind as the Diamonds are with voice, the magic they bring to piano recordings may be even more impressive and involving -- no great surprise, given that Gabi van der Kley-Rijnveld, Crystal Cable's founder, was a concert pianist. Preparing for an upcoming performance by pianist Maria João Pires, I spent many hours listening to Pires' CDs, among my favorites being the Mozart Piano Concertos Nos.2 and 27 [Deutsche Grammophon 479 0075] and her Wigmore Hall recital with cellist Antonio Meneses [Deutsche Grammophon 479 0965]. The Neodio Origine CD player playing piano music through the Crystal Diamonds was a match made in heaven. The speakers' transparency throughout the piano's range and its ability to turn on a dynamic dime, from pianissimo to fortississimo without the slightest hesitation, suggested a more generously sized speaker than the petite Diamonds. But most telling was the Diamonds' exquisite reproduction of the 1950s LPs of Walter Gieseking playing Debussy [EMI Columbia 33CX 1098, 1137, 1149, 1261 and 1304], recordings I've treasured since I first used a sound system to play classical music. These well-recorded historical piano recordings have never sounded more full-bodied and "right," the precision of the Diamond's timing, dynamic shading and harmonic accuracy perfectly reflecting the piano's expressive range and vocabulary.

The harmonic and dynamic accuracy that serves piano so brilliantly was just as apparent with strings, which can be intoxicating. On everything from demanding showstoppers like Paganini's *La Risata del Diavolo* (Salvatore Accardo, *Diabolus In Musica* [Deutsche Grammophon 477 6492]) to immersive string quartet music (The Suske Quartet, *Beethoven String Quartet Op.130* [Eterna 8 27 454]), the diamond tweeter's extension brought air and texture, without ever sounding stressed or fatiguing. Although it can be ruthless in revealing detail, it never sounded harsh unless the playing or the recording called for it. The additional resolution revealed more harmonic information, saturating and filling out the image with tonal structure, resulting in an effortlessly realistic sound.

While the cost may seem high for such a small speaker, the Minissimo Diamond reached that price point the old-fashioned way, by earning it. The Diamond's remarkable and innovative design, flawless build and exceptional material and parts quality combine with its creators' artistic sensibilities to produce a musical experience shared by few speakers regardless of size or cost. This is not a speaker for those who buy their sound system by the pound. Nor is it the speaker for anyone whose main focus is music played at stadium levels (although the addition of Subissimo subwoofers might satisfy even that requirement).

But for the music lover who values the highest quality of resolution applied to the service of spatial and rhythmic integrity, who wants recordings re-created convincingly in front of him, it would be hard to find a better-sounding and -looking speaker than this one. ☺

## Associated Equipment

Analog: Spiral Groove SG1.1 turntable with Centroid tonearm, Lyra Atlas stereo and Titan i mono cartridges, Nordost Valhalla 2 tonearm cable, Audio Research Reference Phono 2 SE phono stage.

Preamps: Audio Research Reference 5 SE and Reference 6.

Amplifier: Audio Research Reference 150 SE.

Digital: Neodio Origine CD player.

Speakers: Avalon Transcendent.

Cables: Nordost Valhalla 2 interconnects, speaker cables and power cords.

Power distribution: Quantum QB8 AC-distribution unit and Qx4 power purifier, Furutech GTX D-Rhodium power receptacle.

Supports: Stillpoints ESS Grid, Stillpoints Ultras and Ultra 5s.; Neodio Origine B1 supports.

Accessories: Record Doctor cleaning fluid and brush, VPI "magic bricks," Audio Physic cartridge demagnetizer, Shunyata Research Dark Field Elevators, Acoustical Systems SMARTractor, Dr. Feickert Analogue's Platterspeed app.