

EQUIPMENT REPORT



Cardas Audio Clear Reflection Interconnect and Speaker Cable

Fluid and Coherent

Kirk Midtskog

Many audiophiles seem to regard cables with a mix of resentment and begrudging admiration—resentment because cables are just long thin things that move electrical signals to the “real” components in an audio system, and yet they can cost *more* than an amplifier or pair of loudspeakers, and begrudging admiration because astute listeners have recognized that better cables can contribute enormously to overall system performance.

Cable makers continue to have a tough sell, though. They seem to have to constantly justify their existence (and product pricing), and sometimes lament not getting their due respect. The manufacturing and design prowess involved in the production of cables may not be as glamorous as that of electronics or speakers, but some cable designers put a great deal of effort into what they make. Lofty cable prices may offend many of you, but well-made cables can make an astonishing difference. Advances in cable design have proven themselves. Why not take advantage of some of the choices now available?

Background, Design, and Context

Cardas Audio, founded by George Cardas in 1987, has demonstrated resiliency and growth in the highly competitive cable and accessories market. One of the elements of its success is the quality of the wire strands Cardas makes. To my knowledge, Cardas Audio is one of the few companies that manufactures its raw wire in the U.S. A year or two after starting the company, Mr. Cardas apparently approached a wire-drawing factory in New England that was on the brink of going out of business and worked out a partnership to ensure Cardas would get high-quality wire (and the wire factory would get a steady stream of orders to keep it in business). Prior to forming this partnership, Cardas could not procure the quality of wire he needed from either overseas sources or from other U.S. suppliers—at least, not at the prices

he knew he would need to make his cables viable in the market. As you will see in the accompanying sidebar interview with Mr. Cardas, the only other available high-quality wire-drawing sources at the time were in Japan, and they were charging U.S. manufacturers very high prices for the sort of high-purity, slow-drawn wire Cardas needed to realize his design goals. Cardas Audio also makes some of its connectors at a machine shop in Bandon, Oregon, the same small seaside town where Cardas Audio has been located for over 20 years. (Some connectors are machined in various different locations.) As it turned out, supplying other manufacturers with OEM internal “hook-up wire,” as well as raw strands (for windings) and connectors, is now the largest part of the company’s business.

Cardas is known for an easy-to-understand and readily identifiable design principle: the Golden Ratio—the ratio of proportions exemplified by the cross section of a nautilus seashell (the Cardas logo), as well as by the length, width, and height of many ancient Greek buildings such as the Parthenon. This ratio, expressed mathematically, is roughly 1:1.61803398871. So if the width of a building, for example, is 10 units long, the length would be 16.1803398871 units long. What does this have to do with audio? As it turns out, the Golden Ratio not only adds to a building’s aesthetic appeal, but also to its ability to mitigate destructive resonances. George Cardas first applied the Golden Ratio principle to controlling resonances in racecar engines and exhaust systems. He then transferred the concept to decreasing unwanted interactions in audio cables (such as eddy currents, RF radiation and absorption, mechanical resonance, strand interaction, high filtering, reflections, electrical resonance, dissipation factors, envelope delay, phase distortion, harmonic distortion, structural return loss...and probably others I am leaving out). Cardas applies the Golden Ratio to cables through the relative location and size of the various conductors within each cable

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bundle—for instance, the outer conductors are about 1.618 times larger than the conductors in the next inner layer, and this pattern is repeated until the innermost conductor ends up being the smallest.

Cardas not only follows the Golden Ratio in its conductor sizes and layouts, it has also devised a way to match the signal propagation speed of the signal-carrying conductors with the “speed” of the surrounding dielectrics. Cardas’ principle of “matched propagation” asserts that the conductors within a cable charge at roughly the speed of light, but the best solid dielectrics charge at a rate roughly 22 percent slower. This velocity difference apparently causes a sort of “shearing” of the signal, similar to the wake of a boat cutting through water. Cardas does not believe cable “networks” can adequately correct for this conductor/dielectric velocity mismatch. Instead, Cardas precisely applies an additional conductor geometry—in conjunction with the Golden Ratio—involving varied twist and pitch angles specific to each conductor layer. As a result, signals moving through the conductors have to travel a longer distance than the overall cable length, which more closely aligns the conductors’ velocity with that of the surrounding dielectrics. (All conductor layers end up having the same length, but their different spiral pitch angles compensate for their relative distance from the center of the cable bundle.) This “Matched Propagation Technology” reportedly results in reduced underlying noise and increased low-level resolution. Matched velocities are the basis of telephone transmission lines; the telephone companies realize matched propagation with coils spaced at certain intervals. Cardas’ innovation is achieving matched propagation velocities continuously within the conductor.

In cost, Cardas’ Clear Reflection (CR) interconnect/cable (\$1150, 1m/\$2800, 2.5m) falls a little below the halfway point between the model above it (Clear \$2320/\$4750) and the model below it in the Clear line (Clear Light \$750/\$1470). George Cardas told me that he did not design CR to a price point, and I believe him. Cardas’ Director of Marketing Josh Meredith mentioned to me, however, that dealers and customers had pointed out there was, indeed, a price and performance gap in the Clear line before Clear Reflection was added—and quite a large one cost-wise. That price gap used to be filled by the now-discontinued Golden Reference model. Golden Reference and the new CR share some DNA—CR was specifically designed to have some of the warmth associated with Cardas’ traditional, pre-Clear, Golden Reference “house sound,” blended with the resolution, dynamic range, and speed of the current flagship Clear model.

In addition, Clear Reflection speaker cable apparently employs a modified geometry that was implemented in the Golden Reference, but CR has the same forged, rhodium-plated copper connectors used in the flagship Clear Beyond model. CR is “shot-gun” bi-wireable, like Golden Reference was. (Clear Beyond is the only other Clear model that is also bi-wireable.) CR has a black jacket—like the Golden Reference had—with a copper-colored stress-relief bead (at the “Y” breakout for the + and – terminations), whereas the rest of the Clear line has a light blue jacket with black beads. CR interconnect apparently uses a conductor geometry similar to Clear’s, but employs fewer bundles of cable, though CR IC also uses the same connectors as the top Clear.

Listening

Right from the beginning Clear Reflection struck me as both coherent and fluid. Coherent because everything sounded organized and clean, without much interstitial noise or “splashiness,” if you will. And fluid because all types of music seemed to simply emanate with a wonderful sense of ease and immediacy, without any sort of subliminal tension. It was as if my inner dialog were, “Ah, this is nice. Just relax and enjoy the music.” I arrived at these impressions by means of the following audition process: 1) Switching the interconnect between the sources and the preamp and listening for a while; 2) switching the link between the preamp and power amp and listening some more; and 3) changing the speaker cable. I did this a couple of times in my own system and also repeated the process in an audio buddy’s system, a meticulously set-up and beautiful-sounding system. I also swapped my normal reference cables (Shunyata ZiTron Anaconda) to CR, and back again few times. Over the course of two months of listening, nothing altered this baseline “coherent and fluid” impression. The combination of coherence and fluidity allowed the music to take on a calm, non-electronic quality and a sense of “proper balance.” When I considered the unforced blend of drum head-and-body sounds, of acoustical guitar strings and body, or of a singer’s throat and chest, on a recording like Doug MacLeod’s *There’s a Time* [RR], it struck me that the CR’s coherence was responsible for many of those musical elements sounding believably proportioned. This coherent quality drew my attention to the musical progression in the songs rather than to an

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480 11th St. SE
Bandon, Oregon 97411
(541) 347-2484
cardas.com
cardas@cardas.com

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analytical breakdown of the particular sonic minutiae in the mix.

I also noted a light lower midrange emphasis in tonal balance—at least in direct comparison to my reference cables and to my friend's Siltech cables. (Further comparisons are addressed below.) This more “low-weighted” quality helped lend a pleasant touch of warmth to the presentation—just as George Cardas set out to do. Mind you, the level of warmth in relationship to the aforementioned commendable levels of apparent speed, dynamic range, and overall resolution, was not the overriding quality I heard in the CR, nor was this warmth quotient as high as my recollections of the pre-Clear Golden Reference sound, but it still offered a beautiful blend of lovely timbre with image specificity and resolution.

We've already discussed the warmth factor, so let me address resolution next. The CR's kind of clarity tends more towards allowing the greater whole to come through rather than spotlighting those aspects of the sound that might immediately suggest *high resolution* in an audiophile sense. For example, there was a winning balance between the sounds of the whole orchestra and the individual instruments throughout *Miraculous Metamorphoses* [RR]. CR's resolution was also good enough to give me the distinct impression that the first piece on *Miraculous*, Hindemith's *Symphonic Metamorphosis of Themes by Carl Maria von Weber*, was most likely recorded with different microphone placements and/or with different eq than the other works on the same release. (The Hindemith has much more of a front-of-the-hall perspective than either the Prokofiev *Love for Three Oranges* Suite or the Bartók *Miraculous Man-*

darin Suite, with their more mid-hall perspective typical of Reference Recordings.)

As a corollary to resolution, I consider CR's soundstaging and imaging performance to be strong points. The proportions of an overall soundscape are portrayed credibly, with commendable width, height, and depth—as well as depth *layering*. Individual images are rendered precisely and clearly but without exaggeration. Images also have heft and depth, rather than appearing like ethereal two-dimensional cut-outs. Some other cables tend to spotlight aspects of the tonal spectrum. Not so with CR; everything “sings” with a unified voice.

So what we have here are a positive set of sonic qualities in a well-made cable at a very reasonable price—considering its performance and the current market. Can Clear Reflection compete with more expensive cables?

I compared CR to Shunyata Research ZiTron Anaconda interconnect/cable (\$2250/1m, \$4327/2.5m) in my own system and to Siltech Classic Anniversary 770i interconnect (\$2700/1m) and the now discontinued LS-188 Classic Mk2 speaker cable (~\$5200/2.5m when still available)—both without Siltech's SATT treatment—in a friend's system. This puts Clear Reflection (\$1150/\$2800) within a few hundred



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dollars of half the price of the other two cable sets.

In my system, the Shunyata Anaconda sounded more detailed, open, transparent, and revealing. Transient response seemed to be quicker with the Shunyata, and subtle dynamic shadings came through more readily as well. On the other hand, Clear Reflection sounded a little more organized, more relaxed, more liquid, and, dare I say it, more “organic.” I prefer the Shunyata on the whole for its dazzling dynamics and remarkable resolution, but I can easily understand if another listener—in a different system—might prefer the less expensive Cardas for its coherence and musicality.

In my audio buddy’s very well tuned system (Lou is a meticulous set-up guy, bordering on fanatical actually), the Cardas sounded a little more expansive and slightly more focused than the Siltech. The Cardas threw a larger, deeper, and more defined soundstage and individual images were a little better fleshed-out, as well. The Siltech and CR had similar respective tonal balances, with the exception of the CR emphasizing the lower midrange a bit more. (There’s that warmth factor again.) The two cables’ overall performances with dynamics were, for all intents and purposes, the same, but I would give the

CR the edge in overall resolution. Now, I must stress that I have also heard the same Siltech cable in my own system and thought it did some things better than the Shunyata set did, such as throwing a wider soundstage and sounding a little more musically natural in some respects. These comparisons illustrate how cables can perform differently than expected across myriad systems.

So, the answer to the question of whether Clear Reflection can compete against more expensive cables is *yes*. Which cable you gravitate towards will probably depend on your sonic priorities, system, and budget. As a reviewer, I prefer the Shunyata Anaconda for its remarkable transient response, transparency, and open soundstaging (as I’d mentioned). Others will favor the more smooth, silk-like qualities of the Siltech, or lean towards the clean, balanced musicality of the Cardas.

Conclusion

When stacked against more expensive cables, Cardas Clear Reflection held its own and, accordingly, gets high marks for delivering good performance at a reasonable price. Clear Reflection is a fantastic cable in its own right. Cardas is on to something with its blend of the company’s previous Golden Reference design and its current Clear technology. I was charmed by Clear Reflection’s fluid, organized, detailed, and generally musically satisfying qualities. I would not hesitate to recommend it to others and would consider it myself for a second system. Mr. Cardas, take a bow.

An Interview with George Cardas

How has the cable segment of the market changed since you founded Cardas Audio in 1987?

Well it has obviously grown tremendously. Cables have gone from “all are the same” to “most important link in the system.”

Are audiophiles more open to the importance of cables now than in those early years?

In general, yes! Now even the general public is starting to get the message. Mainstream manufacturers are now a big and growing segment of our customers.

What was your first inspiration to apply the Golden Ratio to cable design?

I used it as a resonance control technique when designing racecar engines and two-stroke exhaust systems.

What have been your biggest challenges, both as a designer and as a business owner?

They’ve been mostly personal. The business has grown since the day the door opened. My biggest challenge was deciding where and how to limit the business itself to a “family unit” in size. Obviously, the business has grown beyond all expectations, so...

Your company actually has a partnership with a wire-drawing factory in the U.S. How important is this vertical integration to your business strategy and overall product results?

I do these things because they are essential elements, and, over the years, it has become increasingly difficult to find true quality in metals and metal processing. As it turns out, I supply for the bulk of the manufacturers. I would guess that we produce the majority of the “metal” sold in high-end audio. As time goes on, mid-sized manufacturers are being purchased by larger operations that do not want to be bothered with ultra-refined, slow-drawn products. It seems we are becoming the only game in town.

Do you incur higher costs by manufacturing your own parts and by doing so in the U.S.?

Cost and quality implications run both ways. If you want metal like ours, it would be virtually unobtainable for anywhere near what we sell it for. We went into the business initially because of what the Japanese were charging my peers in the business. Similarly with conductors, we bought or built our own machines for layered Litz winding. It would not be possible for us to trust the job to China, and it would probably not save us anything if we did. The price on cables these days is nuts. We can easily manufacture here and have the control we are looking for. We manufacture all over the globe. On some things like the OEM headphone drivers, it is not possible to get what we want here. This is a nightmare really. I would much prefer to do them in the U.S., but we have no choice. It has taken me decades to develop partners in Asia who share our values, and still it is a constant battle. I am not opposed to outside manufacture if it is a better choice, but money is not the name of the game here; quality and quality control is.

How significant is the OEM side of your business to your overall business approach?

OEM is the largest part of my business. I love working with other manufacturers. They are very demanding and keep me on my toes. My metal would not be where it is today if not for the goading of Bill Low [of Audioquest]. I love helping other manufacturers do what they do best. I have a unique set of personal skills that allow me to figure out better ways of doing things and a love for doing things better. This works for me. My metal is art. My conductors are art. If my friends in the business want to use my “paint” to embellish *their* art, I am honored...in fact, I am dedicated.

When you set about designing the Clear Reflection cables, were you also targeting a return to a form of the “classic Cardas sound,” rather than merely addressing a product price point?

I gave little thought to price point. I didn’t make the product for the point. The product is at the point it is because of its relative cost to produce. Clear Reflection is, in fact, a refinement of Golden Reference. The Clear cables were an experiment in broadband clarity and a test of just how flat a response you can achieve without offending the leading edge of the sound. They are what they are: Clear and fast, neutral and articulate.

The Golden Reference cable is an obsessive bottom-up approach delivering pure musical sound from the bottom up without regard to bandwidth. Those cables felt awesome, but, at the end of the day, were a little dark. The Clear Reflection is an attempt to achieve some Clear-like bandwidth within the bottom-up approach of the Golden Reference. So in answer to your question, my objective was a musical feel I wanted back in my life.

Price points...yeah, I guess this will fill that hole. But think about it: It took something like five years for this combination’s time to come. A price point? I could have done that in a heartbeat.

Is the Clear Reflection speaker cable basically a revival of the Golden Reference conductor geometry, or are there other design elements involved?

Well, yes and yes. It uses the connectors and incorporates several design elements seen in the other Clear models, and the strand layering has a slight adjustment. It adds a lot of fine refinements to a tried and proven design.

Can you please explain how the Clear Reflection interconnect resembles or differs from Golden Reference?

It uses a different dielectric formulation-combination and a different strand layering. The interconnects look similar on paper. The Clear Reflection speaker cable is, to the eye, very similar to the Golden Reference.

You should be proud of your accomplishments in the specialty audio field. What is next for Cardas Audio?

Well, thank you very much! I have an amazing invention related to loudspeaker drivers—especially small ones. I will work on this project until it has wings. We are changing the wire-drawing operation to be able to draw down to unheard-of sizes. (We are looking at 54awg silver.) This will open windows for cartridge and hearing-aid manufacturers, etc. I will go where I can best improve the state of the art. **tas**