

The Audio Beat

"A Timing Machine": Adding the dCS Lina Master Clock

by Vance Hiner



In the world of digital music, jitter -- timing errors that manifest themselves as noise -- is the mortal enemy of good sound. Even a tiny bit of jitter is noticeable to the human ear. It can be like pebbles in your shoe. Sure, you can still take a hike, but the stroll is so much more enjoyable when you finally remove the annoying stuff. Once the distractions are gone, you begin to notice details in the scenery and the tension in your muscles dissipates. Removing jitter from a digital audio source has much the same effect.

Because jitter is noise that our brain's limbic systems rejects as unnatural, its presence makes it difficult for our audio systems to reproduce music in a believable and engaging way. Any significant reduction in jitter makes recorded music sound more alive, more palpable, and more three-dimensional. And that's precisely what I experienced while using dCS's new Lina Master Clock (\$7500). The operative word is more. The Lina revealed more of everything in the recordings I love. Before delving into precisely what I heard, we need to explore how a clock could possibly change the way a system sounds.

Reference master clocks have long been used in professional studios, and dCS has been at the forefront of innovation in that field for decades. These devices keep track of time and synchronize the digital signals from a myriad of sources that are used in sound production. A digital clock is like a conductor in an orchestra, ensuring that all the instruments play together in perfect harmony. The value of such a device lies in its ability to reduce timing errors that can significantly distort the sonics of a recording.

According to the engineers at dCS, by using a separate, high-quality master reference clock, a digital system's sound is more faithful to the source. When all of those 0's and 1's are synchronized more correctly, playback accuracy is improved and overall dynamic performance is enhanced. Timing is critically important for a credible and engaging listening experience because, as dCS's Technical Director Andy McHarg puts it, "The right sample at the wrong time is the wrong sample."

Explaining exactly why an expensive DAC like my dCS Bartók Apex DAC, which already utilizes cutting-edge clocking technology to reduce jitter, benefits from being connected to a master reference clock like the Lina is a bit like discussing macroeconomics or quantum physics. You might need a cup of coffee and a notebook to keep up. While dCS supplied me with an extensive, well-written white paper on the subject of clocking, comprehending the science behind this still involves some heavy lifting.



Here's a brief synopsis of the technology inside the Lina and how it works. It's probably best to start by explaining that no audio signal or digital data are transmitted between the Bartók Apex DAC and the Lina Master Clock. Instead, two 75-ohm clock cables are used to transfer a clock signal from the Lina to the Bartók. One is dedicated to 44.1kHz signals and one for 48kHz signals, ensuring accurate clocking for all audio formats and frequencies. This clock signal oscillates between a high and a low state and acts like a metronome, which the digital circuit follows in time to coordinate its sequence of actions. Digital circuits rely on clock signals to know when and how to execute the functions that are programmed.

Highly accurate transmission of the clock signal is important if a reference master clock like the Lina is to effectively deal with the never-ending challenge of jitter in the digital domain. To give you some idea of how ubiquitous and pernicious jitter

is, consider that the audio playback is plagued by two types of jitter: intrinsic and interface. Intrinsic jitter happens inside a DAC, when things like phase noise negatively impact oscillation. Interface jitter occurs when the audio and clock signals pick up interference as they travel from output to input. Interface interference can come from the digital cable itself or from the cable acting as a filter for certain frequencies. Either way, such interference reduces the accuracy of the square wave output from the clock circuitry and negatively impacts sound quality.

Inside the Lina Clock, and within the Bartók Apex DAC as well, reside two quartz crystals that vibrate at a specific frequency. While quartz crystal oscillators are common in digital audio, dCS uses quartz crystal oscillators that the company claims are better at handling phase noise and are less susceptible to jitter.

This decision to use quartz crystal oscillators has had a major impact on dCS's clock design. Specifically, these crystals enable engineers to set up a Phase Locked Loop (PLL) to deal with interface jitter by narrowing down its bandwidth. The reason this works is that quartz oscillators are less prone to phase noise and the resulting jitter. So, if there's any jitter on the interface caused by something like a wobbly AES signal, the DAC won't be affected because the jitter will come and go before the PLL can even react.



By adding dCS's Lina Master Clock to the Bartók Apex DAC, listeners are able to hear the results of what military strategists might call "a force multiplier." Its contributions are not subtle. For a visual glimpse of all the technology that fits inside the Lina Master Clock, I recommend visiting the dCS website for their fascinating video depicting the complex and painstaking process involved in manufacturing the device.

While consulting with dCS's John Giolas for my previous articles about the Bartók 2.0 and Bartók Apex DACs, Giolas would occasionally tease, "If you like what you're hearing, you really need to try one of our clocks." At the time, dCS's Rossini Reference Master Clock had already been extensively covered in the press, so an audition didn't seem likely. When the company unveiled its more affordable Lina Master Clock as a part of its Lina Network DAC system, the planets aligned and Giolas shipped me a unit.

Weighing in at just over 15 pounds and occupying a tight footprint of (4 3/4"H x 8 5/8"W x 13 1/4"D, the Lina could fit quite easily in several locations on my SolidSteel equipment rack. The Lina is a sleek, matte-black odalisque that generates no heat that I could feel with my hands and is so quiet that the only indication the unit is on is a tiny, unobtrusive white LED that is brighter when the clock is engaged and slightly dimmer when it's not.

It's important to note here that the Lina Master Clock has no clocking port to handle digital transport devices. The Bartók (and all dCS DACS) will, however, utilize the 44.1kHz Lina Master Clock reference sync source when playing DSD from file sources, such as those stored on a USB drive or on a network NAS drive via the Ethernet connection. I was surprised to learn that storage-device data as well as streams from Tidal and Qobuz are asynchronous and, therefore, contain no clock information. Given that fact, the accuracy with which a given digital system handles timing is especially critical when using asynchronous sources. It's also one of the reasons the Lina Master Clock has such a profound impact on the sound quality of streaming and playback from a storage device.

The biggest surprise for me, once I engaged the Lina Master Clock, was that I had to re-evaluate conclusions I'd made about familiar albums. The improved timing revealed that the incisiveness of some recordings and the hard-edged leading transients and slap of some instruments were not actually part of the original recording. Some of those crispy edges weren't necessarily the result of engineering choices. Instead, Lina revealed that they were the vestiges of unwanted digital jitter.

I'm a born-again vinyl enthusiast, having come back to the black discs after so many silver ones made me cringe and turn the volume down. What I hear the Lina Master Clock do is bring digital playback closer to the relaxed and natural sound that I've come to associate with a good vinyl rig. Adding the Lina reminded me of what it was like the first time I heard what a Rega turntable can do. The improved pace, rhythm and timing led to toe tapping and head bobbing. With apologies to H.G. Wells, I tell curious non-audiophile visitors that inside the Lina Master Clock there resides a timing machine.

Promotional materials from dCS tout the immersive effect the clock has on their Ring DAC's sound and I cannot disagree with that characterization. Before the clock is engaged, my Bartók Apex delivers the soundstage equivalent of a widescreen format. Once the Lina Master Clock is activated, many recordings are rendered in OmniMax. If you are attracted to scale and scope, you will likely be attracted to the Lina's enveloping impact. For those who are concerned with authenticity, rest assured that music intentionally recorded to represent a more distant, smaller-scale performance is still accurate with Lina engaged. The difference is that those images will be delivered with more dimensionality and heft.

While the Lina Master Clock is shipped with some stock 75-ohm clock cables, Giolas suggested that I swap in a higher-grade cable in order to hear Lina's full potential. Grant Samuelson of Shunyata Research was kind enough to supply Shunyata's Sigma v2 75-ohm clock cables (\$2250 per meter cable) for this article. The resulting improvement was startling. Every sonic advantage I recorded in my initial notes was enhanced by the Sigma v2 cables. The cables did not in any way alter the intrinsic nature of the sound, but it substantially increased the impact. The weight I noticed became heftier. The three-dimensionality I heard took on greater definition.

The result of the cable swap puzzled me, so I emailed Samuelson to ask for a technical explanation for what I was hearing. He replied, "By using our one-quarter speed extrusion process, the conductors in the digital cables are refined, reducing wire incongruities that would induce jitter-related distortions. The TAP and common-mode filters on the clock cables reduce another form of distortion, specifically related to the EMI field and high-frequency noise. Finally, the termination process we use reduces junction impedance." My listening sessions with upgraded clock cables would indicate that any reduction in jitter and other forms of distortion in a digital system has a sonic payoff and that experimenting with clock cables for the Lina is worth considering.

Here's the greatest compliment I can give a digital device. With the Lina Master Clock in place, I find myself listening to streaming music in much the same way I listen to vinyl. I start with the beginning track on an album and rarely reach for the remote until the final track has finished; I'm much too absorbed with the music to be tempted to skip ahead. Streaming files that I've always found a bit grainy and washed out have more weight with the Lina engaged.

For example, Austin troubadour David Ramirez's *My Love is a Hurricane* [Tidal 16-bit/44.1kHz and Qobuz 24-bit/96kHz streams] is a well-produced but highly compressed album. In spite of my love of Ramirez's passionate delivery and the layering of instrumental detail on this recording, I've never felt the instruments and vocals had room to breathe. The Lina

Clock's presentation reveals a depth and fullness of space I've always suspected was on the recording but was somehow obscured or restricted. The recording's compression is still evident, but now I find I can listen to the album all the way through without taking a break. The Lina Master Clock consistently seemed to remove an opaque barrier that had been preventing me from connecting more deeply with some of my favorite music.

Here's another example of Lina's impact on my music-streaming experience. Suzanne Vega's *Nine Objects of Desire* [Tidal 16-bit/44.1kHz and Qobuz 16-bit/44.1 kHz streams] has always been on my digital favorites list as much for Mitchell Froom's elaborate arrangements and engineering tricks as Vega's sharp songwriting. When this album was played back through all of my previous digital rigs, I often felt a bit fatigued by the end of the album, due to many of the compositions' sharp percussive transients and the sibilance of Vega's closely recorded vocals. Played back with the aid of the Lina Master Clock, this recording's layers of lush production detail are undiminished, but the transient edges and plosives have been transformed into a perfectly natural element of the overall sonic landscape.

The Lina has this same relaxing impact on a number of 1990s and early 2000 albums, making them sound much more like an analog source. Could it be that at least some of the listening fatigue I've experienced during streaming sessions has been more a function of jitter in the playback chain than the result of production and engineering choices? I can't be sure, but I can say that streaming music with the Lina Master Clock sounds consistently more organic and effortless.

Speaking of streaming, it's time to address how Red Book CD playback compares to streaming versions of the same titles that have undergone the Lina Master Clock treatment. Prior to the arrival of the Lina, I routinely gave CD playback via my PS Audio Perfect Wave transport and Shunyata Omega AES/EBU cable a noticeable edge over most streaming files. Many CDs had a bit more weight and presence compared to their streaming equivalents. After numerous A/B sessions involving volume matching and other listeners, it turns out that the Lina Master Clock is a transport killer in my system. Even though an occasional CD bested the streaming version, the experience was very similar to comparing the same titles on Tidal versus Qobuz. I couldn't reliably predict which version would have the slight edge. Some were identical, many were a bit better and a few were not as compelling. The Lina Clock consistently improves the sonic quality of streaming titles so much that I no longer feel compelled to check whether the CD is better, unless I happen to notice a deficit in the streaming file I'm auditioning.

Some listeners I know are less bothered by the shortcomings of digital playback than I am. They are fortunate. I have other friends who find that addressing digital's sonic sins with non-oversampling DACs, forgiving speakers, and just the right vacuum tubes to be a much cheaper and immensely satisfying approach to enjoying digitized music. But for those who, when streaming, want to hear mountains of musical detail buried in recordings and the smooth and natural presentation that resembles the best analog, there's no cheap ticket in my experience. In my system, the Lina Master Clock was an addictive device, one I never willingly turned off.