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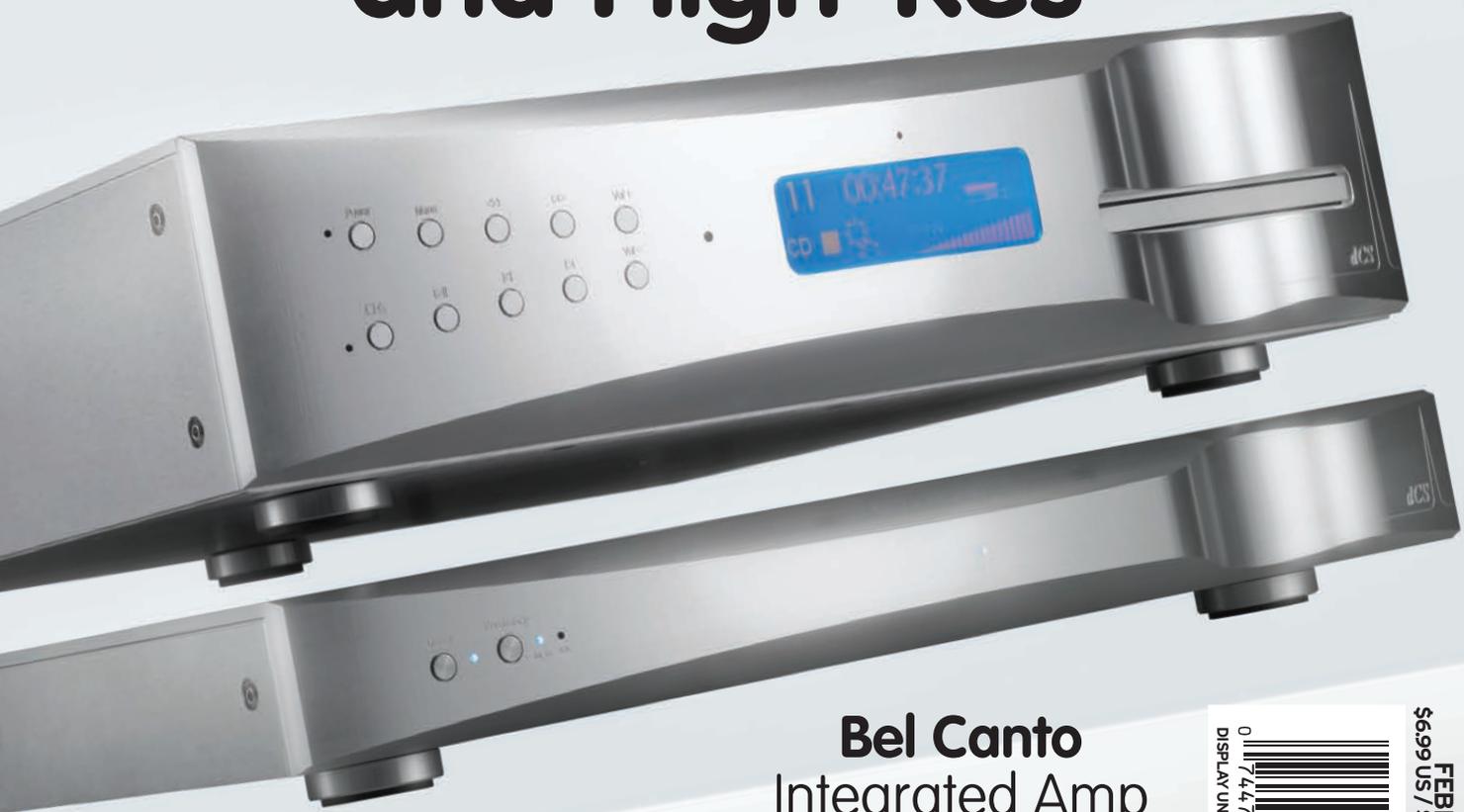
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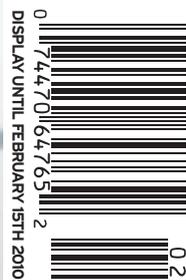
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dCS Puccini CD/SACD Player and Puccini U-Clock USB Converter/Clock

I've lived with quite a few of the most ambitious digital-playback products in my twenty-one years as a full-time reviewer, but somehow never managed to audition a unit from England's Data Conversion Systems (dCS) until now. That's a shame, because the dCS Puccini CD/ SACD player and U-Clock combination has turned out to be one of the world's great digital front ends.

Robert Harley

The company dCS has a long history of technical accomplishments in both professional and consumer audio. The firm pioneered many cutting-edge advancements, including the proprietary "Ring" DAC found in all its digital-to-analog converters (see sidebar). Mike Story, dCS's founder, was also at the forefront of high-resolution digital audio long before it was a commercial reality. I attended a paper he presented at an Audio Engineering Society convention in the early 1990s in which he correctly posited that the sonic improvement rendered by high sampling rates was the result of improved time-domain performance due to the relaxed filter requirements. That's accepted wisdom today, but it was revolutionary nearly twenty years ago. Over the decades dCS has addressed such topics as upsampling, PCM-to-DSD conversion, jitter, noise-shaping, the time-domain performance of digital filters, and other issues long before they became part of the high-end mainstream.

dCS is again taking the technology lead with the U-Clock, a device that vaults the sound of the company's Puccini CD/SACD player into new sonic territory while simultaneously expanding its functionality to incorporate state-of-the-art decoding of high-resolution digital audio from a PC-based music server.

The $17,999 Puccini player is the same model Jonathan Valin commented on in his review of the Scarlatti, dCS's $67,000 three-box statement product (Issue 183). Jonathan concluded that the Scarlatti was the best digital he'd heard, an opinion apparently shared by quite a few high-end manufacturers judging from the number who have purchased the Scarlatti for their own development work or trade-show demonstration. Jonathan also thought that the less-than-third-the-price Puccini was very nearly as good as the reference-quality Scarlatti.

The $4999 U-Clock improves the Puccini's sound quality by delivering an ultra-precise clock to the player, reducing jitter. As has become abundantly apparent, great-sounding digital audio requires extraordinarily precise timing in the conversion of digital data to an analog waveform. My review of the $16,000 Esoteric G-0Rb rubidium clock (Issue 180) created skepticism among certain readers that human ears can detect timing variations that are measured in picoseconds (see, for example, the letter from Dave Martson in Issue 198). The objections to expensive outboard clocks are not based on these readers' own listening experience, but purely on theoretical grounds—conventional clocks *should* be good enough, in their view. But there's a simple way to determine for yourself if jitter is a factor in digital audio reproduction—listen to a Puccini with and without the U-Clock engaged. As we'll see in the report on my listening impressions below, the difference is not subtle.

The U-Clock's second important function is to allow the Puccini CD/SACD player to operate as a digital-to-analog converter for PC-based music servers that have a USB output. The U-Clock takes in digital audio data from a PC on the USB interface and converts it to S/PDIF for presentation to the Puccini. That might not sound like a big deal—one can buy a box for $250 that does the same thing—but dCS has engineered a state-of-the-art USB interface that introduces absolutely no sonic compromises. Rather than considering USB a limiting factor in PC-based audio sound quality, dCS believes USB is the *optimum* interface if engineered correctly.

In most digital interfaces, including S/PDIF, AES/EBU (a variant of S/PDIF), and FireWire, the source component (the CD transport or PC music server, for examples) is the master clock to which the receiving device must lock. Virtually all USB DACs operate in this way, which is known as "Adaptive Mode." Asking the receiving device to lock to the source's clock is problematic for several reasons. Although the USB interface was never designed for transmitting high-quality audio, it inherently has the ability to allow the receiving device to control the data rate from the source device—a feature not possible with S/PDIF, AES/EBU, or even FireWire.

dCS has developed its own technology for exploiting USB's built-in "feedback" system which allows its own high-precision clock to serve as the master, forcing the source (the PC-based music server) to slave to that clock. This technique, called "Asynchronous Mode," transforms the USB interface into a high-quality interface. Rather than the computer establishing the clock precision (not a good idea for many reasons), the entire audio system is clocked by a high-precision crystal inside the U-Clock. Note that an asynchronous USB interface doesn't automatically confer low-jitter and better sound; it still must be implemented with a high-quality circuit.

Moreover, locating this asynchronous USB interface in a separate chassis (the U-Clock) rather than in the DAC itself has many benefits. First, noise in the PC is isolated from the DAC by the U-Clock. Second, the DAC needn't incorporate another clock running at a frequency unrelated to the audio-based clocks. Multiple clocks running at different frequencies within the same chassis can introduce cross-contamination.

The U-Clock is an apparently simple, yet brilliant, solution to adapting a CD player (the Puccini) to the needs of music-server owners. It solves sonic compromises of the USB interface with state-of-the-art design and implementation in a separate chassis, as well as allowing music-server users to decode files through the Puccini's outstanding DACs.

Although Jonathan covered the Puccini as a CD player in his review, let's recap the machine's highlights. The unit is simply stunning visually, with gracious curves and an unusual surface pattern etched into the shiny aluminum front panel. My only complaint is that the front-panel button markings are small and hard to read, a problem that diminished with familiarity. The drawer mechanism of the Esoteric-sourced transport is all-metal

and operates silently and smoothly. A front-panel display allows the user access to a wide range of controls through an extensive menu system. One of these controls allows the user to select whether and how the signal is upsampled. One option is to convert any resolution PCM (from CD or files from a music server) to DSD before decoding (the other option is PCM-to-PCM upsampling). I found that the PCM-to-DSD conversion sounded the best, and this was the option I used for nearly all my auditioning. The display shows the clocking status via a clever icon of two gears meshing. The Puccini will decode 44.1kHz, 48kHz, 88.2kHz, or 96kHz, all with up to 24-bit word length. Note that it will not decode 176.4kHz (such as Reference Recordings HRx files) or 192kHz.

The rear panel offers both balanced and unbalanced outputs, along with digital inputs and outputs (two each on RCA jacks). A BNC connector accepts the clock signal from the U-Clock. The Puccini has a variable output, enabling it to drive a power amplifier directly. You can select a maximum output level of 2V or 6V; I recommend the 2V setting if you are driving a preamplifier.

The U-Clock matches the Puccini visually, and the two look stunning together. The front panel has just two pushbuttons and three LEDs. The leftmost button and accompanying LED is intriguing, to say the least. Marked "Dither," it modulates the clock edges in a controlled way in an effort to improve sound quality. It's counterintuitive that changing the timing of the clock edges could make the Puccini sound better, but dCS found that this small variation "exercises" the PLL in the Puccini and results in better sound. The modulation is easily filtered by the PLL. You can judge for yourself simply by turning dither on and off. The second button selects the clock frequency, either 44.1kHz (used for 44.1kHz sources and multiples of 44.1kHz, including SACD) and 48kHz (for 48kHz and 96kHz sources).

Puccini/U-Clock delivers an enormously appealing and involving musical presentation

Listening

I started by listening to the Puccini as a CD and SACD player without benefit of the U-Clock. It was immediately apparent that this was one serious contender for the best digital I'd heard. The sound was immensely appealing, particularly the gorgeous, liquid, and glare-free midrange. The presentation was a bit set-back rather than forward, with tremendous depth, clarity, and transparency. There was also an intangible sense of sonic coherence that manifested itself as a kind of "musical rightness." Whatever the Puccini was doing, it was different from other great digital I've heard.

After getting a general impression of the Puccini itself, I engaged the U-Clock. One little front-panel button-push vaulted what was already a spectacular sound into entirely new territory. The U-Clock snapped images into sharp(er) focus, increasing the sense of clarity, precision, and definition I had enjoyed from the Puccini alone. The heightened focus had a profound effect on the sense of instruments existing within an acoustic. Without the U-Clock, reverberation tended to be connected to the image itself, as though the image and the hall were merely variations of the same sonic cloth. With the U-Clock, the instrumental image was presented as a clearly defined object existing *within* an acoustic space rather than simply fused to it. The instrument and the surrounding acoustic were presented in a closer facsimile to what we hear it in life.

That was just the beginning of the U-Clock's magic. The Puccini's reproduction of timbre, which already had a bell-like clarity, was taken to a new level by the U-Clock. Timbres had greater palpability and realism, partly the result of less grain and edge (which were already very low) and partly because of greater resolution of textural detail. Similarly, the U-Clock made the Puccini's reproduction of transient information even more lifelike. The leading edges of piano attacks, for example, had a trace of edge that vanished with the U-Clock engaged. Listen, for example, to the wonderful new recording of Vassily Primakov performing Chopin mazurkas on Bridge Records. The U-Clock made the piano more lifelike in transient attack, in richness of tone color, and particularly, in the sense of space surrounding the instrument. I pulled out this CD as a diagnostic tool to listen for specific sonic attributes of the U-Clock but immediately forgot about the sound and listened to the entire disc, completely captivated by the

synthetic gray pall overlaying tone colors, grain and glare embedded in timbres, and a sense of haze or opacity between you and the music. Instruments and voices were vivid and alive, yet the presentation was never forward. In fact, the sound was relaxed and engaging despite the sense of immediacy. Background vocals were revelatory in that I could clearly hear the timbres of individual voices and how they blended into each other. I was also struck by the sheer realism of Neil Young's guitar on some 96kHz/24-bit tracks from *Harvest* sourced from the music server; it had more "guitarness" and less of a mechanical sound than I've heard from this track before. I got the impression of greater density of information, but not in an analytical way. I've heard a number of digital products that sound very clean, precise, and transparent, but those qualities are often accompanied by a mechanical character, a coldness or a stark sterility that doesn't foster musically intimacy. The Puccini/U-Clock's central triumph was the ability to sound super-pristine and precise, yet simultaneously warm and involving.

An analogy that came to mind to describe the Puccini/U-Clock's density of tone color and liquidity of timbre is of two identically colored bed sheets, one made from 600-thread-count cotton and the second made from 400-thread-count material. Put the 400-count sheet through the wash a few times and leave it in the sun for a day. Now compare the two sheets. The 600-thread-count sheet is finer in texture, smoother, and more continuous. It's also more richly hued and vibrant. The Puccini's rendering of instrumental timbre is like that of the 600-thread-count sheet, while most other digital is analogous to the 400-thread-count sheet.

In addition to this remarkably naturalistic rendering of timbre, the Puccini threw a stunning sense of space and depth, revealing the size of the hall and the spatial relationships between instruments. In addition, the background was jet-black which further highlighted the sense of image tangibility. The pair's exceptional low-level resolution contributed to expansive sound as fine spatial cues in the back of the soundstage were rendered with great clarity. Reverberation decay was stunning in the way it maintained resolution down to the lowest levels, the smoothness of the decay, and the way it seemed to hang in space. This is one area where state-of-the-art modern digital is vastly better than earlier efforts, which truncated reverberation decay and sounded coarser and coarser at lower and lower levels.

compositions and Primakov's expressive performance. Such an experience is always the sign of a great component.

In short, if you own a Puccini the $4999 U-Clock is an essential upgrade.

The Puccini/U-Clock combination was "plug 'n' play" with regard to the USB interface. I connected a generic USB cable from my fan-less, drive-less PC server to the U-Clock, selected the appropriate input on the Puccini, and the system played back my music files at a variety of sampling rates. I listened to files at 44.1kHz, 88.2kHz, and 96kHz from the server, as well as CDs and SACDs played in the Puccini's transport.

Getting back to the sound of the Puccini/U-Clock combination, I found myself consistently and deeply engaged with the music. The dCS pair had a different presentation than I've heard before from digital that is difficult to describe. The Puccini/U-Clock was distinguished by a pristine clarity of timbre along with a crystalline-like transparency of soundstage. It simply lacked the artifacts we associate with digital, such as a

I found the Puccini/U-Clock highly involving rhythmically. The bass was extremely punchy and dynamic, with a very tight and controlled quality. I heard a dynamic coherence from top-to-bottom, as though the music "gelled," heightening the feeling of musicians locking into a groove.

There's one area in which the Puccini/U-Clock significantly distances itself from all competition, and that is in the reproduction of very fine high-frequency transient detail. I was floored by the Puccini's resolution of micro-detail—think brushes on cymbals, shakers, the zils on a tambourine, gently struck triangles, and güiro. The lower the level and the more transient the nature of the signal, the greater the extent to which the Puccini outshone other digital I've heard. Information that was simply blurred by other digital was resolved with pristine and vivid clarity by the Puccini. For example, the triangle on Rachmaninoff's *Symphonic Dances* had a delicacy that vividly conveyed the mechanism by which the sound was made. It wasn't just a high-frequency transient, but a pitch accompanied by a strong sense of attack, ringing, and decay. But the track that most dramatically illustrated the Puccini's unmatched performance in this area is the beginning of "Valentino" by Victor Feldman on the JVC XRCD title *Audiophile* (a compilation of two records made in the 1980s, engineered by the great Alan Sides). The track starts with a rain stick behind Hubert Laws' gentle flute passage. I've listened to this track countless times over the years, but have never heard the individual beads moving through the rain stick with such startling clarity. I point this out not because I enjoyed this quality for its own sake, but rather to illustrate how the Puccini accurately conveyed very fine transient detail, and how this fidelity fostered a sense of hearing the instrument itself rather than a reproduction of it.

It occurred to me that one reason the Puccini/U-Clock rendered timbres with such realism could be this fabulous resolution of low-level detail, particularly low-level transients. Musical waveforms contain a richness of micro-dynamic structure (a reed moving back and forth, for example); accurately conveying that structure makes instrumental textures and tone colors more lifelike. Although we're not consciously aware that the timbral realism is derived from this micro-transient information, it's simply one less cue to the brain that we're hearing a reproduction rather than the instrument itself.

Although I don't have nearly as much experience with cutting-edge SACD playback as I have with CD, I thought the Puccini/U-Clock's rendering of SACD was the best I've heard. Interestingly, however, the Puccini/U-Clock's reproduction of CD was so good that it narrowed the gap I usually hear between CD and SACD.

Finally, you're probably wondering how the Puccini/U-Clock compares with the other great digital I've heard lately, including the Meridian 808.2 and Spectral SDR-4000 Pro CD players, as well as the Berkeley Alpha DAC. Starting with the Alpha DAC, the Berkeley unit was a bit more forward in spatial presentation, presenting the front of the soundstage a little closer to the listener. The Puccini's bass was leaner and tighter, with the Alpha DAC sounding "bigger" in the bottom end but somewhat less controlled. The Alpha DAC excelled at macro-dynamics with greater impact on timpani strokes, and also with

SPECS & PRICING

Puccini CD/SACD player/DAC
Conversion: **dCS Ring DAC**
Sampling frequencies: **Up to 96kHz/24-bit**
Inputs: **S/PDIF (x2) on RCA, clock on BNC**
Outputs: **S/PDIF (x2), balanced analog on XLR, unbalanced analog on RCA**
Dimensions: **18.1" x 4.4" x 15.8"**
Weight: **26.6 lbs.**
Price: **$17,999**

U-Clock
Outputs: **Clock signal on BNC (x4), S/PDIF on RCA (x2)**
Inputs: **USB**
Dimensions: **18.1" x 2.3" x 16.1"**
Weight: **16.7 lbs.**
Price: **$4999**

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jquick@dcsltd.co.uk

a warmer and fuller rendering of bass guitar. As great as the Alpha DAC is, the Puccini/U-Clock combination bested it overall with a smoother rendering of midrange textures, a heightened sense of space, and, particularly, the resolution of transient detail. The Alpha DAC was at a disadvantage in the comparisons in that it was fed from the same music server as the Puccini, but through an AES/EBU interface rather than through the U-Clock that locked the computer to its timing reference. Also, keep in mind that these are two very different products; the Alpha DAC will decode up to 192kHz sources and has no USB input, disc drive, or SACD capability, but costs less than one-quarter the Puccini/U-Clock's price.

The other contenders for the state-of-the-art in digital playback (at least in my experience), the Meridian 808.2 and Spectral SDR-4000 Pro, make an interesting contrast with the Puccini/U-Clock. The Spectral and dCS better the Meridian in resolution of low-level detail, transient fidelity, and bass definition. But the Meridian excels, uniquely, in its portrayal of dimensionality—the impression of three-dimensional instruments in three-dimensional space. The 808.2 is also remarkable in its reduction of hardness and glare, particularly in poor-sounding CDs. The Spectral's strengths are in its portrayal of soundstage depth and resolution of fine spatial and timbral detail. I thought the Puccini/U-Clock rendered midrange textures with greater warmth and palpability. All four products have their own virtues, and all are contenders for the state of the art.

Finally, you really need to hear the Puccini/U-Clock driving a power amplifier directly to fully appreciate its clarity and resolving power. Even the best preamplifiers shave off some detail and diminish the sense of immediacy and transparency that are the Puccini's hallmarks.

Conclusion

The dCS Puccini/U-Clock pair is an extremely sophisticated piece of engineering. Rather than working within the limitations of off-the-shelf technology, dCS has developed a number of innovative and advanced technologies to extract the maximum performance from digital media. That effort has paid off in the listening room—the Puccini/U-Clock delivers an enormously appealing and involving musical presentation that is in many ways competitive with the state of the art, and in some aspects establishes a reference-quality level of performance.

The dCS' sound was different from other top contenders I've heard, and I struggled to put that difference, and its effect on musical involvement, into words. But if I had to boil it down to a single idea, it would be that the Puccini/U-Clock simply presents more musical information to the listener without calling attention to the fact that it's presenting more information.

I can't overstate how much I enjoyed music through the Puccini/U-Clock; it was absolutely enthralling on CD, SACD, and high-resolution sources. This is a digital front-end I could live with for the rest of my life. tas

Under the Hood

The Puccini features an Esoteric transport mechanism (with a custom drawer) under dCS's custom-software control. In fact, all the software inside the unit is written by dCS. This software can be updated by downloading new code distributed by dCS on a CD. The custom digital filter is implemented in two DSP chips and two field-programmable gate arrays. Four filter types are available, selectable from the front-panel menu system. Filter 1 has the widest bandwidth and is the recommended setting. Filters 2 and 3 roll off at progressively lower frequencies. Filter 4 is the "measurement" filter, and isn't intended for listening. The filter choice affects the amount of out-of-band noise allowed through the system. All the filters are FIR linear-phase types.

When you select PCM-to-PCM upconversion on the front panel, the digital filter feeds a modulator that converts the PCM data to the 5-bit format required by the Ring DAC. If you select PCM-to-DSD upconversion, the filter's output goes through an additional step of converting PCM to DSD before the modulator that creates the 5-bit Ring DAC code.

The Puccini features exactly the same Ring DAC found in the $67,000 Scarlatti. This DAC, developed by dCS in 1992 and under refinement since, completely eliminates a source of distortion in conventional off-the-shelf DAC chips. It is implemented with 20 discrete devices per channel. Its fundamental nature lends itself to converting DSD signals, which is one reason why the Puccini sounds the best in this upconverting mode. (For a cogent explanation of how the Ring DAC works, see Jonathan Valin's sidebar on page 109 of Issue 183.) The Ring DAC's balanced output feeds a fully discrete Class A output amplifier. This is the signal that appears on the XLR jacks. The single-ended signal is buffered by an op-amp-based circuit so that output levels are consistent between the balanced and single-ended outputs (a balanced circuit inherently is 6dB higher in level). The power supply is a hybrid of switching and linear supplies that was newly developed from scratch for this latest generation of products.

The Puccini is a very advanced product, both in its design and capabilities for the user. Note, however, that the Puccini requires greater owner involvement than other CD players with its selectable upsampling, selectable filters, upgradable software, and extensive menu system. **RH**

JV COMMENTS: Well, I was supposed to write a sidebar comment to this review, but what can I say that Robert hasn't already said better in this brilliantly worded and precisely accurate assessment?

I was very curious to see how my best friend and colleague in this industry would react to the Puccini, since he has so much more experience with the finest digital front ends than I do (and than virtually anyone else in this business does). Don't take it as vanity on my part if I say I am delighted that he heard the Puccini as I do. It's not ego, believe me; it's relief. When I reviewed the Scarlatti/Puccini several moons ago, I thought both were "the best digital" I'd heard, but I thought this for a very specific reason and, let me add again, I thought this without having the vast comparative experience that Robert has with digital sources. My reason for loving the Scarlatti and Puccini was that both sounded like analog sources without sacrificing digital virtues. By sounding like analog sources I don't mean they made CDs sound like LPs, exactly. I mean that they shared with record and tape players a more "holistic" presentation than digital typically provides.

To my ear, digital has always sounded—to greater or lesser extents—flat in aspect and piecemeal in presentation. CD and SACD present the trees, all right, right down to the veins in the leaves, but they invariably seem to lose sight of the scope, spaciousness, and sheer volume of the forest. It's not that CDs and SACDs aren't often sonically impressive—and lifelike. LPs do not typically have the extension and dynamic impact of CD/SACDs, particularly in the bottom octaves; nor do they typically have the sheer crystalline clarity of digital sources. But…digital sources do not have what analog (at its best) has: a realistic warmth of timbre and richness of texture inextricably coupled with a lifelike bloom and body that make instruments and vocalists seem three-dimensionally "there"—perhaps a bit less "look-at-me" detailed than digital but more rooted, more present, more complete, more real. CDs and SACDs make musicians sound the way highly detailed photographs look; LPs and tapes make musicians sound the way statues in a statue garden look.

With the dCS Puccini and the Scarlatti par excellence, this changed. The details they were adding didn't just amount to hearing, oh, three more second violins more distinctly in the string section (although you *could* hear three more second violins more distinctly); rather, I was hearing the whole string section (and each violin in it) with a new-found fullness of timbre and texture and an unparalleled (in the digital realm) three-dimensionality and ambient clarity. The dCS's details didn't stand out as individual parts; instead, the parts it was adding were making more complete wholes. Robert put this better than I did when he said that the Puccini "simply presents more musical information to the listener without calling attention to the fact that it's presenting more information." This is precisely correct.

With the addition of the U-Clock, the gap between the Puccini and the Scarlatti (which has its own clock) has narrowed. Robert once described the way timing errors (jitter) affect digital sound by analogizing an unclocked or poorly clocked CD player to hand-held binoculars—with their inevitable image blur caused by the shaking of your hands—and a precisely clocked CD player to image-stablilizer binoculars—which "freeze" what you're looking at, as if you've taken a jitter-free picture of it. Once again, I can't improve on this. This is exactly the difference that I heard with the U-Clock. What was a bit fuzzy—almost literally "jittery"—snapped into focus.

To an extent the U-Clock gives you the best of both the digital and analog worlds: increased (because better focused/timed) detail, and increased (because better focused/timed) wholes. The U-Clock is a no-brainer recommendation, as is the Puccini itself. **tas**