

# dCS Bartók Digital-to-Analog Converter

Written by Hans Wetzel



I like to think I was ahead of the curve when, in mid-2009, I bought a Benchmark Media Systems DAC1 USB (discontinued) off a dude on Audiogon. That was in the infancy of high-end computer audio, and the well-regarded Benchmark was one of the first mainstream DACs with a USB input. My previous source had been a cheap Sony CD changer (don't judge – I was 23), and the Benchmark DAC offered a big step up in sound quality: that immaculate, analytical sound that digital sources of the aughts all seemed to possess. And at the DAC1 USB's modest price of \$1295 (all prices USD), that kind of sound made it a steal.

Since then, DACs costing less than \$2000 have improved by leaps and bounds – now, almost every maker of audio electronics produces DACs that sound not merely good, but great, and in the years I wrote for SoundStage! Ultra sister site SoundStage! Access, which focuses on affordable gear, I heard many inexpensive, high-performance DACs. In fact, until recently, I wondered how anyone could justify spending far more on a boutique ladder DAC or FPGA-based converter when off-the-shelf chips from Asahi Kasei Microdevices (AKM), ESS Technology, and Texas Instruments offered so much sound quality at so little cost. I can't imagine I was alone. I was still thinking that way when the Bartók DAC, from Data Conversion Systems Ltd., aka dCS, arrived at my door, just as COVID-19 began tearing around the globe.

#### Béla

dCS is based in Cambridge, UK, and its Bartók (\$14,500) is named for Hungarian composer Béla Bartók (1881-1945). It may have the lowest price of any dCS model now made, but you wouldn't know that from unwrapping and hefting it. This all-aluminum DAC weighs a substantial 36.8 pounds, measures 17"W x 4.6"H x 17.5"D, and feels milled from a single billet of metal. That feeling isn't far from reality -- the side and top panels are machined from slabs of top-grade aluminum nearly 1" thick. The front panel, too, is aluminum, and the chassis is metal. Digital-to-analog converters don't need to be anywhere near this overbuilt -- a DAC's innards seldom weigh more than a few pounds, and can usually fit in a half-rack-width case. But, as general manager John Quick told me in a FaceTime call, that's not how dCS rolls. They scrutinize every aspect of their creations, to ensure that the consumer is buying not only a product that sounds good, but is fundamentally complete -- as I discovered in ten weeks' daily use of the Bartók.



In short, the Bartók's materials and build quality are fantastic. My review sample, finished in Black (Silver is available), had the solidity of a concrete block, with no rattles or flex, and its overall fit and finish were the best I've experienced. The Bartók's appearance isn't flashy, but its hand-built construction is heroic, with a Volume dial (it doubles as a menu navigator) and other front-panel controls that feel as good as they look. The Bartók's small display grants easy access to its menu system. The menu gives you full control of how to integrate the Bartók into your system, including the ability to choose its output voltage: 6, 2, 0.6, or 0.2V. You can also perform channel and phase checks to ensure that the DAC isn't being unruly, and configure its clocking, including whether to use the Bartók's own clock, your digital source's clock, or dCS's standalone Rossini Master Clock (see below). Many of the configuration choices offered through the menu I won't describe, for fear of putting you in a coma, but I do need to touch on the digital filter options.

The Bartók is an upsampling DAC. Whatever the resolution of the digital signal it receives -- lossy MP3, CD-rez 16-bit/44.1kHz, even hi-rez 24/96 -- it upsamples it to DSD or DXD. Both of the latter formats have their upsides, but dCS doesn't foist one on the user. The upsampled signal is then oversampled and modulated to the dCS's Ring DAC, so that the Bartók is synchronous with a given file's data rate at either 5-bit/2.8224MHz or 5-bit/3.072MHz. Regarding filters, while some digital designers are philosophically wedded to one type of filter, dCS maintains strict impartiality. The Bartók's six PCM filters allow users to a) weigh how much Nyguist image rejection and phase response they'd prefer (F1 through F4), or use b) a Gaussian filter (F5) or c) an asymmetric filter (F6). If you upsample content to DSD, you can use one of four DSD filters (F1 DSD through F4 DSD) that operate in tandem with the PCM filters. There's also native MQA decoding and rendering via the Bartók's Network and USB inputs, which dCS developed after being entrusted with MQA's source code, which audibly clicks into play when the Bartók is fed an MQA signal. As Quick told me, "At dCS we take a view that the ideal digital filter should work with the rest of the D/A conversion hardware to achieve minimal phase shift while doing its job of stripping out all the non-signal errors, or aliases, and the length of the filter should be only long enough to achieve this without generating ringing of its own."

What makes dCS special is the firm's devotion to the field-programmable gate array (FPGA), which it's been using in its creations since 1989. The great majority of DACs use off-the-shelf delta-sigma chipsets that, as noted above, offer very strong performance. The downside for any electronics manufacturer pursuing the state of the art is the dependency on other companies' products while being constrained by those other designers' limitations, philosophies, and choices of components and filters. But the use of FPGAs has allowed dCS and a handful of other companies (e.g., Chord Electronics, PS Audio) to design their own hardware and software from the ground up to meet their precise needs and expectations, with zero compromise. Another plus of FPGAs is that updates of the Bartók's software can be used not only to improve compatibility or stability, but can actually improve its sound quality. Usually, dCS supports their models' software for six to ten years -- this means that, unlike a chip-based DAC, the Bartók should continue to improve over time. dCS components cost a lot of money, but between the long-term product support, their bespoke technologies, their use of a military contractor to make their circuit boards, and every product being hand-built at their Cambridge headquarters, it's hard to argue with how special the result looks and feels.

The heart and soul of every dCS product is the company's proprietary Ring DAC hardware. This comprises a control board, effectively a motherboard, that performs all the voodoo of digital signal processing (DSP), and a fully balanced, dual-mono analog board occupied by 48 unitarily-weighted current sources per channel. These sources are switched at 2.822MHz for a 44.1kHz signal, or 3.072MHz for a 48kHz signal; their outputs are summed, filtered by discrete analog components, then amplified by a fully differential class-A output stage. Like the ubiquitous delta-sigma DACs or the more esoteric ladder DACs, dCS's FPGA-based architecture has pluses and minuses. Its incredible flexibility is potentially offset by measurements of total harmonic distortion and noise that may not be lower than the newest, most expensive, chip-based alternatives. But as we all know, a laser-like focus on improving one aspect of measured performance can often mean lower performance in other aspects. Speaker designers know this all too well -- every speaker model is the result of a balancing act of compromises. dCS has long focused on maintaining the highest levels of linearity. They pursue this through an algorithm that maps and alternates the 48 current sources for each channel.



The Bartók has every input you could ask for in 2020: two AES/EBU, three S/PDIF (one each RCA, optical, and BNC), asynchronous USB, and Ethernet (for network connection). Each AES/EBU input can accept resolutions of 24/192 PCM or DSD128; used together, they can accept PCM signals of up to 24/384. The Network and USB inputs accept signals up to 24/384 and DSD128, and two of the S/PDIF inputs (RCA and BNC) accept signals up to 24/192 PCM and DSD64; the optical S/PDIF connection is limited to 24/96 PCM.

Other connections include a second USB port, for plugging in a thumb or disk drive, as well as a second Ethernet jack, labeled Loop, which is intended to provide a spare 10/100

port as a convenience for low-overhead devices should all local ports be occupied. Balanced (XLR) and unbalanced (RCA) analog outputs are included. There are also three Wordclock connections: two inputs for use with clocks such as the dCS Rossini or Vivaldi Master Clock and an output intended for use with an external clockable source, such as a transport. There's an RS232 port for third-party automation systems. Finally, dCS offers the Bartók with an optional high-quality headphone amplifier, which bumps its price up to \$17,250.

## Setup and use

The Bartók's beauty is in its supreme flexibility. Want to use it as a fixed-output-level DAC with a preamp and power amp? No problem. How about running it straight into a pair of monoblocks? Also straightforward, thanks to its digital volume control. The Bartók can also serve as the bougiest Apple AirPlay or Spotify Connect front end -- it supports both standards -- and is certified Roon Ready. My current reference system is pretty simple: an Intel NUC music server running Roon with Tidal HiFi, and a Hegel Music Systems H590 integrated amplifier-DAC driving KEF's Reference 3 floorstanding or LS50 minimonitor speakers, all connected with wires from AudioQuest, DH Labs, and Nordost. Also in for review was Constellation Audio's Inspiration Integrated 1.0 integrated amplifier. I first used the Bartók as a straight DAC, plugged into the Constellation's balanced inputs. I then hooked up the dCS as a DAC-preamp directly driving the Hegel's power-amp section, via the latter's configurable but unbalanced home-theater input, and also as a fixed-level DAC into the Hegel's balanced inputs. That last arrangement produced the most satisfying sound. I compared the Bartók with a Mytek Digital Brooklyn DAC+. Over my ten or so weeks of listening to the dCS Bartók, I experienced only one minor hiccup: Its AirPlay input seemed to be password-protected. John Quick, er, quickly pointed me to the Bartók's network interface -- entering the Bartók's IP address into a web browser let me see and edit this password, and I was in. That was it.

That done, my experience in using the Bartók wasn't merely great -- it was flawless. I can't overstate how rare that is for a complex, networked DAC. AirPlay and Spotify Connect worked smoothly, without dropouts. Roon immediately recognized the Bartók on my home network, and streaming was dead easy. The dCS's USB input (connected to my Intel NUC computer) and optical input (connected to my living-room TV, itself plugged into an Apple TV and a Microsoft Xbox One) also worked without a hitch.

Even dCS's companion iOS/Android app, Mosaic, begun as an outsourced project and brought completely in-house in 2017, proved excellent. It offers full control of inputs and filters, and even direct access to a variety of musical sources: UPnP, a connected USB drive, Deezer, Qobuz, Spotify, Tidal, podcasts, and Internet Radio. Mosaic connected quickly to the Bartók, and I found it super easy to stream my local NPR and music radio stations and the excellent Men in Blazers podcast, and to navigate my Tidal account. It's not quite Roon in terms of its interface, but it's arguably the best homegrown software I've used in the last couple years. But if you want a dedicated, physical, official dCS remote control for the Bartók, you'll have to pony up another \$600.



Like those of every other DAC I've used that's offered a choice of filters, the Bartók's filters differed only subtly in sound. dCS suggests that DXD upsampling may sound a little more "relaxed" than DSD. The same goes for some of the PCM filters: F1 and F6 might sound quite "open and clear," F4 and F5 more "intimate and robust." Re the DSD filters, per the Bartók's thorough manual: F1 DSD offers the highest bandwidth, while filters F2 DSD and F3 DSD "progressively reduce the out-of-band noise level at the cost of some bandwidth" and should be used "if your system sounds harsh." Because I enjoy a crystal clear, wide-open sound, and favor transient snap over warmth or richness, I spent the great majority of my listening time with the F1 DSD and F1 PCM filters. The opposite of this approach would be to use DXD upsampling and the F5 PCM filter – to my ears, that combination sounded slightly smoother in the treble and slightly fuller through the midrange. But I'll be the first to admit that the effect might have been psychosomatic. Your mileage may vary.

#### Listening -- and loving every second of it

The dCS Bartók arrived at my home on a lazy Friday evening, after I'd finished a long week of work. I'd been watching Netflix on the TV attached to my system, but quickly swapped out the Mytek Brooklyn DAC+ for the Bartók, which I connected to my Hegel H590 integrated's balanced inputs. Through a couple hours of lazy, horizontal listening on my couch, nothing about its sound jumped out at me. But when I went vertical and cued up some music, that quickly changed. First, the dCS reproduced space in a way I haven't heard from the more affordable chipbased DACs I'm familiar with. Soundstages were suddenly wider, deeper, "blacker." And once I'd heard all this while playing some large-scale orchestral music, I couldn't unhear it. Second and perhaps more impressive, the dCS exhibited the kind of organic liquidity I ordinarily expect to hear from a high-dollar analog rig. I immediately began rifling through my music collection, and by the following afternoon felt very comfortable in concluding that the dCS Bartók was the finest DAC that had ever graced my humble listening room.



Consider J.S. Bach's Partita for Solo Violin No.1 in B Minor, BWV 1002, as performed by Viktoria Mullova (16-bit/44.1kHz FLAC, Decca/Tidal). The Allemanda isn't complicated, nor is this 1994 recording distinguished. But my KEF LS50s minimonitors had never sounded better -- those little \$1299/pair two-ways blew me away. In fact, the majesty of the sound of Mullova's instrument -- from the incredible microdetail, to its sheer effortlessness -- transported me back to the last Munich High End show I attended, where I heard room after room full of \$100,000-plus systems creating soundscapes I could only dream of hearing in my own home.

Granted, it's not difficult to make affordable speakers sound their best when you partner them with nearly 30 grand's worth of electronics. But when Mullova and her fiddle appeared before me with terrific image specificity, their sound completely untethered from my KEFs' little cabinets and completely resolved, with a sweetness I'd expect to hear only in a concert hall. I just sat back and let it all wash over me. I was most enraptured by the spatial component of that sound -- it was as if the front wall of my listening room had suddenly disappeared, and I could now see straight back into the recesses of the recording venue, with no veiling of which to speak. The Bartók may well broaden the aural worldview of those digital luddites who bemoan the flow and ease that go AWOL when a run-of-the-mill DAC gets its hands on a musical signal.

The good news continued with Adele's "Rolling in the Deep (Jamie XX Shuffle)." Someone had ripped the original vinyl single (XL/Columbia) of this remix to 24/192 ALAC with all its analog glory intact, and I'd cribbed the file from the guys at Ayre Acoustics at a Consumer Electronics Show a while back. I heard that subtle vinyl grain just above the noise floor, the velvety texture of Adele's magnificent voice, and the snare drumstrokes dancing about the mix, all courtesy Jamie Smith of The xx. Again, the expansive re-creation of natural-sounding space was sensational, leaving my LS50s apparently missing in action as reverb resounded well past the left-channel speaker's outer side panel, and well behind its rear end of polished piano black.



A similar story was told by "Angel," from Sarah McLachlan's Surfacing (16/44.1 FLAC, Arista/Tidal). Her grand piano was larger than life, its keyboard arrayed straight across the foreground of the soundstage, McLachlan's breathy singing dominating the space between the KEFs. What was remarkable was how little I found to describe. Her voice just sounded . . . right: supremely detailed, yet never sharp or brittle in attack or decay, communicating transients in a way so natural and unforced that attempting to describe it further would be a pointless exercise. The delicate stuff out of the way, I swapped out one pair of KEFs for another. out went the diminutive LS50s, in came my big, three-way Reference 3 floorstanders. For a change of pace, I turned to George Gershwin's Rhapsody in Blue (Jazz Band Version), with the Chicago Symphony Orchestra conducted by James Levine (16/44.1 AIFF, Deutsche Grammophon). I was hooked from the opening clarinet glissando -- it positively sailed through the Ref 3s -- and proceeded to mainline this 17:33-long work directly into my consciousness several times in succession. On that journey I heard minute details I'd never noticed before, including countless creaks of musicians' chairs and stands, and plenty of valve and key action from the brasses and woodwinds. About 30 seconds in, there were the faintest of repeated, deep drumstrokes from left rear. I'd never heard them before. So profound was the Bartók's resolving ability that these incredibly subtle details had all of a sudden broached my consciousness and, as with the dCS's talents at recreating space, I couldn't, and can't now, hear this recording any other way. The Bartók spoiled me on every front.



To those poor souls who've suffered my writing before, such hyperbolic prose no doubt comes as a surprise. My style might be described as doggedly anhedonic -- lavish, unrestrained praise from me is as rare these days as civil political discourse. And yet. The Bartók's equally eager, unrestrained re-creation of "Unfinished Sympathy," from Massive Attack's Blue Lines (2012 Mix/Master) (16/44.1 FLAC, VCT/Tidal), left me damn near somnambulant. Every time I'd try to transcribe my thoughts to digital paper, I was left enraptured by whatever tune was playing -- in this case, a B-side from the British trip-hop pioneers. The propulsive bass line was superbly controlled, and Shara Nelson's wistful lyrics rang through in wonderfully three-dimensional fashion.



For a piece of hardware that will never stray too far from the likes of Miles Davis, Diana Krall, and Rachmaninoff, the title track of N.W.A.'s Straight Outta Compton (16/44.1 FLAC, Priority/Tidal) felt like an appropriate outro. From Ice Cube's scowling anger to Eazy-E's signature high-pitched delivery, and the crushing bass line that underlies it all, the dCS just smashed it -- much to my neighbors' chagrin. (My windows were wide open, and I'd set the Hegel's volume level to the wrong side of Loud.) I could feast on this thing's sound for hour after hour and never tire of it, and during my time with it I frequently did just that. What a DAC.

## Comparison

These days, \$2000-\$2500 buys most audiophiles a near-state-of-the-art DAC. Whether an FPGA design from PS Audio or Chord Electronics, a multibit model from Schiit Audio, or a delta-sigma from Benchmark or Mytek, to name just a few, there's no shortage of excellent options. In fact, you could buy a Mytek Brooklyn DAC+ (\$2195) just like mine, plug it into your high-dollar system, and I'm confident you'd be shocked at how clean and resolving its sound is. And you'd be right. My extensive praise for the dCS Bartók might have given the impression that a substantial chasm in sound quality yawns between it and, say, the more proletarian Mytek that hails from Poland. That chasm is narrower than you might think.

With the Bach Partita, Viktoria Mullova's delicious violin sounded about as transparent through the Mytek as it had through the more-than-six-times-as-costly dCS. That alone is a huge achievement. Still, the Bartók's re-creation of the Allemanda was distinct in some

subtle ways. The soundstage was a touch more compressed through the Mytek --Mullova's instrument sounded slightly more two-dimensional. Gone was the dCS's analog-like ease and liquidity, replaced by a more urgent and vivid sound with a more mechanical, stereotypically "digital" feel. I actually enjoy that sort of well-articulated sound, but it's inherently unnatural, and ultimately, I preferred the Bartók's version.

It was a similar story with Massive Attack's "Unfinished Sympathy." I felt I heard all the same microdetails -- but on the macro scale, the Mytek couldn't match the soft touch and finesse to make this track sound as full-blooded and palpable as the dCS. The width and depth of the soundstage were also abbreviated just enough for me to notice. dCS's Bartók is not leaps and bounds better than more mainstream DACs.

But -- once I'd heard what the dCS could do above and beyond the capabilities of more affordable DACs, it was impossible for me to unhear it. Those millimetric improvements in sound quality, wrought by years of dCS's refinement of their beloved Ring DAC architecture, have produced clear benefits that elevate the Bartók's re-creation of music beyond the common and the ordinary -- not far beyond, but for me, crucially beyond.

## Conclusions

There's no question that dCS's Bartók digital-to-analog converter is costly at \$14,500, without headphone amp or remote control, and especially in an age in which high-quality DACs can be had for a fraction of that price. Nonetheless, it took me less than 24 hours to appreciate why the Bartók costs what it does. Its materials and build quality are outstanding, its software is fantastic, and it's about as flexible a DAC as you can buy today, with native support of MQA, Spotify Connect, AirPlay, and Roon, as well as a volume control. Then there's its wide range of filters, and the fact that it will be actively supported by dCS for at least the next five years.

Finally, it just sounds spectacular. It ushered in the highest-fidelity, most musical sound I've heard in my listening room in the last five years. The dCS Bartók DAC earns my highest recommendation.

. . . Hans Wetzel