

Abbingdon Music Research CD-777 (£3195)

If you're intrigued by non-oversampling digital conversion but not fully prepared to abandon the conventional approach, this unusual CD player/DAC offers both options
Review: **Keith Howard** Lab: **Paul Miller**

To explain the significance of Abbingdon Music Research's CD-777 CD Processor – a product that espouses filterless digital-to-analogue conversion but doesn't insist upon it – demands a brief overview of domestic digital audio's early years, from almost three decades ago.

Conventional history has it that when CD players first went on sale in 1982/3, Philips stole a technological march on its Japanese competitors. Not being able to make DAC chips with true 16-bit performance, Philips used 14-bit chips in concert with four-times oversampling. The converters' quantisation noise was thereby spread over four times the bandwidth, giving the 14-bit chips 16-bit specs.

To realise oversampling, Philips had to incorporate digital low-pass filtering to remove digital image components above 22.05kHz (half the 44.1kHz sampling rate of CD). This brought further advantages in that a digital filter was smaller, cheaper and more precise than the analogue filters used by others, and could easily be made linear-phase. Only a simple analogue low-pass output filter was required thereafter to suppress the remaining digital images beginning at 154.35kHz.

PUTTING THE CLOCK BACK

In testament to Philips' ingenuity, other manufacturers soon adopted oversampling and digital filtering too, and today these technologies are all but ubiquitous. Except, that is, for the few manufacturers and their loyal customers for whom the initials 'NOS' have special, iconoclastic significance. NOS stands for non-oversampling and describes a product that not only winds the clock all the way back to non-oversampling DAC

technology but also deletes the brick-wall analogue output filter, thereby allowing full rein to the ultrasonic images that accepted digital practice asserts must be removed. NOS aficionados demur, believing that steep low-pass filtering – let alone steep linear-phase filtering – is responsible for what a significant faction of audiophiles have disliked about the sound of digital audio from day one.

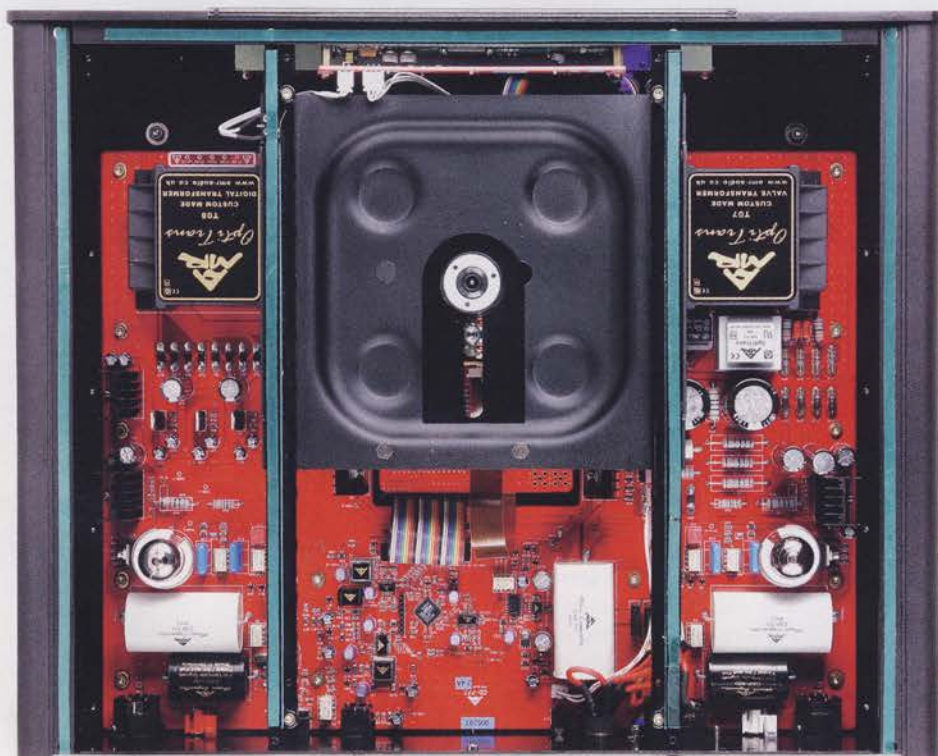
NOS-philosophy DACs are not new, of course – Audio Note, to quote the obvious example, has been making them for years. But DACs that offer NOS output options alongside conventionally filtered ones are rarer still, making the AMR CD-777 – which is both CD player and outboard DAC – an unusual beast indeed. In fact it offers two NOS options, called Direct Mastering I

and Direct Mastering II, two oversampling modes, 2x and 4x, and two upsampling modes, to 96kHz or 192kHz.

MASTERING MODES

Let's begin the tour with the CD-777's top plate, which incorporates the CD mechanism beneath a sliding panel. A small magnetic puck, placed over the disc's centre, holds it firmly in place. To either side of the central disc mechanism three cut-outs in the top plate, which are not quite filled by plastic windows, provide for ventilation while also offering tantalising glimpses of the red circuit board within.

The fascia is simple, comprising a central dot-matrix display panel and, arrayed beneath, five large circular push-buttons. The left-most powers the unit



RIGHT: Sony K-series disc mechanism is controlled by a Philips CD-18 servo mechanism and direct-drive motor using bespoke software. Each output stage uses a 6H1N-EV double triode



up or down from/to standby, the display showing a countdown after power-up as the circuit – which includes a double-triode in each analogue output stage – stabilises. The remaining four buttons offer the usual player controls for the CD mechanism.

To the rear, at either side the CD-777 offers either balanced or unbalanced analogue output via XLR and phono sockets respectively. DAC mode digital inputs are via USB or coaxial S/PDIF, there being no optical input option. An S/PDIF output is provided too, as is a socket for a remote IR sensor. The supplied remote control handset, which is the only means of addressing functions such as switching between CD player and DAC modes and the selection of reconstruction filter, is unusual in offering some controls via its touch-panel and others via buttons beneath.

There are a number of obvious questions to ask of a product like the CD-777, the most obvious of which is: how do the different output modes (NOS, oversampled, upsampled) compare? AMR suggests that Direct Mastering II should be regarded as the default setting, for the reason that Direct Mastering I – the NOS configuration without correction of $\sin(x)/x$ roll-off – will theoretically be 3.2dB down at 20kHz for

CD's 44.1kHz sampling rate, which has the effect of slightly dulling its sound in comparison to Direct Mastering II, where the in-band roll-off is corrected by an analogue filter. The Lab Report indicates that the actual situation is more complex than this, but Direct Mastering II is indeed that little bit clearer and crisper sounding – although, as AMR points out, Direct Mastering I may be preferred with bright source material (or, equally, with bright system ancillaries).

'When ripped, Cassidy's voice swooped and soared freely'



DISC VS RIP

Results with both NOS modes are likely to be system dependent because if the downstream equipment has poor linearity at

ultrasonic frequencies then difference-frequency intermodulation distortion from the unsuppressed digital images may result in sufficient in-band distortion to tip the balance in favour of one of the filtered modes. In my (principally Naim) system there was no such problem and Direct Mastering II mode did indeed reign supreme. Compared to the oversampled and upsampled modes it was simply more open-sounding and ballsy.

This was particularly apparent when playing the scherzo from Mahler's Symphony 6 with the LSO under Mariss

ABOVE: Fascia has five buttons that select standby and provide the usual disc transport functions. Options such as filter choice are selected by using the remote control

Jansons [LSO Live LSO0038], a Tony Faulkner recording (mentioned in these pages before) prepared for CD release from higher sampling-rate masters using Tony's adjacent sample averaging technique, which applies much gentler filtering than is used in conventional downsampling. Unsurprisingly, this track relished Direct Mastering II mode, the CD-777's oversampled and upsampled options seeming somewhat closed-in and mechanical by comparison, echoing long-standing complaints about 'CD sound'.

I say 'disc' but actually I was listening to a rip of the track played via USB connection from a Mac mini running Windows XP and J River Media Center v15. Which brings us to the second obvious question: how does the CD-777 fare as a CD player compared to the CD-777 in DAC mode?

I compared a number of discs and rips, besides the Mahler 6 movement already mentioned, but I'll illustrate the differences using just two contrasting examples: 'El Camino Real' from Jim Anderson's fine recording of JJ Johnson's big band [Verve 314 537 321-2] and 'Songbird' from Eva Cassidy's *Simply Eva* [Blix Street Records G2-10199]. Although the music was very different, my listening impressions (using the USB interface in DAC mode) were broadly similar. AMR claims that its USB input delivers 'computer-based audio at the level of direct CD playback' but I'd say that that sells it short since I consistently preferred the sound of the rip to that of the disc. Johnson's big band sound was significantly crisper, fresher and riper, while Eva Cassidy's acoustic guitar was cleaner and her voice swooped and soared more freely. It's not, I emphasise, that the CD-777 is a let-down in CD mode rather than meticulously realised computer replay can deliver even better results. ☺

DAC'S THE WAY TO DO IT

As with all histories of integrated circuits, the story of Philips' audio DAC chips is an alphanumeric soup. The very first made for its CD players was the TDA1540, a 14-bit design with 4x oversampling to achieve 16-bit performance. Its successor, still revered by many audiophiles, was the TDA1541, a true 16-bit chip usually operated in 4x oversampling mode but which offered the option of non-oversampled operation. Later chips in the series were the TDA1543 and the TDA1545. In seeking to emulate the discontinued TDA1541, AMR has opted to use the UDA1305AT which offers a claimed 3dB better noise performance than the TDA1545A and 5dB better noise and 13dB lower full-scale distortion than the TDA1543. 'The results of listening tests showed it as being closest sonically to the TDA1541 in our implementation,' says AMR's Thorsten Loesch.

CD PLAYER/DAC



ABOVE: Balanced (XLR) and single-ended (RCA) analogue outputs are joined by USB and coaxial digital inputs. The backlit remote control features a smart touch-sensitive display

This decided me on doing the remainder of my listening using the computer source, which brings us to the third obvious question: which is the better of the CD-777's digital interfaces – USB or S/PDIF? The answer will always depend to some degree on the cables employed (I used Wireworld Ultraviolet for the USB connection and TAG McLaren Audio's long discontinued but still excellent S/PDIF cable) but, with a TC Electronic Digital Konnekt x32 FireWire interface providing the S/PDIF signals, I had a distinct preference for the coaxial option.

I used the Elision Ensemble's excellent recording of Brian Ferneyhough's *Incipits* (ripped from Kairos 0013072KAI) for the comparison, a piece that is challenging both musically and sonically, opening with 'obligato percussion' to the right of the soundstage and sawing solo viola to the left. Via the S/PDIF interface both instruments had sharper focus and snappier dynamics, and there was a better developed sense of the recording acoustic.

BETTER WITH CD RES FILES

The listening to this juncture had all been done with 44.1kHz source material because – as stated in the FAQ on AMR's website but not in the owner's manual or in two previous UK reviews of this product – the CD-777 is supposedly restricted to a maximum input sampling rate of 48kHz/16-bits. So if you want to play hi-res files they must be subject to downsampling and word length reduction upstream in the computer. Despite this, AMR claims that 'the CD-777 is still able to provide superior musical enjoyment to most expensive HD capable DACs'.

I have to demur. Provided you avoid the 4x oversampling filter, the CD-777 will play files of 96kHz or 192kHz unmolested via its S/PDIF input [see Lab Report], although the 16-bit resolution limit remains a shortcoming. Via USB it's a different story: files of above 48kHz sampling rate are indeed downsampled by the internal USB receiver.

I compared 16/44.1 and 24/96 versions of two Chesky recordings using the USB interface: Christy Baron's 'Got To Get You Into My Life' and Rebecca Pidgeon's 'Auld Lang Syne'. I normally prefer both in hi-res form but here I preferred them as 16/44.1 files. Other conversion options may produce better results but this goes to show what can happen when a USB DAC doesn't support hi-res files natively.

If your music collection is exclusively CD-res, this may well not bother you. Otherwise the recently announced DP-777 DAC from AMR, which sports a 192kHz capable asynchronous USB interface, looks a better option. ☺

HI-FI NEWS VERDICT

There's something about the sound of NOS DACs that, in the right system, breathes new life into CD replay. In providing a selection of NOS and filtered modes, the AMR CD-777 allows you to judge this issue for yourself, and even choose different filtering according to source material. It's a fine CD player and even better sounding DAC – particularly if you restrict your diet to 16-bit music files.

Sound Quality: 85%

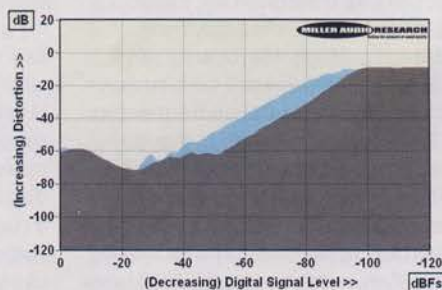


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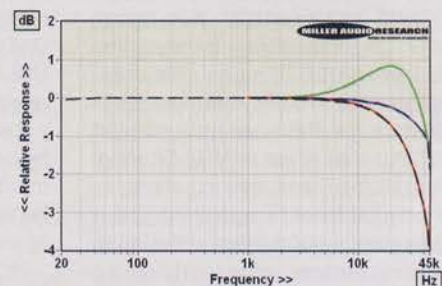
AMR CD-777 (£3195)

The pros and cons of AMR's various digital filter regimes were covered in my Opinion page last month, so this lab report considers the CD-777's underlying DAC and 6N1P tube-based analogue performance. The latter may have as big an impact on the sound of the player, offering a sub 16-bit S/N ratio of 89.93dB (A-wtd re. 0dBfs) with an attendant impact on low-level resolution. Harmonic distortion is also fairly high at ~0.17% through the midrange at peak output, falling to a minimum of ~0.03% at -20dBfs. Distortion increases at lower bass frequencies, reaching ~0.18% at 100Hz just as the player's (balanced) output impedance also increases from 180ohm to 1.1kohm at 20Hz. Stereo separation betrays a similar but unusual deterioration at bass frequencies (<60dB at 20-300Hz), probably caused by cross-coupling through the power supply. Incidentally, AMR specifies an output impedance of <150ohm, a S/N ratio of >100dB and channel separation of >90dB.

Measured in its most linear mode (192kHz upsampled), the CD-777 offers a very flat and extended response with 96kHz (-1.9dB/45kHz) and 192kHz media (-6.6dB/90kHz) although the unfiltered response of -23dB/90kHz in Digital Master I mode is both perfectly acceptable and free of any pre/post-event ringing. The 4x oversampled mode breaks down with 96kHz and 192kHz digital inputs but functions normally with CD. Jitter is both quite high and very complex in nature at 650psec (CD), 800psec (48kHz) and 900psec (96kHz). Readers are invited to view comprehensive QC Suite test reports for the AMR CD-777 player and DAC by navigating to www.hifinews.com and clicking on the red 'download' button. PM



ABOVE: Distortion versus digital signal level over a 120dB dynamic range with 44.1kHz/16-bit CD data



ABOVE: 96kHz/24-bit frequency responses; 192kHz upsampled mode (red/black), 96kHz upsampled mode (blue/black), Digital Master I (red), Digital Master II (green), 2x oversampling mode (blue)

HI-FI NEWS SPECIFICATIONS

Maximum Output Level (Balanced)	2.26Vrms at 180-1100ohm
A-wtd S/N Ratio (CD, 48kHz/24-bit)	92.9dB / 90.2dB
Distortion (1kHz, 0dBfs/-30dBfs)	0.168% / 0.039%
Distortion & Noise (20kHz, 0dBfs/-30dBfs)	0.152% / 0.23%
Freq. resp. (20Hz-20kHz, 192kHz mode)	+0.00dB to -0.30dB
Digital jitter (CD / 48kFs / 96kFs)	650 / 800 / 900psec
Resolution @ -100dB (CD / 48kFs / 96kFs)	±1.4dB / ±4.0dB / ±4.5dB
Power consumption	38W
Dimensions (WHD)	450x120x370mm