

hi-fi news

THE HOME OF REAL HI-FI
& Record Review

Exclusive

VINYL VS DIGITAL

Clearaudio Statement 2 & Chord's DAVE DAC

Rega Aphelion

The new flagship MC pick-up

KEF Reference 1

Exquisite Uni-Q standmounts

Teac UD-503

'Hi-Res' headphone amp/DAC

Luxman L-590AXII

Japan's finest Class A amp?



Music for one

Audio-Technica's closed-back cans

INVESTIGATION

LP sleeve art

HFN explores the world of iconic covers, p26

• **PLUS** 18 pages of music reviews & features • **VINYL RE-RELEASE** The B-52s' debut LP on 180g vinyl
• **OPINION** 12 pages of letters & comment • **VINTAGE REVIEW** Aurex's 15-series micro components
• **SHOW BLOG** Ken Kessler's unique view of CES 2016 • **READERS' CLASSIFIEDS** Hi-Fi bargains galore

UK £4.99 US \$12.99 Aus \$10.99



Teac UD-503

It may look like bit like Teac's great HA-501 but the UD-503 is a very different beast, featuring an onboard DAC plus a surprising variety of signal processing options
Review: **Keith Howard** Lab: **Paul Miller**

Headphone amplifiers no longer form a single product category. With the burgeoning of interest in headphones has come not just a multiplication of but also a diversification in the devices dedicated to driving them.

So we now have (category one) the classic minimalist headphone amp, with an analogue input, volume control and headphone output(s). Category two, appreciating that the headphone amplifier can double as a simple preamp, adds a line level analogue output and perhaps selectable inputs. Category three – into which the £700 UD-503 falls – is the DAC/headphone amp hybrid, which allows direct connection to digital signal sources.

Even here there are further subdivisions, such as between devices that accept PCM digital only and those like the UD-503 – a more feature-rich replacement for the previous UD-501 – which acknowledge the expanding catalogue of DSD downloads by also offering DSD compatibility. In the case of the UD-503 this stretches not just to conventional DSD64 (2.8224MHz) files but to DSD128 (5.6448MHz) and DSD256 (11.2896MHz) files also.

BALANCED OUTPUT?

It's two years now since I enthused about Teac's 'category two' HA-501 [*HFN* Apr '14], and after the review put my hand in my pocket to buy one – two years which have done nothing to blunt my admiration. At a quick glance you might mistake the UD-503 for it, given that both are housed in the same chunky casework with mock rack handles at either side. (These allow you to stand the unit on its front without risk to the power switch, should you need to peer more closely at the rear panel.)

As in the HA-501, the UD-503's mains switch is a toggle type, to the left of the fascia, with a pro audio 'up is on' alignment. Moving right, next comes a

blue LED labelled 'Clock', which indicates the status of the master clock input on the back panel – of which more shortly.

Beneath this an optical/coaxial digital input is offered via a mono mini-jack socket, which accepts an optical mini plug, or, with an adapter (not supplied), can act as a Toslink socket. Teac provides a short adapter lead (phono socket to mini-jack plug) for coaxial connection.

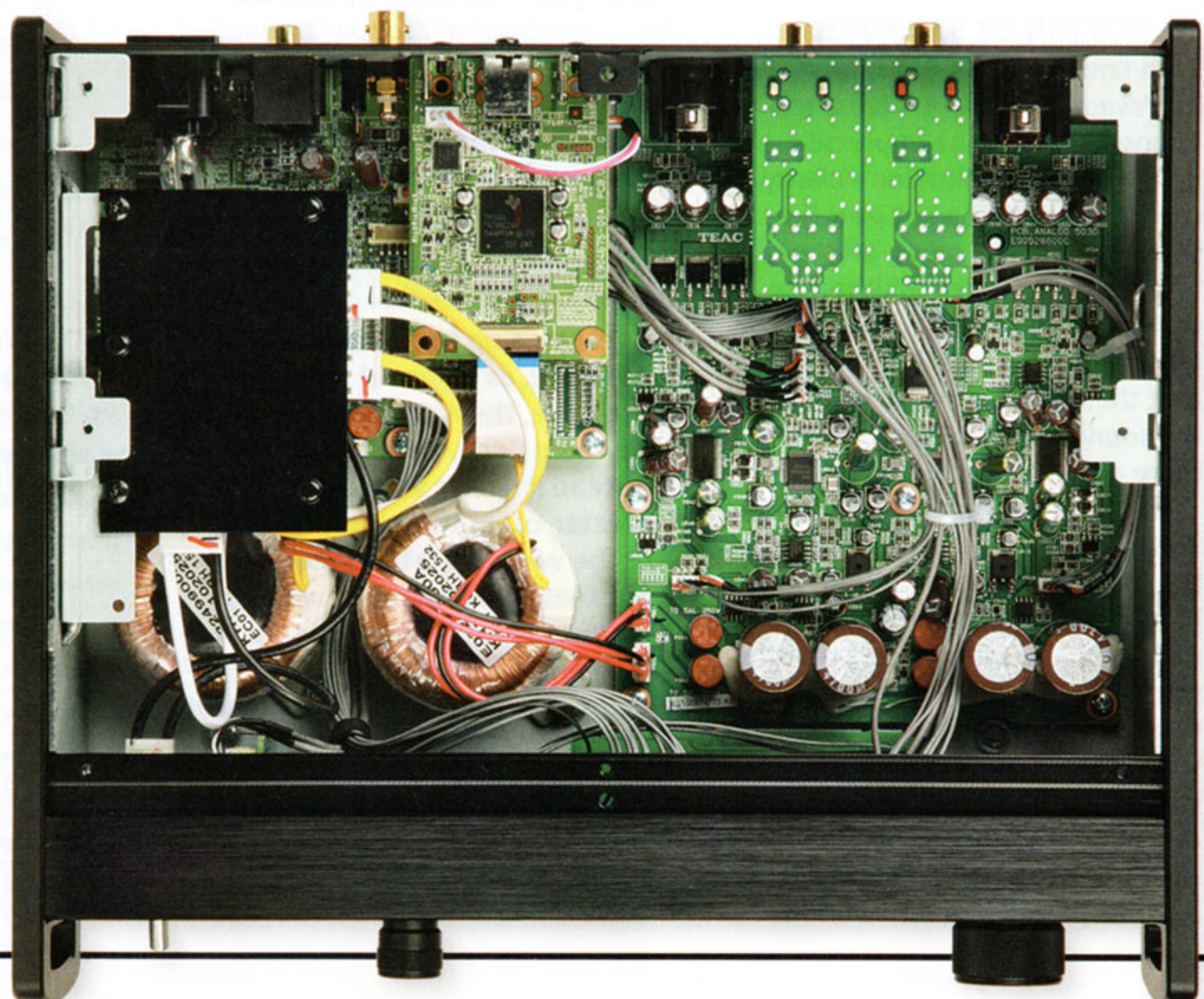
Next along is a rotary control that multi-tasks as an input selector, menu navigator and, via a push, as a menu selector button. A 'Menu' push-button follows which toggles between the menu and the standard content of the alphanumeric display that's next right. Beneath the display are twin ¼in jack sockets that carry the headphone output. These can be configured to provide unbalanced, balanced or active earth output, the last two requiring that the headphone has balanced wiring. Last and largest of all, the volume control occupies the right of the fascia. Remote control is provided via a metal-faced plastic handset.

On the rear panel [see p55], again travelling left to right as you face it, are a pair of gold-plated phono sockets for the single line input, and both phono and XLR sockets, also with gold-plated contacts, for unbalanced and balanced analogue output. In both cases the outputs can be either fixed-level or variable (the selection is made via the menu system), the latter allowing the UD-503's use as a basic preamp. Digital inputs, to the right of the panel, are via USB type B socket, a phono plug for coaxial S/PDIF, or a Toslink socket for optical input.

FILTER/UPSAMPLE OPTIONS

Unusually, a gold-plated BNC socket is also provided for a separate 10MHz clock input – the first time I've seen this feature on a headphone amp – which works in conjunction with the USB input only.

USB connection can be made to a computer running Mac OS X 10.7-10.10 without further ado, whereas users wishing to feed the UD-503 from a Windows



RIGHT: A compact dual-mono design including two linear power supplies, Teac's top model features a pair of AK4490 DACs that support PCM to 384kHz and DSD up to 11.2MHz (DSD256)



machine (v7, v8 or v8.1) must first download and install special drivers. PCM sampling rates up to 384kHz are supported via the USB interface while the other digital inputs support a maximum of 192kHz.

Four different reconstruction filters are offered for PCM [see PM's box-out, below] and two different low-pass filter corner frequencies for DSD (50kHz or 150kHz). The UD-503 DAC also provides for internal upsampling of PCM signals, either to higher-rate PCM (2x, 4x, 8x) or to DSD128. In order to retain integer-factor upsampling, the latter involves 48/96/192/384kHz digital inputs being upsampled to 12.288MHz (256x48kHz) rather than the 11.2896MHz (256x44.1kHz) that defines the typically accepted DSD128 data rate.

There's so much to the UD-503 that investigating all the options it offers would take up more column-inches than are available here. Some I couldn't investigate in any case, notably the balanced headphone connection or the active earth alternative, because I didn't have to hand a

balanced-wired headphone with its cables terminated in 1/4in jack plugs. Indeed, few people have: we're familiar with balanced headphone connection via twin 3-pin XLRs or a single 4-pin XLR, but corporate Japan, it seems, has decided on yet another option. Thanks, guys.

SO MANY CHOICES

I used Audio-Technica's ATH-A2000Z [see p68] and Sony's MDR-MA600 [HFN

Oct '12] headphones in unbalanced mode for all the listening, and confined myself to (1) comparing the digital filter options, (2) assessing the effects of upsampling, and (3) pitting the USB input

against the S/PDIF coaxial input.

As the Teac USB drivers require Windows 7 or 8 (32-bit or 64-bit), the last meant I had to use a different computer than usual – not my second-generation Mac mini, which runs Windows XP via Bootcamp, but the Dell desktop I use for HFN's loudspeaker and headphone measurements. First off – before becoming

'It's remarkable what Teac has packed into the £700 UD-503'

ABOVE: Key to accessing the various options, like upsampling PCM signals to DSD128, is the OLED display. Beneath it the jack sockets offer unbalanced, balanced and active earth output

enmeshed in the digital comparisons – I couldn't resist a straight shoot-out, using the same analogue input signal, between the UD-503 and my beloved HA-501.

It's thoroughly unreasonable, I freely acknowledge, to expect the former, with all its extra capabilities, to match the latter for raw sound quality. But were Teac to have achieved this it would be remarkable. I wish I could tell you that Teac had, but it hasn't. The UD-503 has nothing to be ashamed of given everything it incorporates but, when it comes to sheer sound quality, the HA-501 – the best sub-£1000 headphone amplifier I've yet heard, and one that can embarrass some more expensive competitors too – is a class up.

To make this assessment I used the 192kHz/24-bit download of 'Take Five' from Sabina Sciubba and Antonio Forcione's *Meet Me In London* [Naim label], a *tour de force* by Sciubba in particular whose agile, mellifluous voice dances through this song-setting of the Dave Brubeck Quartet classic.

Via the HA-501 there's a combination of warmth, spaciousness and transparency here that the more closed-in, matter-of-fact sounding UD-503 simply can't match. Which is important, of course, because the imprint of its analogue stages will be on everything the UD-503 reproduces.

Given that the UD-503 offers, for PCM files, five upsampling options (including off) and five filter options (also including off), there are 25 options in total and trying to rank them all would probably see you in Bedlam before the job was done. So I adopted a less structured approach and soon found that on 44.1kHz material without upsampling I didn't much like either of the minimum-phase filters – the linear-phase slow filter was my favourite. ↪

FILTER FLAVOURS

Most new DACs are replete with a raft of DSP-based digital filter options and Teac's UD-503 is no exception with its five switchable offerings (including 'off') that operate on all LPCM media. The default 'FIR Sharp' and 'FIR Slow' are traditional linear-phase types while 'Short Delay Sharp' and 'Short Delay Slow' are minimum-phase filters. FIR Sharp has obvious pre/post transient ringing, which is not ideal, but traded for low phase distortion and better rejection of aliasing images (69dB). SD Sharp offers the same rejection but no pre-ringing/increased post-ringing and the same slightly peaked response (+0.2dB/20kHz with 48kHz files). The two 'Slow' filters offer poor stopband rejection (just 5.2dB) and a rolled-off response (-4.6dB/20kHz with 48kHz files) but much reduced pre/post ringing. I typically view these filter types as ideal for higher-rate (88.2kHz-384kHz) sample rates where poor stopband rejection is arguably less important but time domain distortion is greatly reduced without impacting on response (+0.25dB/20kHz, +0.8dB/45kHz to -9.6dB/90kHz with 192kHz files). PM

DAC/HEADPHONE PREAMP



ABOVE: A standard set of digital ins is offered, including 384kHz/32-bit and DSD256 on USB, and 192kHz/24-bit S/PDIF on coax and optical. RCAs cover analogue ins and outs with XLRs for balanced outs, both fixed and variable with 0dB and +6dB options

But I'd never listen that way because upsampling brought distinct benefits, and then the minimum-phase filters came into their own – still the case with material of native 88.2kHz sampling rate and above. Upsampling to DSD I didn't care for because it imposed the rather grey, softened sound I associate with too many early-generation SACDs.

USB OR S/PDIF?

For example, the 88.2kHz/24-bit download of Daft Punk's *Within* [HDtracks] sounded better than I've ever heard it with 4x upsampling and the slow minimum-phase filter selected, for here it was distinctly more open and dynamically assured than if played at the native sampling rate. Your choice of optimum upsampling/filter setting may differ, of course, but the salient point is that these options are not window-dressing – they make a worthwhile improvement to the UD-503's SQ.

This listening was all done via the USB interface which proved utterly fuss-free in installation and use, and struck me from the outset as providing fine sound quality. But I've often preferred old-fashioned S/PDIF to USB in other converters, so I was interested to hear the comparison via the UD-503 (with my Mac mini/TC Electronic Impact Twin providing the S/PDIF feed).

For this comparison I originally intended to use JRiver Media Centre, identically configured, as the software player on both computers. But I first tried the free Teac HR Audio Player for the USB option, which allows you to select between two modes of replay: DoP (DSD over PCM) in which the DSD datastream is disguised as a PCM one, or native

DSD streaming wherein no disguise is needed.

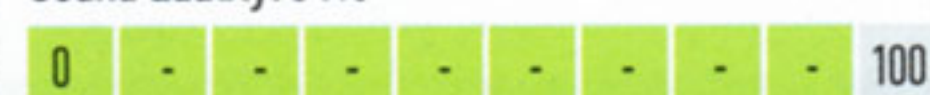
I first used the latter mode for comparing the DSD64 and DSD128 versions of the 'Heiliger Dankesang' movement from Beethoven's String Quartet Op.132 [Native DSD; free download], and was knocked out by how good the DSD128 sounded. It was magnificent, with a heady combination of warmth, detail and super-spacious imaging that the DSD64 version couldn't match. Then I tried the DoP interface alternative – and didn't like it nearly as much.

Is this why I've been less than enthusiastic about USB connection in the past? Whatever the answer to that, this experience persuaded me to use Teac's player for the USB part of the USB vs S/PDIF comparison, with JRiver the player for the S/PDIF feed. Using these two different setups, perhaps for the first time I distinctly preferred the USB interface. Playing Santana's *Jingo* [96kHz/24-bit; HD tracks] and Messiaen's *Theme and Variations* [Linn Records CKD 314 rip converted to 88.2kHz/24-bit PCM] the USB sound was both better resolved and more tightly controlled. Alleluia! ☺

HI-FI NEWS VERDICT

It's remarkable what Teac has packed into the £700 UD-503 – it deserves high praise for offering such outstanding value, especially given the chunky build quality. Teac's own HA-501 may sound better in a straight analogue input contest but the UD-503 adds considerable value with the upsampling and filtering options and fine USB interface of its DAC stage. And you get a free software player! Cracking stuff, Teac.

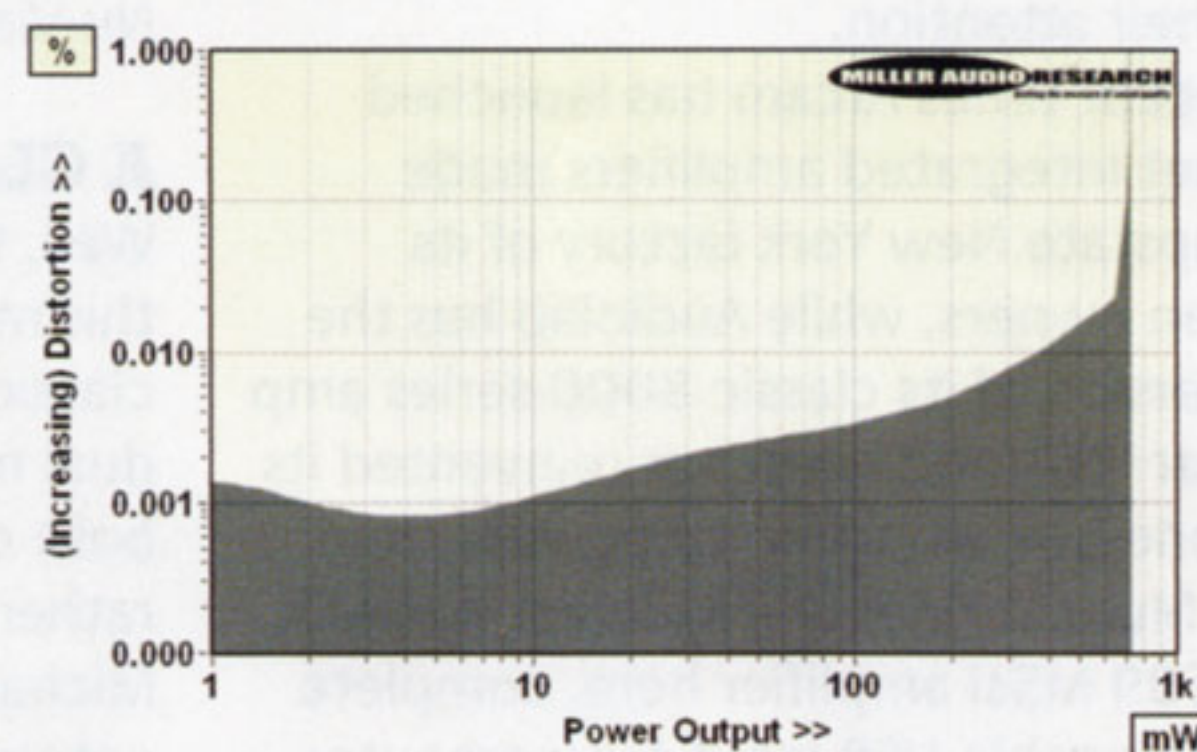
Sound Quality: 84%



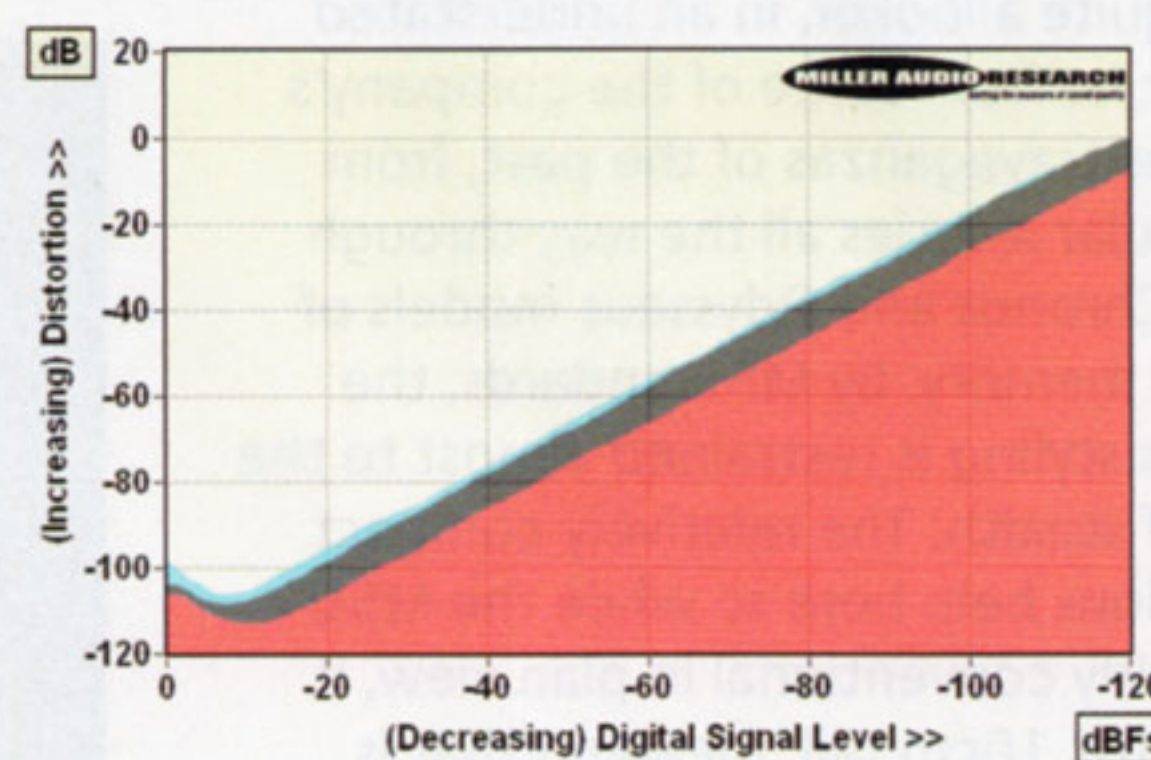
TEAC UD-503

In practice, the UD-503 is not an HA-501 headphone amp [HFN Apr '14] with added DAC. Indeed, Teac rates its new UD-503 at half the output of the 1.5W HA-501 – a realistic figure with it achieving 735mW/25ohm [see Graph 1, below] and offering a maximum 6.1V to support high impedance 'phones. Overall gain is high at +34.4dB (unity gain is actually represented as -12dB on Teac's display) but the A-wtd S/N ratio is still held to an impressive 98dB (re. 0dBV) and the output impedance to a consistent, but not especially low, 12ohm. Via RCA analogue in/headphone out, the frequency response and distortion are both influenced by loading – the former true to ±0.2dB from 5Hz-100kHz into high impedance phones but with a reduced bass (-1dB/20Hz) when driving 40mW/25ohm. Distortion is just 0.0001-0.0005% (0dBV, 20Hz-20kHz) but also 'increases' to 0.008-0.0027% at 40mW/25ohm.

Tested in the 0dB balanced output (2.08V), native (no upsampling) mode, and with the 'FIR Sharp' filter as default, the Teac UD-503 acquitted itself well enough as an outboard DAC [see also boxout, p53]. Distortion holds to mere <0.001% at all frequencies with a 0dBfs digital input, reaching a minimum of 0.00015% at 1kHz/-10dBfs [see Graph 2]. The A-wtd S/N ratio is fine at 108dB but jitter is a little disappointing at ~800psec (all sample rates). This reduces significantly to just 28psec via USB (and via S/PDIF with upsampling) but, as we've reported with other DACs in the past, the USB's A-wtd S/N ratio can fall to a 16-bit 95.7dB (a driver issue). Readers may view full QC Suite test reports for the analogue and digital performance of Teac's UD-503 headphone amp/DAC by navigating to www.hifinews.co.uk and clicking on the red 'download' button. PM



ABOVE: Continuous power output versus distortion into 25ohm 'headphone' load



ABOVE: Distortion versus 48kHz/24-bit digital signal level over a 120dB dynamic range (S/PDIF input 1kHz, red; USB input 1kHz, black and 20kHz, blue)

HI-FI NEWS SPECIFICATIONS

Maximum output (re. 1% THD into 47kohm)	6.10V
Max. power output (re. 1% THD into 25ohm)	735mW
Output Impedance (20Hz-20kHz)	8.4-11.0ohm
A-wtd S/N ratio (re. 0dBV/ digital re. 0dBfs)	98.3dB / 107.8dB
Frequency response (20Hz-20kHz/25ohm)	-1.0dB to -0.01dB
Distortion (20Hz-20kHz, re. 40mW)	0.008-0.0027%
Digital jitter (S/PDIF / USB)	800psec / 28psec
Power consumption	13W (1W standby)
Dimensions (WHD) / Weight	178x76x280mm / 2.8kg

