hi-finews GROUP TEST

USB DACS £200-£1250

TESTED THIS MONTH

CAMBRIDGE AUDIO DACMAGIC 100	£200
MUSICAL FIDELITY M1 DAC	£399
REGA DAC	£500
SHANLING DAC-50	£650
WYRED 4 SOUND DAC-1	£900
M2TECH YOUNG DAC	£950
NORTH STAR DESIGN ESSENSIO PLUS	£1250

Computer audio is becoming ubiquitous in high-end audio, so the hi-fi market is now awash with USB-equipped DACs. In this month's group test we ask if they are all of equal merit...

Cutting-edge gear, cherry-picked by the *Hi-Fi News* editor

The pinnacle of sound quality within its peer group

Great sound, great value and a cut above its rivals

Due to the growing popularity of computer audio in our enthusiast sector, standalone DACs sporting USB inputs are flooding the hi-fi market. It's fast becoming crowded and highly competitive. Moreover, technology is changing rapidly. Less than a year ago, when we tested a group of USB-equipped DACs, we commented that a modern unit should ideally be capable of handling 24-bit/192kHz audio via S/PDIF (single wire) and bit-perfect audio via USB at 24/96. Yet already asynchronous USB interfaces compatible with USB Audio Class 2.0, providing 24-bit/192kHz transfer ability, are becoming commonplace – and 32-bit/384kHz is already being touted as the next step up the ladder to hi-fi heaven.

But there's more to a DAC's sound than simply numbers, as we have discovered in this month's group test of seven models, none of which costs a king's ransom. We have Cambridge Audio's DacMagic 100 that is highly specified despite its entry-level price; a new version of Musical Fidelity's M1 DAC that has been updated with an improved USB input; and Rega's DAC. This, while only having a 16-bit/48kHz-capable USB input, does offer 24-bit/192kHz capability via its S/PDIF inputs. Likewise Shanling's eye-catching DAC-50, which looks a million dollars yet costs just £650. Moving up in price we have an American DAC made by Wyred 4 Sound and a highly-specified Italian model from M2Tech. Also from Italy is North Star Design's brand new Essensio Plus.

THE SYSTEM

The DACs were auditioned over several days in a relatively high-end system comprising Mark Levinson No.383 and Townshend Sir Galahad loudspeakers, a large window through which to observe the relative sound quality of each model. [To see the listening room, visit *www.hifinews.co.uk/news/article.asp?a=9884*.] The source used was a Dell laptop running Windows 7 and foobar2000 media player, so that the functionality of manufacturers' USB Audio Class 2.0 drivers could be verified where appropriate. A SonicWeld Diverter USB-to-S/PDIF converter [*HFN* Apr '12] was employed for listening to the DACs' coaxial S/PDIF inputs. To take into account each model's relative output, the gain of the system was carefully adjusted to standardise listening levels.

THE TEST TRACKS

Among the 16-bit/44.1kHz tracks played were Jeff Beck's 'Behind The Veil' from *Guitar Shop* [Epic EK44313] and Seal's 'Killer', the 'acoustic version' released on the two-disc compilation set *Seal: Best 1991-2004* [Warner 9362-48958-2]. For hi-res testing we listened to an excerpt from Stravinsky's *Firebird* Suite, performed by the Budapest Festival Orchestra under Ivan Fischer [see also p88]. It's available free as three files at 44.1, 96 and 192kHz sampling rates [*www.channelclassics.com*]. Also used was a section of Benjamin Britten's *Simple Symphony*, performed by Norway's Trondheim Soloists, recorded by the 2L label in DXD format [*www.2l.no*]. It's available for download in 24-bit PCM at 96, 192 *and* 352.8kHz sampling rates. ⇨

REVIEWS BY JOHN BAMFORD
LAB TESTS BY PAUL MILLER

USB and S/PDIF DAC
Made by: Cambridge Audio Ltd
Supplied by: Audio Partnership PLC
Telephone: 0207 551 5413
Web: www.cambridge-audio.com

AUDIO FILE

Cambridge DacMagic 100 (£200)

hi-fi news OUTSTANDING PRODUCT

It's hardly been a secret in hi-fi circles that Cambridge Audio was due to replace its tremendous value DacMagic D-to-A converter. Giant-killer though it was – it even boasted balanced outputs – its USB input was limited to 16-bit/48kHz.

Cambridge has produced two new models this year. The DacMagic 100 featured here is a little cheaper than the out-going DacMagic, while a more ambitious DacMagic Plus model (£350) we'll be reviewing in a forthcoming issue.

At the '100's heart lies a Wolfson WM8742 24-bit DAC. Powered by a 12V/2A plug-top supply this small unit might look like a beer-budget audio add-on 'widget', nevertheless it ticks pretty much all the boxes required by an audio enthusiast. Its asynchronous USB input is fully 24-bit/192kHz-capable, Cambridge supplying a USB Audio Class 2.0 driver for Windows PCs via its website. Holding down the source selector button while powering up the DAC governs whether the USB input is set for Audio Class 1.0 or Class 2.0 functionality.

What's missing from this DAC is balanced XLR connectivity. And unfortunately it is *not* compatible with 176.4kHz sampling rate data (via USB and S/PDIF).

OPEN WIDE!

Far from being embarrassed by the considerably larger and costlier DACs in this month's group test, the DacMagic 100 delivered a fine performance in the listening tests. Sounding commendably neutral and self-effacing, via one of its coaxial S/PDIF inputs it delivered an expansive soundstage with Seal's 'Killer'. The image it portrayed was wide and deep, the individual elements of the track convincingly layered in perspective. The Musical Fidelity was judged to be a little sharper-focused, and the Cambridge didn't deliver the fruity, powerful bass of the Wyred 4 Sound DAC-1, nevertheless the DacMagic 100 sounded well-balanced and clean at both frequency extremes.

The sizzling top end of Jeff Beck's 'Behind The Veil' was held in check without being too sat-upon, the dynamic wallops of bass and kick-drum delivered with adequate muscle and girth to keep the adrenaline flowing. The DacMagic 100 opened its mouth wide with higher resolution recordings.

Again, it couldn't *quite* match the vivid clarity of Musical Fidelity's M1 DAC with the 2L recording of Britten's *Simple Symphony*; however, the cohesiveness of its sound proved difficult to criticise. Where the Shanling DAC had sounded smeared, and the M2 Tech over-etched and slightly synthetic, this Cambridge was all of a piece.

Its fine sound quality was similarly evident via its USB input, the excerpt from Stravinsky's *Firebird* Suite conveyed handsomely at both 96 and 192kHz sampling rates.

Sound Quality: 86%

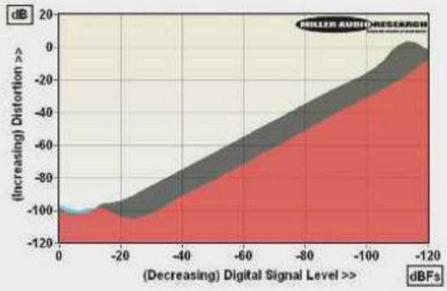
0 - - - - - - - - - 100

RIGHT: DacMagic 100 is available in black or silver. 'Source' scrolls through inputs; LEDs show sampling frequency

HI-FI NEWS LAB REPORT

Cambridge Audio's entry-level DacMagic 100 delivers an astonishing performance for the price. It offers a 2.3V maximum output, a wide 109dB A-wtd S/N ratio (via both S/PDIF *and* USB), a low 46ohm output impedance and very low 0.0005% distortion at peak output through bass and midrange. Distortion does increase slightly to <0.002% at 20kHz but this is consistent up to 192kHz input sample rates (the DacMagic 100 fails to lock to 176.4kHz, however). The S/PDIF and USB responses are otherwise entirely consistent, flat to within ±0.02dB from 20Hz-20kHz with 48kHz sources but subject to Cambridge's proprietary filtering with 96kHz and 192kHz sources (there's a gentle roll-off of –3dB/31kHz and –24dB/40kHz).

Correlated jitter is low at 205psec via S/PDIF and very low at 28psec via USB with 24-bit data, the former a low-rate modulation based around 86Hz rather than a more typical PSU-related pattern. The rejection of stopband images is set by the WM8742 DAC's on-board digital filter at 74dB while stereo separation is >100dB across the board. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	2.31Vrms / 46ohm
A-wtd S/N ratio (S/PDIF / USB)	108.8dB / 108.1dB
Distortion (20Hz-20kHz/0dBFs)	0.0004-0.0019% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.00045-0.0019% (USB)
Frequency response (20Hz-20kHz)	+0.00dB to –0.08dB
Digital jitter (S/PDIF / USB)	205psec / 28psec
Resolution @ –100dB (S/PDIF / USB)	±0.2dB / ±0.8dB
Power consumption	2W
Dimensions (WHD)	106x46x130mm

RIGHT: Three S/PDIF inputs are provided alongside 24-bit/192kHz capable asynchronous USB. Ground switch avoids potential hum loops

USB and S/PDIF DAC
Made by: Musical Fidelity Ltd
Supplied by: Musical Fidelity Ltd
Telephone: 020 8900 2866
Web: www.musicalfidelity.com

Musical Fidelity M1 DAC (£399)

hi-fi news HIGHLY COMMENDED

RIGHT: Blue LEDs indicate input selection and sample rate of incoming data; a green LED indicates 192kHz upsampling

Musical Fidelity has updated its M1 DAC since we tested it [*HFN*, Oct '10]. What has changed is its USB input specification: in the original M1 this was limited to 16-bit/48kHz, whereas this latest variant now offers 24-bit/96kHz capability. This remains 'USB Audio Class 1.0' of course, consequently no proprietary drivers need to be installed.

Our Lab Report shows broadly identical technical performance, as the M1 still employs the same 24-bit dual-differential DACs with oversampling to 192kHz, an LED on the front panel proclaiming '192kHz upsampling' once the M1 has locked on to an incoming signal. Much is made by the company of its attention to detail in the design of a power supply that includes choke filtration on the mains input.

Four digital inputs are provided, one of each flavour: coaxial, optical, AES/EBU (XLR) and the aforementioned USB. On the front panel a push-button scrolls through the inputs; however, the selected input is not remembered on powering down. Bring the M1 out of standby and it always defaults to its coaxial S/PDIF input, which some users might find mildly annoying.

NOTHING ADDED

Examining it previously, I was impressed by its detail retrieval and vivid sound character. Hearing it in this test group made me appreciate just how distinguished it really is compared with other models in the field, its crisp and lucid sound quality often showing some more expensive DACs here a clean pair of heels.

What's particularly impressive given its price is the manner in which it opens the window onto recordings. For example, where the 'earthy' and bold-sounding Rega and Wyred 4 Sound models sound attractive and endearing they *do* appear to impart something of their own character. With the M1, however, you sense you're listening to the sound of the *recording* rather than the DAC. The electronic percussion in the Jeff Beck track showed a touch of fizz because, frankly, that's how it is. Similarly Seal's 'Killer' was brightly-lit – nonetheless the clarity was fabulous with wonderful layering of the production's individual elements.

Via both its S/PDIF coaxial and USB inputs the M1 DAC served up the sound of the Budapest Festival Orchestra with a wide palette of texture and tonal colour. The hi-res recording by 2L of the Trondheim Soloists performing Britten's *Simple Symphony* was also highly explicit.

Sound Quality: 83%

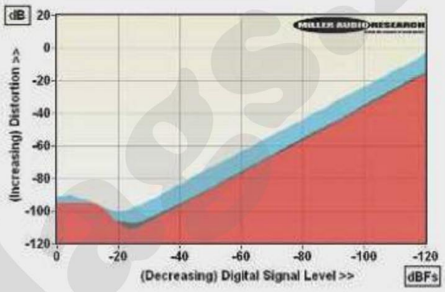
0 - - - - - - - - - 100

RIGHT: Both single-ended (RCA) and balanced (XLR) analogue outputs are provided, with four digital inputs

HI-FI NEWS LAB REPORT

If there's one area of technical performance that MF's engineers typically have nailed to the post then that's jitter, or at least jitter suppression. Thus the M1 DAC suffers a minuscule 36psec jitter with 24-bit/48kHz data, 38psec at 24-bit/96kHz and just 14psec with 24-bit/48kHz data over USB with a default Windows OS driver. Importantly, MF also achieves the same 114dB A-wtd S/N ratio with both S/PDIF and USB inputs, the 4.1V balanced output something of a bonus at this price level. The response is carefully judged, showing the mildest treble lift of +0.13dB with 44.1/48kHz inputs before rolling gently away beyond 30kHz with 96kHz and 192kHz inputs (–3dB/43kHz with 96/192kHz –12dB/70kHz with 192kHz only).

Distortion is comprised almost uniformly of 2nd-4th harmonics (many of the DACs here show stronger 3rd, 5th and 7th) but of the two M1 samples tested both had fractionally higher THD on the right (0.0015-0.003%) than the left (0.0007-0.003%) over the 20Hz-20kHz range. All were within MF's specification, however, as was the ±0.1dB/–90dB linearity. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	4.10Vrms / 45ohm (balanced)
A-wtd S/N ratio (S/PDIF / USB)	114.2dB / 114.1dB
Distortion (20Hz-20kHz/0dBFs)	0.0007-0.0020% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.0007-0.0032% (USB)
Frequency response (20Hz-20kHz)	–0.03dB to +0.13dB
Digital jitter (S/PDIF / USB)	36psec / 14psec
Resolution @ –100dB (S/PDIF / USB)	±0.2dB / ±0.2dB
Power consumption	5W
Dimensions (WHD)	220x100x300mm

USB and S/PDIF DAC with five digital filter options
Made by: Rega Research Ltd, Essex
Supplied by: Rega Research Ltd
Telephone: 01702 333071
Web: www.rega.co.uk

Rega DAC *(£500)*

Housed in a particularly sturdy aluminium and steel case with a protective plastic coating over its inset fascia, Rega Research's straightforwardly-named Rega DAC might best be described as a 24-bit/192kHz-capable D-to-A converter with a USB input included for 'convenient hook-up of a computer' – since the latter is only capable of accepting 16-bit audio up to a maximum of 48kHz. Those building a library of hi-res digital downloads will need to invest in a hi-res capable USB-to-S/PDIF converter (or use a computer with an appropriate soundcard) to take full advantage of the Rega DAC's potential.

The DAC uses a Wolfson digital receiver and PLL that have their own dedicated power supplies, and a pair of parallel-connected Wolfson WM8742 DACs driven via a buffer stage – similar to the arrangement used in the Isis flagship CD player, says Rega. No sample rate conversion is employed, rather data is processed at the incoming sampling rate to minimise signal processing. There is, however, a choice of no fewer than five digital filter settings, selected via a button on the front panel.

Fascia LEDs reveal the incoming sampling rate, but the fact that there's only one labelled '44.1-48k' is not wholly helpful when pushing audio from a computer, since it fails to confirm that your computer playback system is correctly set up to play out CD rips at 44.1kHz without deleterious re-sampling.

COMMANDS ATTENTION

You could tie yourself in knots trying to determine which digital filter characteristic you prefer. I certainly did – coming to the conclusion that it will always be source recording dependent. In the end, most of the listening was done using 'filter 3'.

The Rega DAC sounded particularly powerful and dynamic (via coaxial S/PDIF) with a sense of immediacy that commanded attention to the music. The bass and drums in the Jeff Beck track really kicked and punched, while the percussion sparkled without too much brittleness. Seal's vocal in 'Killer' was highly explicit too, the Rega DAC making his diction easy to decipher over the myriad percussive embellishments in the recording.

The DAC also sounded glorious with our selected hi-res recordings, the excerpt from Stravinsky's *Firebird* clearly sounding more open and natural at higher sampling rates, although the colour of the Budapest Festival Orchestra was better described by the Cambridge and Musical Fidelity DACs under test.

Via USB the Rega sounded leaner and less wholesome, with a tendency to stridency. And this time both the Seal and Beck tracks had a 'fizzy edge' to percussion.

Sound Quality: 76%

0 - - - - - - - - 100

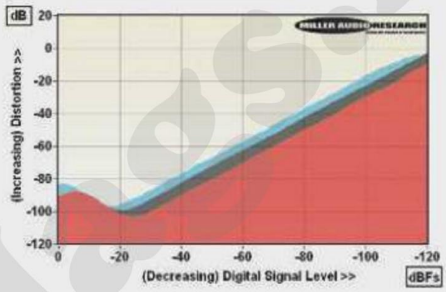
RIGHT: LEDs show sampling frequency (see main text), digital filter and input selection. Black finish casework is available too

RIGHT: There are four S/PDIF inputs plus USB. Two digital outputs are included, with single-ended (RCA) analogue outputs

HI-FI NEWS LAB REPORT

The story of Rega's DAC is best told through its five alternative digital filter settings. The linear and minimum phase apodising filters 4/5 are the most interesting because it's only the latter that trades unnatural pre-ringing for more post-event ringing (a more agreeable phenomenon), although both show the same sharp ~19kHz roll-off, reaching –4.05dB/20kHz. Filters 2 and 3 also have no pre-ringing but the responses are 'flatter'. With higher sample-rate inputs the response is rolled away more gently, but prematurely, ranging from –2.4dB/30kHz to –4.5dB/30kHz (96kHz digital input, Filter 1 versus 5). The flattest response at 96kHz+ is achieved with Filter 3 (–0.5dB/40kHz) but this 'brickwall' filter is the most traditional of the quintet.

In other respects, the DAC offers a minimum 0.0007% distortion through the midrange, increasing to just 0.0016% at 20kHz/–20dBFs [see graph, below] and while the A-wtd S/N is good at 105.9dB this falls to 98dB via its generic 16-bit/48kHz USB input facility. Jitter is low enough at 250psec (24-bit/48kHz), the modulation mainly PSU-related. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	2.15Vrms / 570-605ohm
A-wtd S/N ratio (S/PDIF / USB)	105.9dB / 95.6dB
Distortion (20Hz-20kHz/0dBFs)	0.0037-0.0081% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.0040-0.0089% (USB)
Frequency response (20Hz-20kHz)	+0.00dB to –0.02dB
Digital jitter (S/PDIF / USB)	250psec / 240psec
Resolution @ –100dB (S/PDIF / USB)	±0.1dB / ±0.2dB
Power consumption	7W
Dimensions (WHD)	215x80x270mm

P R I M A R E

THREE STEPS TO HEAVEN

hi-finews OUTSTANDING PRODUCT

Primare I32 Integrated Amplifier

"Forget any preconceptions about Class D switching amps...this Primare sounded tight and grippy along with highly explicit treble that made the percussion sound uncannily real...and the bass *was* impressive: extended, powerful and highly descriptive."

Group test, Hi Fi News & Record Review June 2011

hi-finews OUTSTANDING PRODUCT

Primare R32 Phono Stage

"Effortlessly involving are the two words I'd use to sum up the Primare's sonic signature...this kind of quality for well under a grand is what constitutes a top flight bargain, making the R32 our clear winner."

Group test, Hi Fi News & Record Review January 2012

hi-finews OUTSTANDING PRODUCT

Primare BD32 Universal Player

"Primare's BD32 can be considered an audiophile bargain in the world of high-end components...it sounds detailed, airy and sophisticated with all recorded media. A worthy universal source for any high-end system."

Hi Fi News & Record Review February 2012

karma audio-visual

Karma Audio-Visual
Phone: 01423 358 846
www.karma-av.co.uk

WWW.PRIMARE.NET

USB and S/PDIF DAC with upsampling options
Made by: Shenzen Shanling Electronic Co. Ltd, China
Supplied by: Real Hi-Fi Ltd
Telephone: 01257 473175
Web: www.realhi-fi.com

Shanling DAC-50 *(£650)*

China's Shanling company tends not to hold back when it comes to industrial design. If you prefer understated elegance you might consider its products 'blingy', but there's no denying their superb quality of fit and finish. This DAC-50 is no exception. I wouldn't be shocked if there were another zero added to the price tag, it's so beautifully made. It's unlikely a boutique high-end manufacturer could even source the metalwork for the DAC-50's chassis for £650, let alone populate the case.

Under its striking bonnet lies Texas Instruments' PCM1796 DAC and SRC4192 upsampler, with a Cirrus Logic CS8416 receiver chip. On the fascia are just two chromed buttons. One scrolls through the DAC-50's four digital inputs; the other switches between 96kHz or 192kHz upsampling, or 'FS-Mode' whereby upsampling is disabled, and the internal sampling frequency is equal to that of the input signal.

It's the only DAC in this month's group to feature a headphone output – gain is controlled by rotating the chrome end cap on the top of the front right pillar. Similarly, the chrome cap atop the front left pillar acts as a rotary on/off switch.

The DAC-50 is supplied with a handsome system remote controller that covers all the DAC's functionality (except power on/off), including display bright/dim/off. Needless to say, the majority of buttons on the handset are superfluous unless you also own a Shanling disc player and/or tuner.

A POLITE PERFORMER

Little if any appreciable differences could be heard when switching between the Shanling's upsampling options, nevertheless the DAC-50 was auditioned set to maximum 192kHz upsampling. With its S/PDIF input fed by the SonicWeld DDC the Shanling sounded smooth and civilised, relaxed in demeanour.

Both the Seal and Jeff Beck tracks lost some of their bite and energy compared with the best in the group, appearing slow in the bass and rather too 'polite'. Nevertheless the Shanling did respond well to the Britten recording, where it sounded more dynamic and vibrant. If it was judged to be rather 'safe' and unchallenging with 16-bit/44.1kHz data, with 24-bit/96kHz source material it stepped up a gear, sounding quicker and more open. Channel Classics' *Firebird* excerpt at our three sampling rates revealed the DAC-50 was clearly capable of highlighting the improved dynamic and tonal shading provided by higher resolution material.

As it is only capable of accepting 16-bit data at a maximum sampling rate of 48kHz, the USB input of Shanling's DAC-50 – as with that of the Rega DAC – is something of a 'legacy' from what has quickly become a bygone era in high fidelity audio. It showed in the listening tests too, producing a soft and diffuse sound compared with its coaxial S/PDIF input.

Sound Quality: 68%

0 - - - - - - - - 100

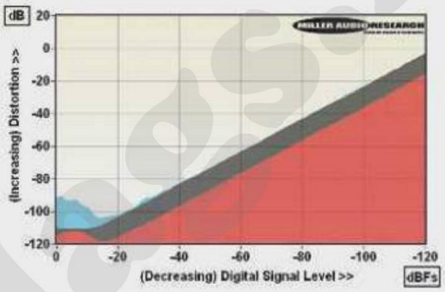
ABOVE: The display indicates the upsample mode rather than incoming rate while the rotary volume control (front right pillar top) acts on the headphone output, not the line outputs

ABOVE: Single-ended and balanced line outputs are provided alongside a coaxial digital output. Inputs are coaxial (RCA), optical (Toslink), AES/EBU (XLR) and USB

HI-FI NEWS LAB REPORT

While Shanling offers both 96kHz/192kHz and native modes – the latter employed for lab testing – there was no practical difference in measured response, S/N ratio, distortion or jitter in any mode. Furthermore, while the DAC-50 accepts 192kHz data via S/PDIF this is downsampled to 96kHz within, yielding a response good to –4.5dB/45kHz with either 192kHz *or* 96kHz inputs. With all input sample rates, the DAC-50 applies a broad +0.25dB boost around 20kHz. USB inputs are further limited to 48kHz with a S/N ratio that falls from the wide 113.7dB achieved over S/PDIF to a 16-bit value of 96dB. In practice, Shanling's USB performance matches Rega's 16-bit/48kHz implementation.

Thanks, in part to its Burr-Brown PCM1796 DAC, distortion is exceptionally low at ~0.0005% at the 4.1V maximum (0dBFs) balanced output and just ~0.00006% through the midrange at –15dBFs [see Graph, below], with equivalent performance from 20Hz-20kHz via USB below –20dBFs, the ~15dB increase in noise notwithstanding. Also, its low-level resolution is excellent at ±0.2dB over a full 100dB dynamic range. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	4.10Vrms / 97ohm (balanced)
A-wtd S/N ratio (S/PDIF / USB)	113.7dB / 96.0dB
Distortion (20Hz-20kHz/0dBFs)	0.0005-0.0036% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.0005-0.0065% (USB)
Frequency response (20Hz-20kHz)	–0.00dB to +0.20dB
Digital jitter (S/PDIF / USB)	80psec / 85psec
Resolution @ –100dB (S/PDIF / USB)	±0.2dB / ±0.4dB
Power consumption	7W
Dimensions (WHD)	457x75x262mm

USB and S/PDIF DAC
Made by: Wyred 4 Sound, California
Supplied by: Item Audio
Telephone: 01782 621225
Web: www.wyred4sound.com; www.itemaudio.co.uk

Wyred 4 Sound DAC-1 *(£900)*

RIGHT: Two-line LCD display indicates input selection and incoming sampling rate. The set-up menu allows filter adjustment

Hailing from America's west coast, Wyred 4 Sound makes a range of electronics including this DAC-1, a more expensive DAC-2 with AES/EBU digital input and remote control operation, and a baby µDAC for desktop systems.

All its models are based around ESS Technology's DAC chipsets, this DAC-1 model employing the Sabre32 Reference 32-bit, 8-channel Audio DAC used in quad-differential mode. The ESS chip is also used as the receiver, and performs all the signal selection and routing.

While the finish is a tad utilitarian, the construction is reassuringly rugged. Wyred 4 Sound builds its own analogue section incorporating discrete dual-differential FET input amplifier stages to provide fully balanced as well as single-ended outputs. Independent regulated supplies feed analogue, digital and control sections.

As there are only three buttons, power on/off and input up/down, you have to read the manual to learn how to access and navigate the setup menu. This allows maximum output levels to be determined for each of the five digital inputs, along with tailoring of the digital filter characteristics, such as bandwidth adjustment and slow or fast roll-off.

FULL-BODIED SOUND

After some experimentation with filter settings, in the test system the DAC-1 was preferred in its default state with the IIR filter set to <50kHz with 'fast roll-off'. Via S/PDIF the overriding characteristic of the DAC-1 might best be described as solid and 'earthy'. Tonally it's a little dark – which does make for relaxed, easy-on-the-ear listening – with tremendously tight and powerful bass that's richly textured. My listening notes showed some similarities to the Rega DAC, observing a forthright and powerful rendition of the bass and drums in both the Seal and Jeff Beck tracks. Indeed, a chunky, full-bodied sound appears to be the Wyred 4 Sound's stock in trade.

While the DAC-1 might add some colour to recordings, it is nevertheless transparent to improvements in resolution in the source. The enhanced spatial and tonal shading provided by the hi-res versions of Channel Classics Records' Stravinsky track was clearly revealed by the DAC-1. It sounded great via its USB input as well, although in this model it's limited to 24/96. For 192kHz capability one needs to step up to the company's £1300 DAC-2.

Sound Quality: 76%

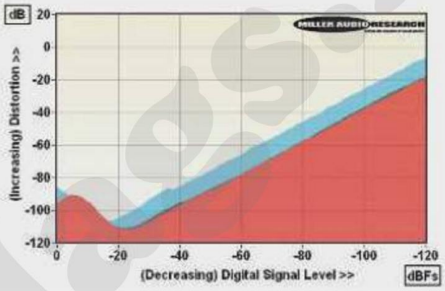
0 - - - - - - - - 100

LEFT: Single-ended (RCA) and balanced (XLR) outputs are included, with USB, two coaxial (RCA) and two optical (Toslink) S/PDIF digital inputs

HI-FI NEWS LAB REPORT

Based around the same 8-channel 32-bit 'Sabre' DAC that powers the Oppo BDP-95EU universal player [*HFN* May '12], its performance here is very heavily influenced by Wyred 4 Sound's implementation. For example, the Sabre DAC can achieve vanishingly low levels of distortion and while the W4S DAC-1 hardly has high levels of THD, its 0.006% at a maximum 5.1V balanced output (falling to 0.00025% at –20dBFs) is determined instead by a 3rd harmonic originating from its proprietary analogue output stage. The A-wtd S/N ratio is fabulously wide at 115dB through both S/PDIF and USB inputs, the former handling 192kHz inputs natively (the response reaches –1.9dB/90kHz), the latter up to 24-bit/96kHz (response reaches –0.8dB/45kHz).

Performance is generally very clean – stereo separation is >120dB across the board and resolution holds to ±0.1dB over a full 100dB range. However while jitter, or at least correlated jitter, is very well suppressed at 40-70psec (48-96kHz) there's some very obvious uncorrelated, (possibly) phase noise jitter on all high-res spectra [see graphs via *www.hifinews.co.uk*]. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	5.10Vrms / 97ohm (balanced)
A-wtd S/N ratio (S/PDIF / USB)	115.2dB / 115.0dB
Distortion (20Hz-20kHz/0dBFs)	0.0044-0.0055% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.0051-0.0075% (USB)
Frequency response (20Hz-20kHz)	+0.15dB to –0.11dB
Digital jitter (S/PDIF / USB)	70psec / 60psec
Resolution @ –100dB (S/PDIF / USB)	±0.1dB / ±0.2dB
Power consumption	11W
Dimensions (WHD)	216x105x343mm

USB and S/PDIF DAC
Made by: M2Tech S.r.l, Italy
Supplied by: Purité Audio
Telephone: 0208 815 5878
Web: www.m2tech.biz; www.puriteaudio.co.uk

AUDIO FILE

M2Tech Young DAC *(£950)*

Well-known in computer audiophile circles for its compact USB-to-S/PDIF converters that resemble large pen drives, M2Tech has developed its own asynchronous USB transfer implementation called hiFace. The headline story behind its ambitious Young converter is the company's further development of its hiFace interface and proprietary drivers (for Windows and Mac) to provide 32-bit/384kHz transfer capability over USB.

The Young is housed in a brushed aluminium case, its power supplied from a 15V/1A plug-top adaptor. There is also a (£750) Lithium-ion polymer battery supply/charger upgrade option: the Palmer Power Station. The Young employs TI's '32-bit' PCM1795 DAC (as does the Essensio, opposite) although its internal filters are bypassed in favour of a custom-designed 'minimum phase' oversampling filter implemented here on a field-programmable gate array (FPGA). The analogue section employs a Class-A biased output stage.

Of the two unlabelled fascia push-buttons, the left one activates standby on/off, while the right one is used to scroll through the inputs; pressing this selector also brings the DAC out of standby. Behind the distinctive grille a three-digit LED matrix display first indicates the chosen input and then changes to show the sampling frequency of incoming data once locked on.

BLEACHED COLOURS

While its numbers look mightily impressive, the Young failed to shine when compared directly alongside other DACs under test. Heard first with its coaxial input being driven by the SonicWeld DDC it performed well enough, sounding noticeably open and spacious with Britten's *Simple Symphony*. A brightening and lightening of the sound palette was observed compared, say, to the darker sounding Rega, together with much of the sharply focused imagery of the Cambridge and Musical Fidelity DACs. Certainly the sound of the string ensemble was sharply etched when heard alongside the 'lazier' Shanling DAC.

Despite its clarity, however, the sound lacked colour. Just as some panel speakers seem to create images of musicians suggesting cardboard cut-outs, the Young DAC's sound lacked a little 'three-dimensional' body and substance.

Listening via its 384kHz-capable USB input, the M2Tech DAC's tendency to bleach the colour and texture of the string instruments was exacerbated by a slightly 'dirty' – and consequently fatiguing – aspect to the sound, despite its high-resolution capability.

Sound Quality: 72%

0 - - - - - - - - 100

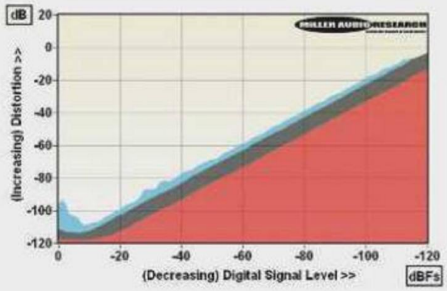
RIGHT: Simply two buttons for power and input selection, with large LED matrix display

ABOVE: Digital inputs – S/PDIF (on RCA, BNC and Toslink), AES/EBU (XLR) and USB – provide good versatility, although analogue output is single-ended (RCA) only

HI-FI NEWS LAB REPORT

While the other DACs in our test tend to show variation in their respective S/PDIF and USB performances, the M2Tech Young DAC shows a greater variation according to incoming sample rate. Both its USB and S/PDIF inputs will handle up to 24-bit/192kHz files, even though the latter offers a 108dB A-wtd S/N and the former a 16-bit 96dB [see M2Tech Evo, *HFN* May '12]. However, the response, distortion and stopband performance of both inputs is very different with 44.1/48kHz files and 96/192kHz files, possibly as a function of its custom digital filter.

The impulse response with the lower sample rate files shows limited pre and post-echo ripples in the time domain (a good thing) but the response also shows substantial (±0.15dB) ripples in the frequency domain. Stopband rejection is very limited at just 10.5dB and there's a huge increase in harmonic and stopband IM distortion (from 0.0003% to 0.6%) up at 20kHz. The response with higher rate 96/192kHz files is far smoother, rolling gently away to –3dB/30kHz and –3dB/70kHz, respectively, without 'ripples'. Jitter is low-ish only, at 320psec. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	2.61Vrms / <1ohm
A-wtd S/N ratio (S/PDIF / USB)	108.1dB / 96.0dB
Distortion (20Hz-20kHz/0dBFs)	0.00035-0.0019% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.00040-0.0021% (USB)
Frequency response (20Hz-20kHz)	+0.14dB to –0.40dB
Digital jitter (S/PDIF / USB)	320psec / 85psec
Resolution @ –100dB (S/PDIF / USB)	±0.1dB / ±0.4dB
Power consumption	5W
Dimensions (WHD)	200x55x260mm

AUDIO FILE

USB and S/PDIF DAC with direct, preamp and headphone outputs
Made by: North Star Design Srl., Italy
Supplied by: Audio Emotion Ltd
Telephone: 01333 425999
Web: www.northstar.it; www.audioemotion.co.uk

North Star Essensio Plus *(£1250)*

hi-fi news OUTSTANDING PRODUCT

North Star Design's new 'Plus' version of its Essensio DAC employs the same architecture as the model we tested last July. It also has the same suite of inputs, the price premium of £280 buying a headphone amplifier built-in and a digital volume control. You can drive a power amp or active speakers directly – assuming a digital-source-only system, as there are no analogue inputs provided. Its IR handset provides remote control input switching, volume control, standby on/off and mute. USB Audio Class 2.0 drivers are included on a CD-ROM to allow 32-bit/192kHz data transfer via USB.

Pressing and holding in the volume knob accesses the Essensio Plus's setup menu. You can determine whether the DAC operates in direct mode or via its volume control, and turn the headphone output on/off. The maximum level of the analogue outputs can be set to 1, 2 or 4V *without* invoking on-chip digital attenuation. The converter chip provides 0.5dB volume steps, but as you'll lose around one bit of resolution for every 6dB of attenuation it's sensible to set the analogue output level as near the 0dB mark as is practical (according to power amp gain and desired listening levels). We left the 'Plus in direct mode for the listening tests.

CLEAN AND AIRY

As with the 'standard' Essensio, this Plus version delivers music in a free-flowing manner while its tonal character allows observation of micro details without sounding hyper-detailed or edgy. Nor does its personality appear to change between its coaxial S/PDIF and USB inputs: important for those seeking to enjoy music from a computer source without compromising quality or having to invest in a high quality USB-to-S/PDIF converter.

The percussive elements in Jeff Beck's 'Behind The Veil' and Seal's 'Killer' sounded clean and airy, free of grain and splash. Where MF's explicit M1 DAC errs to a 'warts 'n' all' presentation, the Essensio somehow manages to pull off the neat trick of sounding silky and refined while giving nothing away in terms of clarity and image focus. It sounds fresh and open at low frequencies too, less creamy and characterful than the Rega and Wyred 4 Sound models, with hear-through clarity and fabulous LF extension. The North Star's openness and ability to describe the character and texture of instruments resulted in the hi-res recordings of Britten and Stravinsky sounding sublime.

Sound Quality: 85%

0 - - - - - - - - 100

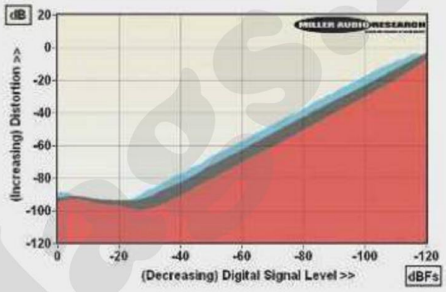
ABOVE: Display shows volume level unless in Direct mode. LEDs indicate input and in-coming sampling rate

ABOVE: Analogue output is single-ended (RCA) only, but in addition to USB there are five S/PDIF inputs – three optical (Toslink) and two coaxial (RCA)

HI-FI NEWS LAB REPORT

This 'Plus' version behaves exactly as the original Essensio [*HFN* Jul '11] but with the advantage of a built-in preamp offering a low 73ohm output impedance. Performance is still determined by its choice of Crystal's CS8421 32-bit/192kHz upsampler, Burr-Brown PCM1795 '32-bit/192kHz' DAC and, of course, North Star's proprietary analogue stage that confers an impressively uniform ~0.003% distortion right across the audio band, also broadly unchanged over the top 30dB of its dynamic range [see Graph, below]. Jitter is impressively low at 35psec (24-bit/48kHz data) and 50psec (24-bit/96kHz data) via S/PDIF with USB achieving parity at 40psec.

In practice, the USB input mirrors S/PDIF performance in all areas save the ultimate A-wtd S/N ratio – 95.8dB versus 107.5dB, respectively (North Star USB 2.0 driver/XP OS). The frequency response of all digital inputs is flat to within –0.2dB/20kHz with 44.1kHz/48kHz sources and –1.0dB/45kHz with 96kHz sources, the S/PDIF input even reaching up to –3.4dB/90kHz with very high resolution 24-bit/192kHz digital files. **PM**



ABOVE: Distortion versus digital signal level at 1kHz (red/SPDIF, black/USB) and 20kHz (blue/USB) over a 120dB range

Maximum output level/Impedance	2.0Vrms / 73ohm
A-wtd S/N ratio (S/PDIF / USB)	107.5dB / 95.8dB
Distortion (20Hz-20kHz/0dBFs)	0.0027-0.0035% (S/PDIF)
Distortion (20Hz-20kHz/0dBFs)	0.0025-0.0036% (USB)
Frequency response (20Hz-20kHz)	+0.00dB to –0.21dB
Digital jitter (S/PDIF / USB)	35psec / 43psec
Resolution @ –100dB (S/PDIF / USB)	±0.5dB / ±0.6dB
Power consumption	7W (5W standby)
Dimensions (WHD)	300x70x170mm

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GROUP TEST VERDICT

Shanling's handsome-looking DAC-50 is exquisitely built, but it failed to shine when heard side-by-side against half a dozen peers. 'Pleasant' and 'safe' were adjectives that kept cropping up during the listening tests, the DAC-50's sonic performance being commendably free of digital nastiness but lacking in verve, especially via its limited-resolution USB input.

PUSHING BOUNDARIES

It was quite something to see the display of M2Tech's Young DAC flaunting '352' when using its USB input to play a selection of sample tracks downloaded from Norway's 2L label, recorded in DXD and delivered as 24-bit/352.4kHz WAVs. M2Tech can be applauded for pushing boundaries; however, the Young was outclassed by other DACs in our group. It delivered detail in spades, but with CD-quality and hi-res audio alike it sounded slightly monochromatic in the test system.

Rega's DAC was a different audio animal. What it lacked in resolution and finesse it made up for in verve and vibrancy. It had tremendous presence through the midband and proved highly engaging. However, in today's rapidly evolving and highly competitive market it does look a bit expensive given its limited feature set – selectable digital filters notwithstanding. Its limited-resolution USB input means it's unlikely to be the first choice for enthusiasts keen to enjoy the world of hi-res downloads.

Similarly forthright and entertaining was Wyred 4 Sound's DAC-1 which delivered music with considerable dynamism. Its tonal balance appeared dark and rosy, while its powerful and rich bass would endear it to many. It performed admirably well via S/PDIF and USB inputs, albeit the latter being limited to 24-bit/96kHz. With balanced outputs included, it can be recommended as a good and feature-rich all-rounder, especially to fans of energetic rock music.

Next up the sound quality ranking comes Cambridge Audio's tiny DacMagic 100, proving that great things can indeed come in exceedingly small packages. Its sound is a bit 'grey' and understated compared alongside the ultra-vivid MF and North Star models, but given its bargain price it would be churlish to declare it anything less than an outstanding product.

> 'Great things can come in exceedingly small packages'

While I can't quite forgive its lack of 24-bit/176.4kHz compatibility, this won't matter a jot to the thousands who will buy it alongside Cambridge's iD100 digital iPad/iPhone dock (£150) designed to partner it.

At just £400 Musical Fidelity's updated M1 DAC could be *the* DAC of choice for audiophiles on a modest budget – if only its USB input was capable of 24-bit/192kHz alongside its S/PDIF and AES/EBU inputs. As it stands, you'll need to add MF's £230 V-Link192 USB-to-S/PDIF converter if you want to cover all computer audiophile bases. But this is great reasonably-priced esoterica, and tremendous value given its balanced connectivity, and so MF's M1 can be very highly recommended – provided your system can handle its stark, matter-of-fact tonality.

A DELIGHT

North Star Design's Essensio Plus proved the most delightful DAC of the group. Its sound is sharp-focused and vibrant, with energy and bite, while obviating the squeaky-clean, hyper-detailed sound that can often make digital replay appear unnatural and hard-on-the-ear. Yes, it's the most expensive product here, but don't forget that the Italian company's cheaper Essensio performs identically if you don't require the Plus's extra functionality.

ABOVE: Two outstanding DACs at either end of the price scale in this month's group test: Cambridge Audio's DacMagic 100 and North Star Design's Essensio Plus