

Will you hear the naked truth?

Benchmark DAC1 - a genuine sensation

By Michael Madsen

Product: Benchmark DAC1 Silver
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Price: ca. 10,000 DKR

Separate D/A converters only have legitimacy if they are better than the end converters you have already listened to, typically those that are built in to your CD player.

Manufacturers of expensive and advanced high-end equipment have traditionally had dedicated CD-drives (CD-player without built in converters) and separate D/A-converters on their program. In the recent years the tendency has moved towards optimizing the complete cd player instead. A few manufacturers have even turned the situation a bit upside down by providing their integrated CD players with digital input, which allows the D/A converters of the CD player to be used in connection with external digital sources such as DVD players, DAB-tuners, sound cards, and so fourth.

From an entirely different world

If you have a talent for developing audio equipment, you have two worlds to chose from. In the hifi business, as you know, there is a good deal of voodoo and many kinds of tweaks and special habits which in the professional sound world rarely have much respect. There, the cold facts are in the front row.

In the hifi world they ask, "How does it sound?" In the pro-sound world they ask, "What can it do and how much does it cost?" Of course, one is not indifferent to the sound, but the practical matters are of another importance altogether.

The last time we tested a dedicated professional sound product, it was also a D/A converter. That was in High Fidelity 3/03, where we successfully tested the ADDA 2402 converter from Digital Audio Denmark, which is by the way not only an D/A converter, but also a converter of analog signals into digital ones.

The topic of this test is a neat little box, which exclusively converts from digital to analog. It's about the Benchmark DAC1.

Barrier-breaking

Already before we go into the performance of Benchmark DAC1, we can establish that this product is barrier-breaking, as the success within the professional sound world has now spread so much into the hifi world that it has recently become available in a more "civil" and living room friendly version. Silver has no rack-mount ears and is supplied with a neat, bright front plate. To some of us, that is not going to matter much, though, because the little box only measures 20.5 x 4.5 x 21 cm (W x H x D) and weighs a mere 1.6 kg. As Dave Thomas said about it in Stereo Times, "Heck, I've eaten steaks bigger than this thing."

Inside, the two versions are completely identical, but now DAC1 is also available in a cosmetically updated version for domestic usage. Such things otherwise happen very rarely, and in this context it's interesting to note that Benchmark sends people to the large CES exhibition in Las Vegas, which is otherwise mostly for consumers and to a lot lesser degree for professional sound people (CES is short for Consumer Electronics Show). The plan of Benchmark is - so we heard - to concentrate more on hifi, now that their little DAC1 has been so extraordinarily well received in the hifi world as well.

DAC1 is in actual fact a genuine sensation and has long ago had all sorts of recommendations for studio purposes, where leading mastering people and sound technicians like Bob Katz, Doug Sax, Bob Ohlsson, Glen Meadows and many others support it warmly. The first time we heard rumors about DAC1 was when John Marks mentioned it in *Stereophile* (July 2003). That mention was later followed up by an actual test by John Atkinson (*Stereophile*, May 2005). Later, we became aware of its existence again, when a good friend of the editorial staff, who resides abroad, told that he had bought a Benchmark DAC1 in the US, and that its sound quality in full lived up to his very big expectations.

However, DAC1 wasn't available on the market here in Denmark - or so we thought. It appeared that it was represented by the company Futureware, who has specialized in - you got it - equipment and software for professional purposes.

Benchmark

The company, Benchmark Media Systems, Inc., situated in Syracuse, NY, was established in 1978 and has released a long row of professional audio products and also received an impressive range of distinctions over the years. Also the DAC1 has received countless distinctions. There is lots of information about the company, its products and many technical issues on the company's own web site at www.benchmarkmedia.com.

Benchmark has really struck lucky with their smart little DAC1, as is confirmed by the fact that in a short while during the research for this review, I succeeded in browsing by more than 10 reviews just on this little DAC1 converter, some of which are quite elaborate, serious and well-documented. All reviewers seem to agree that this converter offers a so far unheard-of attractive ratio of price and technical performance. Several reviewers even think that they have never come across anything with better measures or sound - regardless of price!

So of course we had to check that out.

Versatile and easy to install

In spite of the small dimensions, DAC1 can do it all and in most cases even more than that. Who, for instance, needs two parallel headphone outputs? Headphones are used often in the pro-world, and here it is naturally of great importance not to disturb one another, and that all circuits at any time yield the optimal sound quality, which is the case here.

By using a small switch on the front (which may be deactivated by a small internal jumper) you can choose from three digital inputs AES/EBU (on XLR basis), SPDIF (BNC or RCA/phono via the included adapter) or optical SPDIF (TOSLINK™). All inputs accept any sampling rate between 28 and 195 kHz as well as any word lengths up to 24 bit. DAC1 detects any emphasis and automatically treats the signal accordingly in the digital domain. Besides the two headphone outputs, which can drive any headphones with unheard-of minimal distortion, the analog signal can be taken from the backplate either in balanced (XLR) or unbalanced (RCA/phono) form.

The levels can be adapted in coarse steps (10 dB) via internal jumpers and fine-tuned using little multi-turn trimmers (2 dB per turn) via small holes in the backplate. A small switch on the backplate gives the possibility to choose whether the volume knob at the front should only control the headphones or the very signal output level as well. In this way, the little DAC1 can be used as a preamplifier and thus be directly connected with the optimal level of signal for any power amplifier or e.g. a set of active monitors. So the little box is far more flexible and has more features than it appears at first.

The secret

Rarely does a device offer a real innovation which distinguishes it radically from all others of its kind, but that is actually the case with DAC1. The secret is called UltraLock.

The UltraLock technique has the purpose of making the converter completely immune to incoming jitter. Haven't we heard that claim

before? Yes we have - in fact many times - but it hasn't really held good in practice. Diverse buffers, PLL loops, regular digital delay lines etc., which were supposed to eliminate jitter, have so far only done a partial job at best. We have never before tested a DA-converter, which behaved in the exact same way, regardless of which digital cable you hooked up to it and whether the dish was served in XLR, phono or even optical form (TOSLINK™) - but that's how it is with Benchmark DAC1!

What's brilliant about UltraLock is that it solves the jitter problem in a new and very different way. Whereas you're normally fighting to synchronize two clocks, of which one is in the digital source and the other in the converter, the principle of UltraLock is to let the internal clock of the converter run freely, completely independent of what's poured into the converter. The necessary adaptation takes place exclusively by a fast and precise adjustment of the over sampling of the converter, so the whole system precisely matches the actual input. That it actually works as intended is fully confirmed by an overwhelming amount of documentation done by Benchmark as well as independent laboratories round the world. Our measurements using our Audio Precision equipment fully confirms the stated specifications.

Benchmark prefers to keep the technical details about UltraLock to themselves, but as far as we have been able to tell, it all takes its starting point in an older article about clock jitter written by Robert W. Adams from Analog Devices. The heart is a so-called asynchronous sample rate converter of the AD1896 type (from Analog Devices - who else?), which is of the second generation in DAC1 (the precursor was called AD1890). The sample rate converter is followed by an AD1853 24 bit/192 kHz multibit-sigma-delta DAC of the same origin. With respect to the filtering and the special UltraLock principle, about which we unfortunately don't know the details, it operates with a fixed internal sample rate of 110 kHz, which assures a bandwidth of up to 55 kHz if permitted by the digital source. The filtering is continually adapted to the current sample rate, and the DAC1 is

altogether easy and pleasant to handle. It consequently makes sure to make the best of the situation and never complains about anything with clicks, bangs or other abnormal sounds. It always makes an effort to yield its best, and if it's not pleased with what's being served, it simply keeps its mouth shut.

Measurements above all

It is no secret that at professional sound companies, like Benchmark, they trust measurements more than golden ears. The thesis is something like 'if no errors can be measured, then no errors can be heard.'

In return, one realizes that, e.g., distortion related to jitter theoretically is both measurable (and therefore possibly audible) even if more than 20 dB below the unfiltered basic noise in the audible range, which in a well-made 24 bit converter - as this certainly is - already is far beyond 100 dB lower. Converted to errors in the time domain, these strict demands correspond to deviations of a few pico seconds, which may be both measurable and audible, unless something is done about it. One just prefers to measure first and listen later.

The effectiveness of the UltraLock system is underlined by the fact that even incoming jitter of the order of hundreds of nano seconds does not affect the analog output signal in any way. Benchmark even claims that their UltraLock system always accounts 100% for the jitter of any incoming digital signal, as long as the input receiver knows how to handle the signal.

Benchmark obviously have complete Audio Precision System Two equipment at their disposal and know how to operate it. They found it worthwhile to dedicate 15 pages of the in every way superb manual to demonstrate the technical superiority of the DAC1 by graphs. And to be honest, we don't recall seeing more convincing measurements than these.

There are limits after all

In the excellent manual you find not only a lot of description of the converter's virtues and

outstanding qualities, but also a section about what UltraLock converters can NOT do. Here it's pointed out that jitter errors which have occurred during the conversion from analog to digital (in the ADC) are of such complex nature, that they are principally impossible to restore.

The latest product from Benchmark is, logically enough, exactly a state-of-the-art analog to digital converter, the ADC1, which is claimed to have as low jitter as at all possible with the present technology. In this context they refer to a collection of CD's, that appear to have been recorded with the Benchmark ADC1 as one of the first links of the chain. This list can be found at www.benchmarkmedia.com/info/getcd.html. Among the recommended CD's there is a release from DMP, which dates back as far as 1996, so there is apparently many years of development behind this new converter. Curiously enough, it appears that we in those days achieved permission to use a track from that very CD on one of our own High Fidelity reference CD's, but we'll come back to that later.

The sound of nothing

DAC1 has been tested in different constellations and especially with as different sources as at all possible. Anything from a Denver DVD player from Wal-Mart via a thoroughly modified Sony CD player to costly multi-format devices of varying origin have been put in front of DAC1. Generally, our conclusion is that the UltraLock system also, in practice, keeps its promises. At no point did we experience differences in the sound from the analog output of the converter, no matter where and how its input was provided. Even the so controversial TOSLINK™ was tested using 20 meters of optical cable and gave results as good as with short balanced XLR cables for dedicated high-end sources - very impressive and most thought-provoking.

However, it is not only the ADC in the very early part of the chain which influences the eventual sound quality produced by DAC1. One example is the Tact 2.2x preamplifier with spatial correction and similar processors based on sample rate

conversion, which however does not benefit from the "secret trick" that is special about the UltraLock coupling. It is our general experience that as soon as sample rate conversion is involved, it's associated with risk of irretrievable damage to a digital audio signal, if you don't know exactly how to avoid it. It is always of utmost importance that signals intended for sample rate conversion and digital forwarding has the lowest possible jitter content. In general, sample rate converters tend to "freeze" jitter in the very signal, similar to what A/D converters do. By the way, Tact uses the exact same sample rate converter from Analog Devices (AD1896) in their 2.2x model as is used in the Benchmark DAC1.

As mentioned above, a release with the DMP Big Band (Glenn Miller Project, DMP CD 519) is not only recorded using the Benchmark ADC1, but also available on our own Reference CD No. 25. Therefore, as our starting point, we choose a couple of tracks from this very CD in the description of the sound characteristics of the DAC1.

The Future Sound of London, track 1, with Her Face Forms In Summertime, is a distinctly synthetic production, which via DAC1 in a previously unheard-of way gets to appear bare and completely on its own terms. In the DMP Big Band recording with Tuxedo Junction, track 4, the neutrality is so pronounced, that you spontaneously react to the freedom of digital fluff of any kind. The sound is smooth, dynamic and super detailed, but yet with lots of brass ring - a very convincing experience, which testifies that the CD media can convey extremely high sound quality if merely used properly. Also the classical section of the CD - and large amounts of other recordings - feel more dry and precise than we have experienced before - and far, far better than we remember from back in 1997, when we produced Reference CD No. 25.

It is impossible in practice and under the circumstances deeply unjust to criticize this converter for the neutrality of its sound, for that is the very intention behind its coming into

existence. It is our clear understanding, that Benchmark DAC1 is an extremely precise conveyer of sound, which does not possess the least touch of neither “musicality” nor “soul”. But, in return, if there is musicality or soul in the recordings you ask it to convert from digital to analog, then it does so completely without interfering and thus also without limiting whatever there may be of exactly musicality and soul.

In practice, the sound character (or lack of just that) of the converter is completely the same, no matter whether you listen via headphones or draw it from the unbalanced or balanced outputs.

It is recommended in the manual, under all circumstances, to attempt to connect the DAC1 directly to one’s power amplifiers to get as close to its sound as possible. We can only recommend that anyone who has the opportunity tries the same, because any analog preamplifier after the DAC1 has to be extraordinarily good in order not to compromise the ultra-pure sound of the little DAC1.

Conclusion

The Hi-Fi business now has serious competition from two sides. The computer business offers PC’s and sound cards with the most incredible capabilities at prices below what the Hi-Fi business has gotten us used to pay for a piece of cable. And now the professional sound business is actually releasing Hi-Fi products on the market, which technically compete with even the wildest high-end, but only costs a fraction. The high-end manufacturers would be wise to keep an eagle eye on their new competitors.

The Benchmark DAC1 is developed for professional use in sound studios, yet the little D/A converter has still appealed so strongly to the high-end segment of the Hi-Fi market, that the company has now taken the consequences of the unexpected success and adapted the DAC1 cosmetically to its new target group.

The Benchmark DAC1 is a pronounced no-nonsense product, which at the same time contains

an unexpectedly simple solution in the form of the jitter-rejecting UltraLock principle, which combined with state-of-the-art of traditional specifications for linearity, noise, distortion etc. give a relieving guarantee for optimal yield even against heavy odds.

Soundwise, the DAC1 almost behaves like a polished mirror, which shows what your digital music collection is really made of, completely without interfering and without “soul”. Many recordings are far better than you think, while others disappoint badly.

So now it’s just up to you whether you and your stereo equipment can stand being face to face with the truth - and if that’s the way you wish to move altogether.