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considerably more elaborate than normal upsampling. That may be so, but as far as we can see it's doing a standard upsampling job, with just the same sort of response as most conventional up- or over-sampling players. Accoustic makes much of the additional noise created by regular upsampling, but we've yet to see evidence of that. The firm also seems to imply that normal DACs share digital processing for both channels and so create a slight time delay between them. But we feel that problem (to the extent that it ever really was one) was laid to rest 20 years ago!

So in fact what we have here is a perfectly standard digital filter, one with a slightly sub-optimal performance that does not attenuate rapidly enough as frequency increases above 20kHz. This results in a small degree of aliasing in the output of the TUBE-DAC. Where we will give Accoustic high marks is in the elimination of jitter, with the audio output showing no trace of distortion.

As one would certainly hope, everything about the construction of this unit is deluxe, from the very positive control switches to the uniformly high quality of components inside and their immaculate assembly to the circuit board. All the usual high-end touches are there: twin mains transformers, multiple regulated power supplies, nice connectors, even a "Generalised Impedance Converter" – a nifty circuit configuration for the final analogue filter. You get both unbalanced and balanced audio outputs and all three flavours of electrical digital input. It's also AES/EBU balanced, which is the preferred mode of connection to the Drive I. Digital outputs are a nice touch, too, facilitating connection of a recorder or remote DAC slaved to the TUBE-DAC's selected input.

SOUND QUALITY

We expected some decent sounds from all this high-tech and weren't disappointed. It has all

the hallmarks of classic high-end kit, with excellent neutrality, effortless detail and almost tangible grip, authority and control. It is, of course, impeccably well-mannered and locks on very quickly to the incoming digital signal – whereas some high-end DACs can be confusingly slow.

One of the consistent features we've found across a range of upmarket CD players (and since we spent most of our time with the TUBE-DAC partnered to a Drive I, a CD player is effectively what we were testing) is the high degree of polish they bring to the sound, making cheaper players sound rough by comparison. This one is no exception, joining such company as Meridian and dCS in offering sounds that appear to belie their origin.

During the time that high-sampling-rate, high-bit audio has been slowly penetrating the market, CD recording and replay standards have risen making one question what all the high-res fuss is about. In the practical sense of the terms, this is high resolution. And, thanks to an otherwise uneventful Xmas, we had plenty of opportunity to listen at leisure to Accoustic Arts' statement on digital replay and our respect remained high across a wide range of music and recordings. ■



DAC to the future

Accustic Arts' latest high-end DAC has a performance to match its credentials.

PRODUCT Accustic Arts TUBE-DAC II

TYPE Digital to analogue converter

PRICE £4,995

KEY FEATURES Size (WxD): 48x10x37.5cm
● Weight: 12kg ● Inputs: S/PDIF (BNC and phono), AES/EBU (XLR) ● Outputs: Balanced (XLR) and unbalanced (phono) audio, S/PDIF (phono) and AES/EBU (XLR) digital ● Input compatibility: 32, 44.1, 48kHz, up to 24-bit

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OK, so the Accustic Arts TUBE-DAC II is not the most expensive DAC in the world, but this little baby is hardly cheap. It only handles sampling rates, for example, up to 48kHz, so to most intents and purposes it is half of an exceptionally upmarket

CD player, in partnership with the matching Drive I transport (£2,995).

The company behind this assault on the highest peaks of CD replay is Schunk Audio Engineering, a German outfit offering amplifiers, loudspeakers and cables, alongside a top digital source like the TUBE-DAC, and a handful of very slightly less esoteric digital models.

Features in the TUBE-DAC include that well-known 21st-century amplifying device, the thermionic valve, in this case a pair of ECC83 triodes, which is a common enough sight in audio. Used here in a hybrid configuration (which as our own measurements were able to confirm) it differs in some ways from your average valve circuit.

But valves aren't that expensive and don't account for the price. A cost that's explained largely by three things, two of which we could see and one we could only read about. The case, made largely of thick aluminium panels is superb and there's a generous sprinkling of ultra-high-performance op-amps, to be precise ten type OPA627. The latter is one of those near-mythical audio components that outperforms standard parts in almost every way. And the part we read about? Accustic's own digital filter, with a 32-bit microprocessor for which great things are claimed.

The 32 bits sound good and so do many of the claims made for this bit of electronic trickery. Accustic doesn't call it a 'filter', just 'digital signal processing', and claims that it's

Q&A

We recently spoke with Accoustic Arts' CEO for Engineering, Research and Development, Martin Schunk, who revealed some of the secrets behind the TUBE-DAC II's success.



HFC What does the 32-bit digital filter achieve that conventional ones don't?

MS It is not only a digital filter but also a data collector. It collects digital data via the parallel multiplier network, achieving a high degree of accuracy. It also recognises CDs which have been recorded with emphasis, which is then digitally processed and embedded in the frequency content, and it also emits the left and right channel simultaneously via two separate lines.

What are the advantages of using a GIC?

The intention is to suppress the high frequencies before any aliasing occurs. With 44.1 kHz sampling frequency not more than 22kHz can be transmitted. Higher frequencies evolve as aliasing. These frequencies are suppressed partly by the digital filter and the rest by the analogue filter. Due to this system configuration, which is not doing any over- or up-sampling, less high frequency noise is generated. Upsampling can create noise at high frequencies.

The GIC operates precisely in terms of frequency response – optimised in terms of phase and group delay – and keeps the internal resistance of the circuit constant at all frequencies. Therefore, the operational amplifiers are always working in their perfect operating range.

What precisely do the valves offer that transistors couldn't?

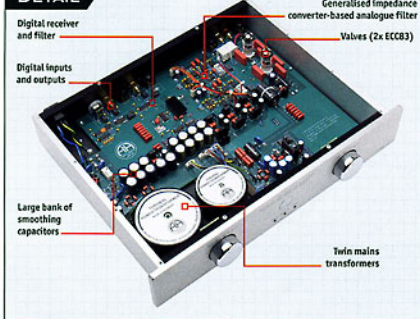
The characteristics of a tube are such that the resulting distortion is more harmonic. At the position of the filter where we use the tube it is superior to semiconductors as it has an extremely high input resistance and it is very fast.

Why was the decision made not to support 96kHz digital sources?

Only DVDs are 96kHz. The digital input receiver is located before the digital filter. It's a unique component and extremely good at its task. Other available digital input receivers on the market include additional functions, but also have significantly worse data and characteristics. It can process 28-52 kHz, therefore the sampling frequencies 32, 44.1 and 48kHz are supported.



DETAIL



Among the many discs that we were able to audition on the TUBE-DAC was a newly made CD of operatic voice and piano, recorded so recently that the original sound was still fresh in our ears. The recording itself was excellent, that much was obvious from the most casual listen, but the real extent to which the tenor's high notes rang true was much more apparent via the TUBE-DAC than via our resident (modest but capable) CD player. The human voice is such a familiar sound that any interference with its complex harmonic structure has a disproportionately large subjective effect, making it a good test of audio equipment. In this case, it was clear that both the recording and replay equipment had admirably discharged their function and the sound was less 'digital' than we were used to.

It's worth mentioning that, we tried playing the same recording from the hard disc of a computer, rather than from the CD in the Drive I. Computers are renowned for being a jittery source, but there was really very little difference between the two. Accoustic Arts may not thank us for saying this, but the TUBE-DAC has very good rejection of incoming jitter and is therefore quite unfussy about the source.

Moving a world away to highly processed contemporary pop, the TUBE-DAC is similarly assured, unfazed by the multi-layered nature of studio productions. Rapid, funky synthesiser can prove a tough test for digital sources,

but again the result is confident, detailed, almost calm. Which can come as a bit of a shock if you've used to more coloured audio kit.

If there is anything to criticise, it's a very slight degree of hardness in the highest registers when reproducing instruments with an extended harmonic structure – a violin being perhaps the most critical. In such cases, the 'air' around the instrument is not quite so pure, the decay at the end of notes a touch less well-defined.

Overall, though, this is clearly a very capable DAC indeed, with plenty going for it sonically, and, in terms of ownership, it practically exudes class. This experience has certainly made us keen to visit other Accoustic Arts products. And who knows what further treats lie in store? **HFC**

Richard Black



VERDICT

SOUND



PRO Detailed, tonally near-perfect and possessed of both delicacy and authority. The combination of sonic skills makes this DAC confident across a wide range of musical styles.

EASE OF DRIVE



CONCLUSION

Very much a DAC for all seasons, this is an expensively built product with much to commend it. The Drive I is the perfect partner but all kinds of other sources also benefit, including a computer.

HI-FI CHOICE



OVERALL SCORE

