SOUND OF THE DECADE

EXCLUSIVE REVIEW

Celebrating 10 years in the hi-fi business, Audio Synthesis has launched the DAX Decade, the latest incarnation of its successful digital-to-analogue converter

by MARTIN COLLOMS

British specialist Audio Synthesis has built up a loyal following for its aptly named and finely-crafted 'Passion' series of passive line controllers. We last visited the range two years ago, when we covered the Passion 8 (a remote controlled version) plus a power amplifier, the Desire [*HFN/RR*, May '96].

The Audio Synthesis DAX digital decoder proved to be another success, and by 1996 had evolved into the DAX-2 [*HFN/RR*, May]. Now we have the DAX Decade, its name chosen to commemorate the company's 10 years of operation. Other new products for 1998 include a luxury CD transport and a new power amplifier. Special combinations of the DAX and power amplifier are also available for those who want to take the short-path Audio Synthesis technology to its practical limits. (A complete combination will be reviewed soon.)

Taken as a general purpose digital decoder, the DAX Decade has some important features. One is the ability to accept the proprietary Audio Synthesis 'N-Code' format, which minimises the signal modulated and related interference jitter, as well as the standard S/PDIF digital audio signals. The concept itself is interesting — in a sense the Passion control has been moved inside the Decade, thereby eliminating one interface connection. The control functionality itself has also been moved into the digital domain; remote control of volume and (digital) input selection are now derived by control logic and a digital signal processor. Analogue signals may be interfaced with the addition of an accessory A/D converter unit, soon to be available in the AS range.

The control functionality itself has also been moved into the digital domain, i.e. remote control of volume and input selection [digital] is now derived with control logic and a digital signal processor

DSP control allows further functions to be incorporated, for example, high-resolution, wide dynamic range for volume: rather better than the previous passive equivalent. Volume settings are initially 1dB resolution over a 96dB overall range. Fine control, to 0.3dB, of channel balance is possible, plus absolute phase inversion. Higher control resolutions, even 0.1dB, are available to order.

More subtle aspects include user programmable dither (previously seen on the Meridian 518 digital controller, reviewed in *HFN/RR*, August '96), control of the LCD display brightness to include full mute, instant or fade audio mute facility, and last but by no means least, HDCD decoding as standard.

The established DAX-2 is currently priced at £2195 in single-

ended and £2890 in balanced-output form. Now incorporating the digital 'pre-amp' facility, the new DAX Decade costs £2795 SE and £3490 balanced. In accordance with the Audio Synthesis upgrade policy, a DAX-2 SE may be rebuilt into a new Decade for a supplement of £1250 (this isn't possible for the older technology of the original DAX). And while we're quoting prices, note that the new Transcend CD transport will cost £2500, and the new 2 x 175W per channel Desire Decade power amp £2495.

In appearance the DAX Decade offers a substantial upgrade on the old. The thick mirror-polished alloy fascia and fine-grain anodised casework put it right in the front rank of audiophile build quality.

Decade is clearly distinguished by the gold-plated, milled from solid control knob for manual entry of volume when so required, and by a back-illuminated large LCD display window. Some indication of the build quality is given by the weight, 17kg — we're talking Wadia territory here! Full sized, it measures 450x115x330mm (whd).

Front panel controls include the full input selections complement of Toslink, AT&T glass optical, BNC coaxial, phono coaxial and AES/EBU balanced via XLR. In addition to mute/standby there is a memo button which accesses the various modes. Input selection can be set to 'auto', when it will search and lock the available 'live' digital input.

Menu choices include channel balance, signal phase invert, user name function for inputs, display brightness in four levels including mute, user control of dither from the DSP to the DAC including 'mono', '1- bit' and a choice of '2 or 5 bits with high frequency weighting'. For the record, the dither is operative at 8-times this internal re-sample rate. As supplied, the DAX Decade was [illegible] for its natural maximum output of 3.13V, with the volume control in '1dB' step mode. This is operative down to -40dB, below which the steps increase to 2dB. Below -60dB, 3dB steps apply.

Mains input is by an IEC detachable cord with an adjacent primary power switch. There is no digital 'record' output, this being a little-used feature which had been found to lower DAX fidelity.

For the balanced version (not reviewed), the XLR audio outputs are duplicated in top quality, double-gold-plated phono sockets. In this model, the signal path isn't compromised by adding a balanced output buffer; instead, the required differential signal is generated in the digital domain, and the entire D/A path is duplicated for the second audio signal phase. Thus this version operates in digital differential mode, in theory giving even greater resolution and dynamic range for balanced power amplifiers.

TECHNOLOGY

Noting the balanced option outlined above, after careful analysis the Pacific Microsonics PMD1 DSP/digital filter chip was chosen as the function core of this decoder, this LSI chip naturally incorporating the HDCD decoding facility.

Internally operating at 24-bit resolution, the optimised use of this chip allowed adoption of the inbuilt digital volume control, whose interface is specifically designed not to corrupt the HDCD coding process. Internal processing and resampling is at the 8-times fs level and 24-bit data words are output to the DACs.

Balanced Burr Brown PCM63 converters, now more or less an industry standard for high end designs, deliver better than 21-bit effective resolution for this design, while a special phase-lock system is used to precision-gate the audio current from the DACs to the single-ended Class A I/V converters to help suppress any last trace of jitter energy.

Digital input data acquisition is by Crystal, this followed by no fewer than three cascaded phase-lock loops, these delivering a jitter rejection bandwidth to as small as 1Hz.

Following the I/V stage there is a non-feedback, three-pole passive alias filter, followed by a power buffer, the latter hardwired discrete with top quality components, including Vishay bulk foil resistors at critical points.

As regards the power supply, nothing has been left to chance. In addition to extensive multiple local regulation, the DAX Decade has three power transformer toroids, almost improbably serving a total of 40 regulators. On engineering grounds, the Decade design is reaching for the sky!

SUPPLIER

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THE LISTENING SYSTEM

For this review, digital domain signals were generated by Meridian 200T, Krell KPS20 and Audio Synthesis Transcend transports. Comparison players and decoders included the Krell KPS20i/l, Audio Synthesis DAX-2, Wadia 860 and DCS Elgar.

Monitoring was via a Krell FPB-600 and Conrad-Johnson CAV-50 and Cary 572 amplifiers, with comparison line control from Conrad-Johnson ART and Audio Synthesis Passion 8. Cables were by van den Hul, Siltech and Transparent. In the main, the speakers were Wilson WITT 2 supplemented by the Avantgarde Duo and the QUAD ESL 63. Extensively soak-tested by the manufacturer, the DAX Decade settled down quickly after a few days use.

First of all, while the unit comes with a remotely controllable volume, it may be left on 'full' and used as a fixed output decoder with any audiophile grade pre-amp. That pre-amp has to be pretty special in view of the typical loss (on my listening-test scoring scale) of 7 to 12 points when an audio chain is assembled from separate components, even when such very high quality sources are concerned. Even if there is detectable loss when the on-board digital volume facility is operative, this is likely to be preferable with direct power amplifier connection; in the case of the DAX Decade, the loss amounted to just 4 points when judged at the highest quality level.

Consequently, we can confirm from the outset the wisdom of fitting a volume control to this unit for use in the most critical applications.

In context of the borrowed Audio Synthesis system, the arrangement made sense, and provided seamless control and drive to the amplifier, improving on the sound quality of the earlier AS implementations.

In absolute terms, the difference in quality compared with the DAX 2 is incremental and concerns a more neutral tonality. With the benefit of hindsight, the older DAX sounds a bit bright; the new model is more sweetly voiced and plays with lower subjective distortion and cleaner sibilance. Since the old model fared well in review in these respects, it was only by direct comparison of the two that these aspects could be properly described. Clear gains were also audible in transparency and the recovery of low level ambience.

When the Audio Synthesis transport was used there were significant gains and minor losses. The losses included a sense of a more steady pace, a mite less

rhythmic and upbeat than when using the Decade with a Krell or the old (Philips CDM4-based) Meridian 200 transports. The gains, which could be largely attributed to the N-code interface for the digital data link, were of a greater sense of ease and purity, with significantly higher definition, transparency and focus. Clearly there is a notable development here.

Transparency is the most obvious quality, and the Decade achieves an excellent soundstage: spacious, ambient, of large scale and with very good perspective.

The general standard is very good for this decoder, which when direct-coupled to a fine power amplifier achieves a reference-level score of 50 points. There is little to criticise; the bass is neutral, extended and crisp, the mid highly resolved, and the treble is well up to the best modern standards.

CONCLUSION

Audio Synthesis has continued the successful development of this high-performance decoder to bring substantially better build quality with a highly professional look, adding advanced facilities such as user controllable dither (in review we generally used '1-bit dither, flat filter') remote digital volume, remote digital source selection and many others, including absolute phase inversion. Sound quality has kept pace with these developments, to maintain the unit's strong market and review ranking for the price.

So, the 'recommended' status continues for the DAX in its new Decade form, while DAX 2 owners may well have to consider their spending priorities, in view of the possible upgrade path to the new DAX package. It beats the sound quality of a DAX 2 plus a Passion 8, which was the whole point of the exercise, and does so at no increase in price. +

AUDIO SYNTHESIS DECADE

LAB REPORT

Much of the lab measurement was purely academic, so nearly perfect were the test results: response flat from near DC to 20kHz, channel separation better than 125dB mid-band. At full level, the simple THD readings were the best yet, -103dB for low and mid frequencies, 24-bit, and -95dB for 16-bit. At high frequencies it still bettered -95dB, this essentially system noise.

At 10dB below full modulation, the distortion was still state-of-the-art at -92.5dB. There were no significant harmonics visible at -70dB using dithered encode; all you see is a measurement noise floor at 50dB down(-120dB relative to full level), this essentially the dither component of the test signal.

I looked for some obvious proof that this converter had better than 16-bit resolution when fed higher-bit data and found confirmation in the high-frequency intermodulation results. Fed with the usual '16-bit' data, the full-level result was excellent at -105dB for difference tone distortion; with a -10dB modulation level, I got -95dB . Increasing the data to 24-bit (from the AP SYS-2 generator), this improved to -112dB and -105dB respectively [Fig 1]. This proved the higher resolution of the Decade on such a source. Further proof of 24-bit data was seen in the low-level measurements. In fact, it was possible (with suitable filtering) to recover a tone at 140dB below full level with 0.5dB accuracy by using the usual dithered encode. Linearity was quite superb [Fig 2]. Even here the minor deviation shown is a function of residual noise for a 16-bit input, rather than a loss of level accuracy for the recovery of encoded tone.

I checked the linearity when set to a substantial 40dB of digital volume attenuation. Between -65dB and -95dB there was up to 8dB of error seen on the graph [Fig 3] but putting this in perspective these errors were in fact quite small and occurred below -105dB relative to full level. It means that the volume control was still better than 10-bit resolution at this low setting. Conversely, it reinforced the point that one would seek to operate a digital volume control fairly high in its working range, with the right match to the system, in order to maximise the working resolution and thus maximise transparency.

With no volume attenuation, distortion products were buried in the noise floor, but with attenuation there was an inevitable increase. The visible changes in harmonic distribution were more interesting for small setting differences. For example, at -3dB volume setting with input level close to -20dB, in fact -19.8dB and 20.4dB, the combined result was a shift from odd to even order. This was audible on the test set audio monitor but it's debatable whether harmonics at -110dB relative to full level would be audible [Figs 4, 5]!

A check on low-level clarity was made using a high-resolution analysis of a 10.05kHz tone. Even with the digital volume control in action (set to -4dB), the noise floor was better than -125dB at generally -129dB and there was no broadening of the central tone all making for a classy result.

The frequency response under de-emphasis measured to within -0, +0.4dB 500Hz to 20kHz, not quite perfect but good enough. Output impedance was a low 330 ohms.

Examining the radio frequency content in the audio output, I found the Decade unexceptional; ie, some amplifiers might not sound quite so good with this source. Signals were present up to 250MHz at a moderate -45dB though with two components at around 35MHz and 85MHz rising to -40dBm. Spuriae in the lower band to 100kHz were well controlled, typically to -110dB relative to full output.

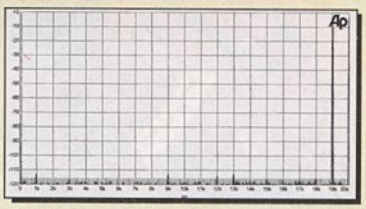

Fig 1. Audio Synthesis DAX Decade: high-frequency intermodulation, 24-bit (see text)

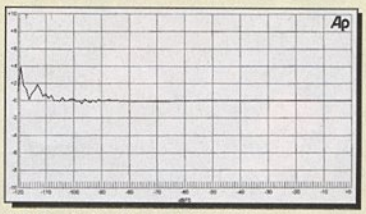

Fig 2. Audio Synthesis DAX Decade: linearity to -120dB

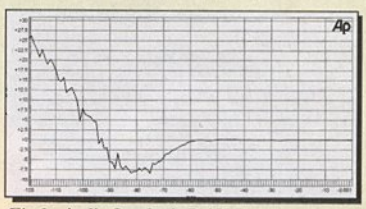

Fig 3. Audio Synthesis DAX Decade: digital volume control linearity

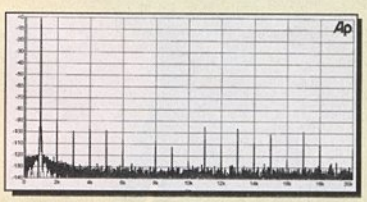

Fig 4. Audio Synthesis DAX Decade: 1kHz tone at -19.8dB (volume at -3dB, see text)

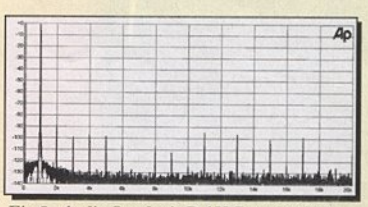

Fig 5. Audio Synthesis DAX Decade:1kHz tone at -20.4dB (volume at -3dB, see text)

Test results	Audio Synthesis DAX Decade		
	20Hz	1kHz	20kHz
Channel balance (dB)	0.1	0.1	0.1
Channel separation (dB)	125	88	72
Frequency response (dB)	-0.1	0	0
Distortion (THD vs level, dB):			
At 0dB	-108	-105	-81
At -30dB	-96	-92	-68
At -60dB	-62	-59	-15
At -80dB	-35	-41	-10
At -90dB (dithered)	-20	-30	+5
At -100dB (dithered)		-21	
At -110dB (dithered)		-12	
Resolution (linearity error, dB):			
Error at -60dB	–	0	0
Error at -80dB	–	0	0
Error at -90dB	–	0	-0.4
Error at -100dB	–	-0.4	-0.2
Peak output level L/R		3.442/3.473V	
Relative output level ref 2V (dB)		+4.76	
Output impedance L/R		47ohms	
Intermodulation, CCIR, 0dB (dB)		-104	
Stopband image suppression (dB)		96.5	
1Hz noise modulation (dB)		+12.1	
Signal-to-noise (A-wtd, dB)			
With emphasis, 0LSB		114.5	
Without emphasis, 0LSB/1LSB		110.6/111	
Total correlated jitter		155 picoseconds	
Digital outputs		S/PDIF and AES/EBU	
Crystal clock accuracy		-0.2ppm	
Track access time (to track 99)		3 seconds	
Typical price (inc VAT)		£2795	