

Valve-Equipped DAC

ANDREW HARRISON GETS TO GRIPS WITH AN IDIOSYNCRATIC BUT UNDOUBTEDLY INTERESTING DAC FROM VALVE AUDIO DEVICES

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Given the brand name Valve Audio Devices (VAD), it's not at all surprising that the company thoroughly embraces valves in a three model line-up that currently includes the *DAC-10 DSD*, a DSD-only converter called the *DSD Player*, and the *DAC-12 DSD* which is the unit tested here. Equipping digital-to-analogue convertors (DACs) with valve circuitry is nothing new, but such devices are more commonly found only in the output stages, the final furlong within the DAC, by which point the audio signal is resolutely analogue and is therefore considered to be responsive to what's perceived to be the kinder, more warming treatment of vacuum-state electronics.

Designer Gregor Szymczyk is a Polish-born electronics engineer who has long been working with valves in the pursuit of musical excellence, and in the case of the *DAC-12* we find no fewer than three pairs of valves ranged down the centre of the unit. Two *6SN7*s are used to form the analogue output stage; two *CV574* full-wave rectifiers are employed for the power supply of the input valves; and two *E88CC* double triodes are used on the S/PDIF inputs, buffering, impedance matching and creating a balanced output for the S/PDIF receiver.

In fact the *DAC-12 DSD* is two distinct digital converters in the one chassis. For PCM-based digital audio, whether from traditional S/PDIF or USB computer sources, the digital audio signal passes to two off-the-shelf hybrid-multi-bit stereo DAC chips, using each in dual-differential mode. The specific type is not disclosed by the designer, who feels that the specification is less important than the overall circuit application. More remarkable is the design philosophy of the DSD convertor. Instead of taking a DSD-capable DAC chip such as a delta-sigma device from ESS, TI or Cirrus Logic, VAD's designer has taken an unusual approach, based on simply filtering DSD's raw PDM bitstream to reconstruct the analogue waveform.

Either DSD64 (as used for Super Audio CD) or the more recent DSD128 variant can be accepted, through a separate USB input receiver (with its own USB port on the rear), using the DSD-over-PCM (DoP) protocol that's ignited computer audiophile's interest in DSD in recent years.

The PCM-encapsulated DSD bitstream is taken



by another Combo384 Amanero USB input receiver, then fed *via* input buffer and shift register through an analogue FIR filter, followed by a 4th-order low-pass filter. This is fixed at around 50 kHz to remove the worst of the format's ultrasonic hash, and both filters are configured in dual-differential balanced mode. The resulting output is a reconstructed analogue signal that has not seen the usual digital signal processors (DSPs) we'd expect to find in a modern DAC.

New to the *DAC-12 DSD* is a three-way switch on the front panel, used for fine tuning the PCM inputs' digital interpolation filter: CD is a minimum phase 'apodising' filter; MIX is a minimum phase 'soft knee' filter; and HI is a linear phase 'soft knee' type.