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Michael Lavorgna | Dec 29, 2015

I eat bits for breakfast. Lunch is a simple bit-sized snack. And dinner is the analog to real food. This has been my routine these past four years as editor of AudioStream.com, where we digest all things computer audio.

In that time I've reviewed over 100 digital-to-analog converters, ranging in price from $60 to over $12,000. This adds up to roughly 150,000 words spilled on DACs. You'd think my pen would be running dry—especially if you feel, as some do, that all DACs sound pretty much the same. If that were the case, I could have written just one review, for that very first DAC, then cut and pasted it for all the rest. What was I thinking?

Of course, all DACs do *not* sound the same. One good reason for their differences is that the DACs themselves are not the same. Some hobbyists like to think that all DACs that contain, say, an ESS Sabre DAC chip will sound more or less alike, yet that could not be further from the truth, and for a simple reason: *DAC chips do not make music*. It takes a bunch of other stuff—*important* stuff—to turn bits into music.

One of the more fascinating facts about DACs is revealed when you talk to their designers. It's fair to say that each designer has a different philosophy of DAC design. While delta-sigma DACs are the topology du jour, some designers depart from this crowd in search of what they feel is a better way.

PS Audio's DirectStream DAC handles digital signal processing and more with a field-programmable gate array (FPGA), as do the DACs made by the UK's Chord Electronics. Rather than using the reconstruction filter provided by the DAC chip, others, like Ayre Acoustics, implement their own filter in an FPGA. Bruno Putzeys, of Mola Mola, forgoes chips altogether in his DAC, using only discrete semiconductors and offloading to a digital signal processor (DSP) such sonically important functions as upsampling and dejittering. Then there's the non-oversampling school (NOS), in which bits are converted to analog using new old stock (NOS) chips like the Philips TDA1543 and TDA1541.

Among all these ways, are any right or wrong? It depends on whom you ask. Objectivity is not to be found among designers, and if it were, what a boring world it would be. We want our audio designers to be passionate, searching souls, driven by a near-mad desire to give us our digitally stored music in all its original power and glory . . . at least *I* do.

We can look to measurements for a cooler head. But, as we all know, measurements can't tell us how something sounds. More important, no set of measurements can tell us how something will make us *feel*. Distressingly, this shortcoming also applies, more or less, to subjective reviews: While we do our best to communicate to readers how something sounds, all we can ever really tell you is how it sounds *to us*.

Totaldac d1-tube-mk2 DAC

Which brings me to Vincent Brient (footnote 1). He's based in France, near the island of Mont Saint-Michel, atop whose rocky cliffs perches an eighth-century abbey. Saint-Michel is surrounded by some of the wickedest tidal shifts on Earth, with a difference of about 46' between high and low tides. This is where, under the company name Totaldac, Brient makes a variety of digital-audio products.

For his DAC designs, which do not use oversampling, Brient's technology of choice is the discrete R2R ladder: This approach converts incoming binary data to voltages, and requires only two resistor values: R, and 2R. It sounds simple and easy, yet conversion accuracy relies on the precision of those resistor values.

You also need a boatload of them. Each Totaldac resistor ladder is made with Vishay Precision Group's 0.01%-tolerance VAR-series Bulk Metal Foil resistors—in the US, these range between $9 and $15 each, depending on quantity—the exact number required varying with the model. Totaldac's d1-tube-mk2 DAC (€9100) contains 200

resistors for each of its two channels. Precision is the make-or-break proposition for any resistor-ladder circuit; Brient spent years refining his.

Every Totaldac also contains an FPGA, within which a number of different processes occur. All incoming data are buffered with a 10ms delay and reclocked, reportedly to improve jitter performance. A user-selectable *finite impulse response* (FIR) compensation filter corrects for the imperfect frequency response endemic to non-oversampling DACs; according to Brient, the d1-tube-mk2's treble rolloff is more than 3dB at 20kHz without the FIR filter. Last, the DAC's digital volume control is implemented in the FPGA, with 69-bit resolution.

An XMOS-based, asynchronous receiver is employed for the USB input; the d1-tube-mk2 also has TosLink, coax S/PDIF, and AES/EBU inputs. Outputs are pairs of RCAs and XLRs, both single-ended. The Totaldac's external power supply attaches to it with a screw-down umbilical cable. A generic plastic remote handset gives the user control of volume level, engaging or disengaging the FIR filter, turning the front-panel display on or off, power on/off, input selection, phase polarity, earth connection (signal ground is either connected to or isolated from earth), and mute.

As the d1-tube-mk2's name suggests, its output stage includes two ECC82/12AU7 dual-triode tubes, instead of the discrete class-A transistor circuit found in Brient's d1-dual DAC. My review sample included the DSD (DoP) option (€320), which allows the USB input to accept DSD64 data. All the inputs, S/PDIF and AES/EBU, as well as USB,

support PCM resolutions up to 24-bit/192kHz., though the TosLink input maxes out at 24/96.

The d1-tube-mk2 is wrapped in a case of black aluminum, and there's an anti-vibration copper sheet mounted inside. I like the Totaldac's size (14" wide by 4.3" high by 11.3" deep) and shape (a truncated pseudo-pyramid). Its polymethylmethacrylate (PMMA) front panel comes in black or silver, and displays (in yellow) the data I'm interested in: volume level, input selected, sample rate. The little external power supply (4.8" W by 2.5" H by 7" D) mimics the DAC's shape.

Business: Necessary requirements

I live in Computer Audioville: All of my digital music is stored on a Synology DS412+ NAS. My MacBook Pro runs the Roon Server software, and I used Totaldac's USB filter/cable (€330 in lengths of 0.25, 0.5, or 1m; €360/2m) to connect Mac to DAC. To control playback I used my iPad Mini, running Roon.

Music: Necessary nourishment

When we talk about listening to music, what we really talk about is an emotional connection. I want to feel as if there's nothing separating me from my music—a tall order, considering all the complications entailed by the process of listening to recorded music. I don't want to hear great bass, a rich midrange, or silky-smooth highs. I especially do not want to hear a soundstage—ever. What I want to hear is Ron Carter, János Starker, Alfred Brendel, PJ Harvey, Björk (those last two together doing "Satisfaction" is worth your Google time), Jimi Hendrix, John Coltrane, Miles Davis,

Julia Holter, D'Angelo, EinstÅrzende Neubauten, Zoviet*France, Chet Baker, Nina Simone. You get the idea: *music*.

Footnote 1: Totaldac, France. Tel: (33) 2 90 02 11 39. Cell: (33) 6 18 03 14 08. Web: www.totaldac.com.