INTRODUCING THE CDT SIX

WHY HAS AUDIO NOTE (UK) CREATED A TWO BOX CD-TRANSPORT WITH VALVES IN IT?

Friends (and the clever foes) agree that the sound quality achievable with Red Book CD Replay is still superior to any streaming or computer / server based solution.

But why? And why would a separate CD transport improve the sound of CD-Replay, let alone one so elaborately designed and built as our new CDT-SIX?

How can one digital signal differ from another? Surely 'Bits are bits'?

Here are some explanations by Andy Grove, chief designer of Audio Note UK.

The concept for the CDT-SIX arose while I was contemplating the SPDIF interface, which is the ubiquitous connection between transport and DAC. I'd been studying ways to improve it, and came to the conclusion that the best way to treat it was to think of it as an analogue transmission line, rather than as a digital interface.

The truth is, when we speak about 'digital' it is really a Platonic concept, which is impossible in reality. However, if we take the idea that a separate DAC and transport are superior to an integrated player, then we need a way to connect them together - and whatever that way is, it must be real!

Now, transmission lines generally require a defined impedance at each end - at both the transmit and receive ends - to preserve pulse fidelity and to prevent reflections and ringing, yet a digital gate doesn't provide this. In reality, the gate transitions from one state to another (0,1) in real time, and the voltages represented by those states are also real. During that transition time, the state is undefined. This is pretty well controllable inside a CPU, the distances are short and the parasitic capacitances and voltages are tiny. When we venture into the macro-sized world, and we are considering the fact that microscopic signal defects are audible, even if they are not easily measurable, then it's time to take a closer look at what's happening.

So I decided to research and create a way to buffer the digital internals of the transport and DAC to provide a pure, defined analogue impedance for the transmission line. It would be relatively simple to keep the signal pure between the transport mech and the buffer, and similarly at the other end, by careful design and the use of special cabling. At first I started to think about a solid state solution; when we think about high speeds and digital, that's where an engineer naturally looks. But then I thought I may as well just go 'all the way' and do it with valves from the outset.

With this aesthetic in mind I designed a simple transformer coupled stage, first with a long term friend of mine, the 6SH7, and then with a EF800 RF pentode, with a small transformer one at the transmit end and another at the receive end.

The active stages are wideband SE Class A transformer coupled, working in transconductance mode, connected to an impedance-defining transformer and resistor network. Of course we use Audio Note (UK) resistors and silver wire in the transformers - no compromise! - but this means that the defining impedances at each end are created by valves and exceptional quality components, not a few pennies worth of digital gate, and this is at least partly responsible for the astounding difference this technology makes.

I built the prototype of just one end (I can't remember which, transmit or receive) and gave it a listen. The result was subtle in some ways yet as obvious as the midday sun in others; colours were improved and the high frequencies became more silky and less digital sounding. What I heard was the biggest step towards the sound of analogue in years of digital replay.

Encouraged by this, I built a complete system, transmit and receive and yes, the results were even better. So, it was now obvious that buffering at both ends of the cable was required to get the full benefit…

At the time there was a certain amount of scepticism about this kind of thing at Audio Note (UK), well everywhere, I guess the accepted knowledge at the time was that, once it's in the digital domain, it either works or it doesn't - a kind of digital thought in itself.

However, what was clear to me was that much the same kinds of effects due to technologies, materials and components occur in the digital domain as they do in the analogue domain (remember what I said in the opening paragraph). This is particularly evident in the cable connection between DAC and transport. (I have certain exotic theories as to why this is the same, but now is not the time to go into them.)

I conducted the preliminary experiments with one of our lower end DACs, but after discussion with Peter and Andy Whittle we decided that we should build a kind of super DAC 5, using the PSU from the M9 to power the analogue stages. This DAC would have the receiving buffer and the CDT-SIX would have the transmitting buffer.

To complement this new super-DAC, I designed a new I/V transformer, using the core which we were currently using in the AN-S9. Again this new DAC was to utilise all the best components and materials we had available, to bring its specification up to the same kind of level as the M9, or above.

Neil (our transformer expert) gave himself some new grey hairs winding the transformers, I assembled the special boards and handed those and the plans to the production crew, and some time later the first proper DAC arrived at what was the old 'Audio Note Skunk Works" all built with the new parts and technologies. I checked it over, adjusted it and put it in the listening area. Andy W and Peter sat down to check it out.

I went back to my lab for a bit to get on with some other work, and returned after the unit had run for 20 minutes, only to walk through the door to see Peter and Andy with their mouths and eyes wide open in awe…

For the first time we had a digital replay which was truly on the same level as that achievable by LP.

This wasn't a subtle, incremental gain, it was a new paradigm. We were hearing analogue sound from a digital system; smooth, warm, transparent mid, real dynamics, real treble, real bass, no sense of that processed, plastic/electronic sound we have all become so used to from digital (and we have to remember here that at Audio Note (UK), we are already used to listening to the most organic sounding digital equipment around, on a daily basis).

I suppose what we have to take from this is that when we talk about 'digital audio' things aren't as clear cut as they seem.

Engineers and mathematicians like the subject because they can use the power of the PC and software like Matlab to work apparenlt miracles with it, and it's all clean and 100% accurate. But that word exists only within the PC itself, or on the page of calculations. Once we get out of that world, where 1s and 0s are represented by real voltages and where things happen in a finite length of time, and where both of these, voltage and time, are subject to both stochastic and signal related uncertainties, we have to think analogue again.

I am not against mathematics, modelling, or measurement in any way. I routinely use all three to create Audio Note (UK) products; I have to, otherwise nothing would work. However, there are too many papers written purporting to hold the formula to creating 'The Philosopher's Stone of Audio', and too often, they are written by people who haven't created a single good sounding product in their entire career as an audio engineer. This failure comes about due to a lack of understanding of the problem, which is to recreate a musical event, one that has meaning to a human listener.

The bounds set by mathematical and engineering rigour - bounds which are artificially set, due to thoughts taking place solely within the logical or Platonic world - limit the available dimensions of freedom to think and acceptance that another could create something which works but which does not fit within those bounds. I guess here we could contemplate the work of Kurt Godel, in our case, to say 'not everything that sounds good is provable as to why it does', and conversely, 'using logic and rigour will not reveal all that is available to us to create good sound'. At some point we reach a level of blurred uncertainty, and the human element is required.